Anomalous LAD and CX Artery Arising Separately from the Proximal Right Coronary Artery—A Case Report of Single Coronary Artery with Coronary Artery Disease

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ABSTRACT Coronary artery anomaly has been reported at a rate of 0.6% to 1.3% in routine angiographic series. Moreover, single coronary artery is one of the rarest anomalies among coronary anomalies. Eventhough patients with coronary anomalies are usually asymptomatic, they may also be associated with myocardial ischemia, ventricular fibrillation, syncope, congestive heart failure, and sudden death. In this article, we report a case of single coronary artery anomaly with the left anterior descending (LAD) and left circumflex (LCx) coronary artery arising separately from the proximal right coronary artery. Since the presented case was associated with ischemic heart disease, coronary artery bypass grafting was carried out. He is currently well. doi: 10.1111/j.1540-8191.2005.00141.x *(J Card Surg 2006;21:309-312)*

Coronary abnormalities, incidentally diagnosed during routine angiography, are ranged from 0.6% to 1.3%.[1–6] Of these, an isolated single coronary anomaly is the rarest one.[7–9] Coronary anomaly such as single coronary artery anomaly must be considered, if the left main coronary artery cannot be opacified by selective contrast medium injection during coronary angiography. Also, reports of atherosclerosis occurring in single coronary artery are available in the literature. Patients with an isolated single coronary anomaly may present with symptoms such as angina pectoris, myocardial infarction, arrhythmias, syncope, sudden death, and congestive heart failure.[10–12]

This report presents a very rare form of single coronary artery associated with obstructive coronary artery disease that the left anterior descending (LAD) and the left circumflex (LCx) coronary artery arose separately from the proximal right coronary artery at right sinus Valsalva.

CASE REPORT

A 47-year-old male presented with intermittent episodes of chest pain for last 2 weeks. His pain was located at left side of the chest and expanding to the left arm. On medical history, there were smoking, hypercholesterolemia, and family history as coronary risk factors for coronary artery disease. He was on aspirin and atorvastatine therapy for a 1 year. On physical examination, his blood pressure was 125/70 mmHg with a heart rate of 70/min. Cardiac and lung auscultation were unremarkable. An ECG recording showed normal sinusal rhythm with nonspecific T wave changes in V1 to V6. Chest X-ray was normal. Two-dimensional transthoracic echocardiography demonstrated no cardiac abnormality. For further evaluation, he underwent exercise myocardial perfusion scintigraphy, and developed chest pain after walking for 5 minutes on the treadmill, with concomitant 2 mm ST depression throughout the precordial leads. Nuclear scintigraphy also revealed that there were ischemic areas at anterior and inferior wall. He subsequently underwent coronary angiography and left ventriculography from the standard right femoral Judkins technique. Coronary angiography did not show any vessel originating from the left coronary sinus (CS). The left anterior descending, left circumflex, and right coronary arteries originated from the right CS separately via single ostium without left main trunk, classifiable as a Lipton R-I A. All of the coronary arteries originated from the right coronary artery and had a normal course and distribution (Figs. 1 and 2). Both the LAD and LCx had a normal anterior course, and gave rise to the diagonal, septal, and obtuse marginal branches.

