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Case Report
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Congenital Anomaly of Single Dominant Right Coronary Artery with Hypoplastic Left Coronary Artery

Cheng-Yen Chuang,[1] Yen-Chou Chen,[1] Ho-Shun Cheng[1] and Ming-Hsiung Hsieh[1,2]

With the popularization of new imaging technology, more people are deciding to undergo non-invasive studies such as multidetector computerized tomography (MDCT) before receiving coronary angiography. For this reason, coronary anomalies of coronary artery are being encountered more frequently. We here report a 68-year-old male presenting with typical angina. The MDCT images suggested chronic total occlusion of the left anterior descending (LAD) artery with collateral circulation from the right coronary artery (RCA). The patient's coronary angiography showed a congenital coronary anomaly with a single dominant RCA supplying the entire coronary circulation of the heart with both LAD and left circumflex artery hypoplasia.

Key Words: Angiography • Anomaly • Computerized tomography • Coronary artery

CASE REPORT

A 68-year-old male presented with intermittent chest tightness of two months duration at our outpatient department. He had a history of hypertension, and dyslipidemia under regular medication. The patient stated the chest pain was located in the retrosternal area with a sensation of squeezing tightness. The episodes lasted for half an hour, were accompanied with palpitation and usually occurred on exertion. The chest pain did not radiate to other areas and did not cause cold sweating, nausea, or vomiting. Rest could relieve the discomfort.

Along with the positive treadmill test, the patient was given the Thallium-201 stress test. The results revealed myocardial ischemia of the anterolateral wall, basal inferior wall and basal inferolateral wall. The patient thus underwent multidetector computerized tomography (MDCT) of the coronary artery, and the radiologist reported chronic total occlusion of the left anterior descending (LAD) artery with collateral circulation from the right coronary artery (RCA) (Figure 1). Therefore, the patient underwent coronary angiography, and the results revealed single dominant RCA with a proximal origin at the small left circumflex (LCX) artery and continuing distally to the territory of LAD, while the left coronary artery was hypoplastic but not totally occluded (Figure 2). The coronary angiographic images were completely identical to the MDCT images. Ultimately, we did not perform a coronary intervention, and the patient's intermittent chest tightness was brought under medical control at our outpatient department.

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[1]Division of Cardiovascular Medicine, Department of Internal Medicine, Wan-Fang Hospital, Taipei Medical University; [2]Department of Internal Medicine, School of Medicine, College of Medicine, Taipei Medical University, Taipei, Taiwan.
Address correspondence and reprint requests to: Dr. Ming-Hsiung Hsieh, Division of Cardiovascular Medicine, Taipei Wan-Fang Hospital, No. 111, Section 3, Hsin-Lung Road, Taipei, Taiwan. Tel: 886-2-2930-7930 ext. 2818; Fax: 886-2-2933-9378; E-mail: mhhsieh@tmu.edu.tw

DISCUSSION

Single dominant coronary artery is a rare type of coronary artery anomaly and can cause angina-like symptoms.[1,2] The patients are usually asymptomatic but sudden cardiac death has been reported in young ath-

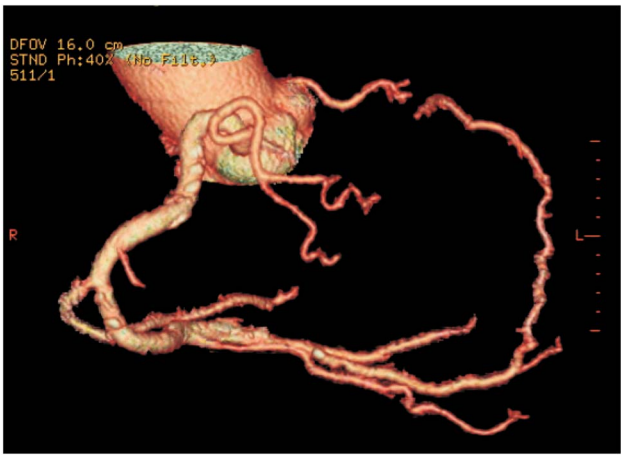

Figure 1. *Three-dimensional computerized tomography of the coronary artery shows a single dominant right coronary artery with proximal origin at the small left circumflex coronary artery and continuing distally to the left anterior descending artery. A hypoplastic left coronary artery is also evident.*

letes.[3] Anomalous coronary arteries do not appear to be associated with an increased risk for development of coronary atherosclerosis.[4] However, acute coronary syndrome in patients with coronary anomaly, especially solitary coronary ostium, has a higher risk of intervention since it is the sole source of blood supply. In this case, our patient presented with typical angina. The MDCT images indicated chronic total occlusion of the LAD artery. However, the coronary angiography confirmed a solitary coronary ostium originating from the right sinus of Valsalva with hypoplastic change in both the LAD and LCX. The RCA supplies almost all of the coronary circulation including the left ventricle of the heart, which is supposed to be supplied by the left coronary arteries.

