Anomalous Origin of the Left Circumflex Artery from the Right Sinus of Valsalva: Non-ST-segment Elevation Myocardial Infarction

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Abstract

An anomalous origin of the left coronary artery from the right sinus of Valsalva (RSV) is rare. We herein report the case of an 80-year-old woman who presented to the emergency department with chest pain. Emergent coronary angiography was performed following a diagnosis of non-ST segment elevation myocardial infarction. A right coronary angiogram showed that the common trunk originating from the RSV branched into the left anterior descending and right coronary arteries. Although the initial angiogram failed to show the left circumflex artery (LCx), considered to be the culprit vessel, computed tomographic angiography demonstrated that the LCx was located immediately below the common trunk and exhibited a retroaortic course. We successfully treated the patient and obtained optimal angiography results.

Key words: coronary vessel anomalies, coronary sinus, myocardial infarction

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Introduction

Congenital anomalies of the coronary arteries are often found incidentally on coronary angiography or at autopsy. The incidence of coronary artery anomalies is only 0.2-1.3% based on adult angiographic series. Such anomalies may result in life-threatening conditions, including arrhythmias, syncope, myocardial infarction and sudden death (1). The most important determinant of the prognosis is the relationship of the arterial course to the aorta and pulmonary arteries (2). We herein report the case of an 80-year-old woman who presented with non-ST-segment elevation myocardial infarction (NSTEMI) of the left circumflex artery (LCx), which originated from the right sinus of Valsalva (RSV) and ran through posterior to the aortic root. We successfully treated the patient with coronary stent placement in the LCx guided by computed tomography (CT) angiography.

Case Report

An 80-year-old woman presented to the emergency department with chest pain that had developed one hour previously. The patient was a non-smoker with a history of diabetes mellitus, although she did not take any medications for the diabetes. The initial vital signs were as follows: blood pressure, 103/63 mmHg; pulse rate, 55 beats/min; respiratory rate, 20 breaths/min; and body temperature, 36.6°C. The laboratory findings showed a serum creatinine kinase level of 66 IU/L (56-244 IU/L), creatine kinase-myocardial band level of 6.4 ng/mL (0.0-5.0 ng/mL), troponin-I level of 0.1 ng/mL (0.00-0.16 ng/mL) and myoglobin level of 152 ng/mL (0-72 ng/mL). Electrocardiography demonstrated ST segment depression of 2 mm in leads II, III and aVF and 4 mm in leads V1-V4. Emergent portable transthoracic echocardiography (TTE) revealed regional wall motion abnormalities (RWMA) in the entire severely hypokinetic posterolateral wall and hypokinetic mid to basal inferior wall.

The patient immediately underwent coronary angiography...
under a suspected diagnosis of NSTEMI; however, the procedure failed to show the left coronary artery (LCA). Subsequent right coronary angiography revealed a common trunk between the right coronary artery (RCA) and left anterior descending artery (LAD) at the RSV (Fig. 1A) Although the LAD contained an intermediate lesion, it was not considered to be the culprit lesion. We then performed an additional angiography scan using a pigtail catheter to check the anomalous origin of the LCx. Nevertheless, the orifice of the LCx remained invisible on images of the coronary sinus and ascending aorta.

The patient continuously complained of severe chest pain, and the levels of cardiac enzymes increased markedly, up to a serum creatinine kinase level of 5,392 IU/L, creatine kinase-myocardial band level of 597.4 ng/mL and troponin-I level of 181.3 ng/mL (0.00-0.16 ng/mL). We then performed thoracic CT angiography to exclude the possibility of aortic dissection and an anomalous origin of the coronary arteries 10 minutes after coronary angiography. Although there were no abnormal findings for the ascending aorta, the LCx was clearly identified immediately below the common trunk located at the RSV (Fig. 2). Immediately after thoracic CT, we located the LCx using a multipurpose catheter, which showed thrombotic total occlusion in the proximal area. After inserting a 0.014-mm guide wire, the thrombus was aspirated using a thrombosuction catheter. Finally, a drug-eluting stent (resolute integrity: 4.0×26 mm) was implanted in the culprit lesion at three hours after symptom onset. As shown in Fig. 1B, final coronary angiography showed optimal findings (TIMI 3 flow).

In order to ascertain the orifice, distribution and course of the coronary arteries, the patient underwent multislice CT coronary angiography at three weeks after admission. Consequently, the anomalous course of the LCx was found to solely originate from the right coronary sinus with a retroaortic course (Fig. 3).
Congenital anomalies of the coronary arteries occur at a rate of approximately 0.2-1.3%. The origin and course anomalies are incidentally found on coronary angiography in 0.29-1.3% of cases (1, 2). In particular, a left coronary artery originating from the RSV is very rare, found incidentally in approximately 0.017% of individuals undergoing coronary artery angiography (3).

The most important determinant of the clinical and long-term prognoses is the course of the left coronary artery and its relationship to the position of the aorta and pulmonary arteries. An anomalous left coronary artery originating from the RSV may have four pathways: between the aortic root and pulmonary artery (interatrial course), a trans-septal course (subpulmonic course), anterior to the right ventricular outflow tract (anterior or prepulmonic course) and posterior to the aortic root (retroaortic course). Left coronary arteries coursing between the aorta and pulmonary artery are known to have a high risk of sudden death in young men (4).

Approximately half of patients with an anomalous left coronary artery arising from the RSV experience fatal events before 20 years of age. Such events usually occur during or shortly after vigorous exertion (5). There are several hypotheses regarding the poor prognosis associated with anomalous left coronary arteries originating from the RSV.

First, the coronary blood flow may be reduced by compression of the pulmonary trunk or aorta as a result of an increase in pressure in these vessels during exercise (6). Second, acute takeoff or the presence of slit-like orifices in these arteries may produce ischemia that can result in angina, syncope, congestive heart failure, arrhythmias and/or sudden death (7). Third, histological changes consistent with regional ischemic inflammatory-mediated myocardial remodeling are associated with a poor prognosis (7). Finally, although controversial, some authors have suggested that coronary segments with an anomalous course are vulnerable to atherosclerosis (8).

In symptomatic patients with this anomaly, especially young patients, it is widely accepted that corrective surgery should not be delayed. On the other hand, no controlled studies have evaluated the outcomes of this intervention in asymptomatic individuals. Intracoronary stent placement has also been used as an alternative to coronary artery bypass grafting (CABG) in symptomatic patients with ischemia.

If the origin of the vessels is not identified after the initial angiography procedure, the interventionist must consider the possibility of an anomalous origin of the coronary artery, which can be further investigated using immediate left ventriculography or aortography. However, if angiography does not clearly show the origin of the anomalous artery, non-invasive imaging modalities, including CT angiography, echocardiography and magnetic resonance imaging, must be considered.

In conclusion, we herein reported an interesting case of NSTEMI with an anomalous coronary origin of the LCx. In this case, coronary angiography revealed a common trunk originating from the RSV that branched into the LAD and RCA. In addition, the LCx independently ran through a retroaortic pathway immediately below the common trunk. Although initial coronary angiography failed to clearly show the anomalous origin of the LCx, considered to be the culprit vessel, we were able to locate the culprit lesion using immediate CT angiography and thereafter successfully treat the patient.

The authors state that they have no Conflict of Interest (COI).

References
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