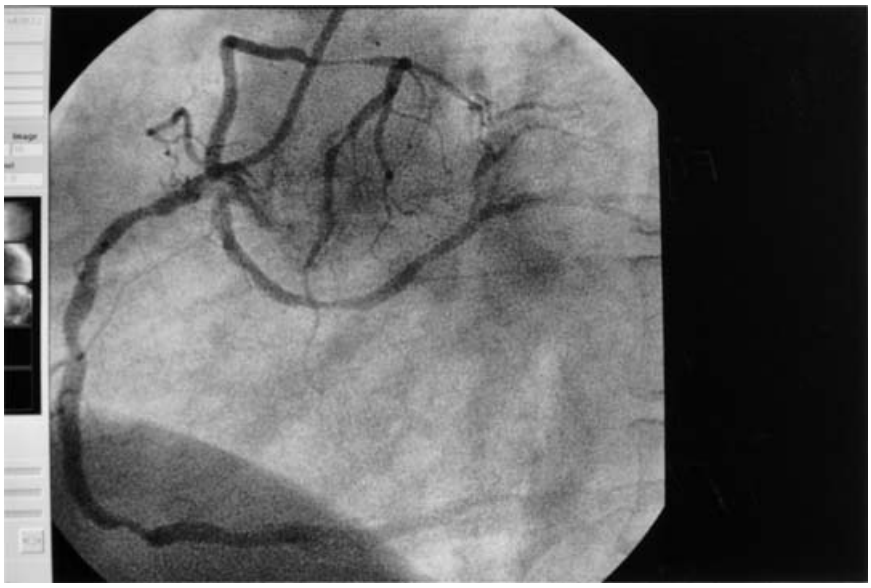

Figure 1. *Coronary angiogram in the left anterior oblique angiographic imaging, showing single coronary artery with coronary artery disease giving rise to all three epicardial vessels. RCA = right coronary artery; LAD = left anterior descending artery; LCx = left circumflex artery.*

Also, this anomaly was associated with diffuse coronary atherosclerosis with severe narrowing in all coronary arteries. The left anterior descending coronary had 85% lesion in its mid-segment, left circumflex coronary had a mid-segment 75% lesion. RCA appeared to have significant lesion at mid- and distal-segment (50% and 70%, respectively). The left ventricular systolic function was normal. Left ventricular ejection fraction was estimated to be 65%. Coronary artery bypass grafting was recommended and successfully carried out with anastomosis of the left internal thoracic artery to the left anterior descending artery, and bilateral radial arteries from the proximal aorta to circumflex coronary artery and the RCA. He was symptom-free 4 weeks after operation.

DISCUSSION

Coronary anomalies are not recognized during routine screening. In general, they are diagnosed

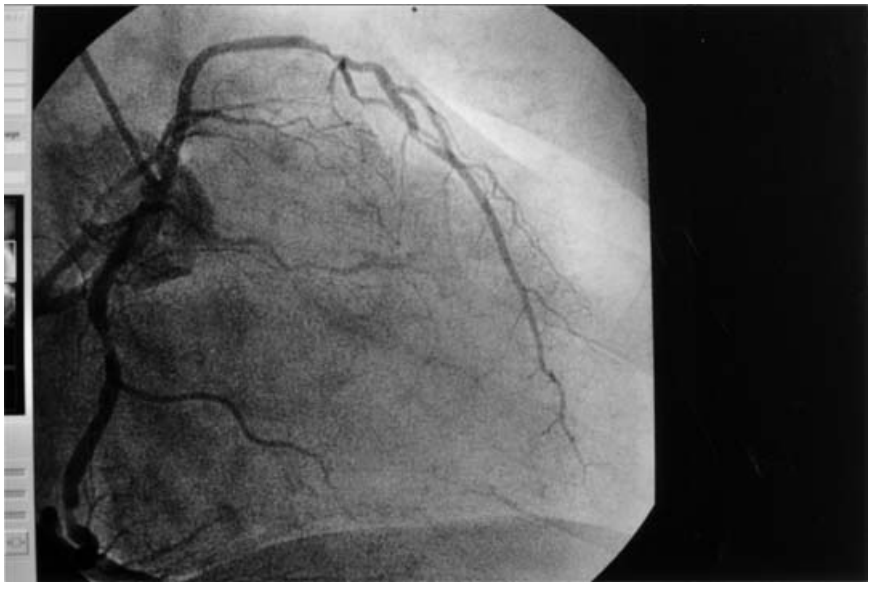

Figure 2. *The right anterior oblique angiographic imaging showing anomalous LAD and LCx artery arising separately from the proximal right coronary artery.*

incidentally during coronary angiography.[1–6] Of these, the most common coronary abnormality is that the LAD and LCx coronary artery originate separately from the left sinus of Valsalva (52%), and the second commonest anomaly is that the LCx artery originates from the RCA or right sinus of Valsalva (27%). The third commonest anomaly is coronary artery fistulae (5%). Isolated single coronary anomalies are one of the rarest anomalies, and constitute approximately 2% to 4% of all coronary anomalies.[7–9] Coronary atherosclerosis can also occur within anomalous coronary arteries.[10–12] We present the absence of the left main coronary artery with the left anterior descending and circumflex coronary arteries arising separately by single ostium from the right coronary sinus in a patient accompanying with coronary artery disease without other congenital cardiovascular malformations.