Categorization of solitary single coronary artery based on anatomy can be either classified as anomaly of the abnormal origin or as anomaly of abnormal course by the scheme proposed by Lipton et al.[7] Depending on the location of the coronary ostium, the congenital anomaly is classified as "R" type (originating from the right sinus of Valsalva) and "L" type (originating from the left sinus of Valsalva). Based on the anatomy of the coronary arteries, it is classified into three types. In type I, there is a solitary dominant artery, with R-I type thus meaning solitary dominant RCA, and L-I type meaning solitary dominant left coronary artery. In type II, one coronary artery originates from the proximal portion of

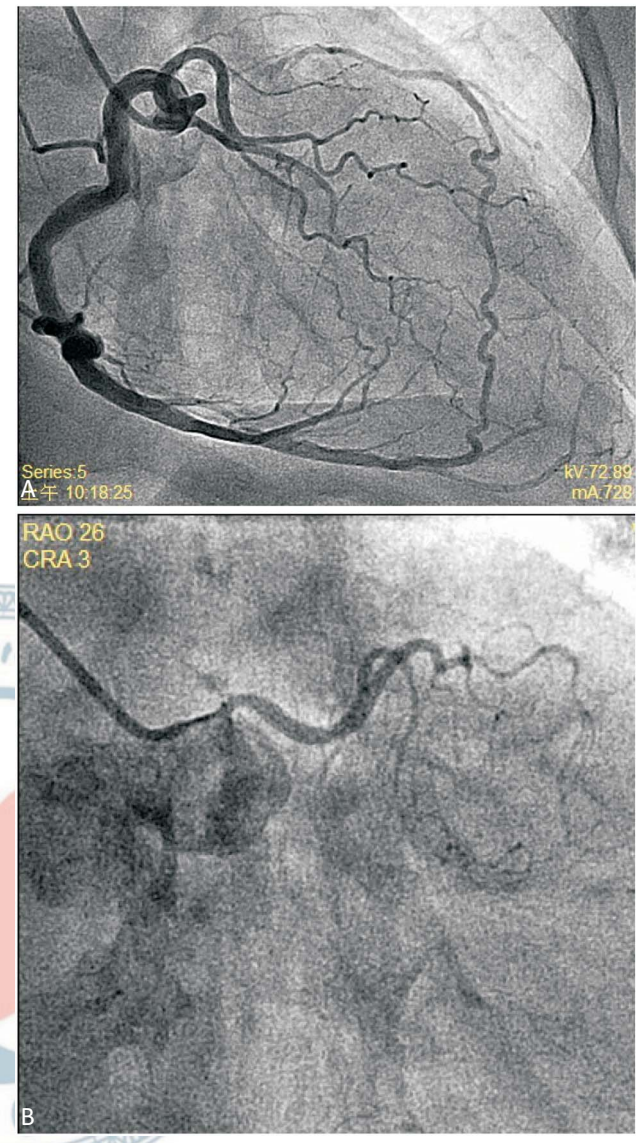

Figure 2. *Coronary angiography reveals the same picture of a single dominant right coronary artery with proximal origin at the small left circumflex coronary artery and continuing distally to the left anterior descending artery (A), and a hypoplastic left coronary artery (B).*

other normally located coronary arteries. In type III, there is an absence of the left main coronary artery (also known as left main trunk). The LAD and LCX have separate origins from the proximal part of the normally located RCA. Based on the course of the transverse trunk, it is classified as types A, B, P, S and C: type "A" means "anterior to the great vessels"; type "B" means "between the aorta and pulmonary arteries"; type "P" means "posterior to the great vessels"; and type "S" is "septal type", which means a part of the route goes

through the interventricular septum. Type "C" means "combined type".

In our case, the coronary angiography showed a single dominant RCA with both LAD and LCX hypoplasia. The posterior descending branch of the RCA extended anteriorly in the interventricular sulcus to the territory of the LAD and supplied the entire blood circulation to the left side of the heart. For this reason, the patient was classified as R-I-S type single coronary anomaly.

MDCT angiography is a noninvasive method for detecting and excluding coronary artery stenosis. Kacmaz et al. performed a retrospective evaluation for single coronary anomaly and suggested compatible sensitivity to coronary angiography.[5] However, possible artifacts occurred during computed tomography angiography and reconstruction could mislead the diagnosis. According to the review by Kroft et al., the possible causes of artifacts that hamper MDCT coronary angiography image interpretation are mainly motion artifacts that cause blurring and incorrect diagnoses due to coronary artery calcifications.[6] It is difficult to distinguish the distal part of a dominant vessel from a collateral circulation vessel especially when the vessel is calcified. Cardiac, respiratory and postural motion during the MDCT study can cause artifacts of reconstruction that make the image interpretation less reliable. Additionally, the higher radiation exposure and cost of MDCT should also be considered. In our case, the MDCT images clearly demonstrated single dominant RCA, but were diagnosed as chronic total occlusion of the LAD. The rarity of this congenital anomaly and our limited prior exposure to the condition may have caused this misdiagnosis.

In conclusion, we reported on a patient with R-I-S type single dominant RCA, whose MDCT results were misdiagnosed as chronic total occlusion of the LAD with collateral circulation from the RCA. Although MDCT can be a powerful, non-invasive and convenient tool in the diagnosis of coronary anomaly and coronary artery disease, the most effective use of this imaging device requires experienced doctors for proper interpretation to avoid misdiagnosis, especially among patients with rare congenital abnormalities.

DISCLOSURES

None.

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