Single coronary artery anomalies are considered potentially dangerous, even not coursing between the aorta and the pulmonary artery, because it can cause cardiac ischemia, congestive heart failure, and sudden cardiac death. In most patients with such coronary anomalies, the symptoms and signs of heart diseases depend on anatomical malformations and accompanying anomalies.

Single coronary artery anomalies are described with respect to the point of origin of the left and right coronary arteries, the distribution over the ventricular surface and their relationship with ascending aorta and pulmonary artery.[8,9] In this classification, according to the site of origin of single coronary artery in the right or the left sinus of Valsalva, the R or the L letter is assigned. Thereafter, the Latin number I, II, or III depends on the relationship between the three main epicardial vessels. In group I, they emerge separately, following the normal anatomical course of either a right or a left coronary artery; in group II, they originate from the proximal part of the normally located coronary artery; and in group III, the left anterior descending artery and the circumflex coronary artery arise separately from the proximal part of the normal right coronary artery, without a common left main coronary artery. In addition, the last capital letter indicates the relationship of the anomalous coronary arteries with the great vessel: whether they have a course anterior letter A, posterior letter P, between the great vessels letter B, and combined letter C.

During coronary angiography, it was not possible to locate and opacify the left coronary ostium in the left sinus of Valsalva. Cannulation of the right coronary ostium in the right sinus of Valsalva showed that the LAD and LCx coronary artery were arising separately from proximal right coronary artery. In our case, neither external compression nor anormal anatomical course was detectable at angiography onto the anomalous vessel. All coronary arteries course anteriorly. Our case was classified as an R-I A coronary anomaly according to Lipton's classification (Fig. 3). This case represents the most serious coronary anomaly of origin, associated with the highest incidence of symptoms and sudden death. This risk is further increased if the course is between the great vessels. In addition, our patient had obstructive coronary artery disease. Therefore, we thought that, in this case, this anomaly and concomitant coronary artery disease cause angina pectoris or myocardial ischemia.

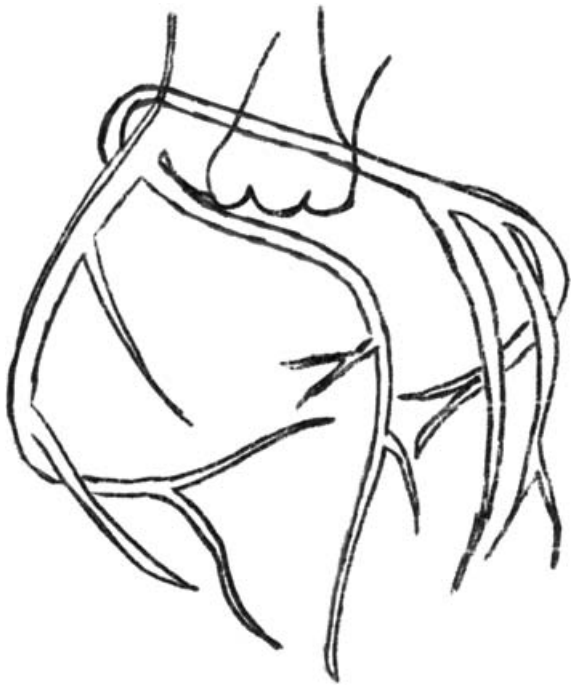

Figure 3. *Schematic drawing of the LAD and LCx arteries in this case. The LAD and LCx arteries took an anterior course on the cardiac structure.*

Although noninvasive techniques are now available to help further detailed evaluation of coronary artery anomalies, coronary angiography is still gold standard, and required to accurately diagnose and evaluate coronary anomalies. Prior to cardiac surgery, coronary angiograms are very important. Since surgical complications may follow if the operator unwittingly incises the anomalous vessel. Surgical approach may involve reimplantation of the anomalous vessel in the proper coronary sinus. In addition, coronary artery bypass grafting alone may be used as the standard procedure for restoring normal distal coronary flow with good long-term results.

In conclusion, eventhough it is rarely seen, one should keep in mind that single coronary abnormally alone, or with its atherosclerotic lesions can cause angina pectoris or myocardial infarction. In addition, we believe that coronary bypass grafting itself represents the safest and most effective procedure.

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