

Anomalous Double Blood Supply to the Anterior Descending (LAD, RAD) Artery in an Infective Endocarditis Patient: A Case Report

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ABSTRACT

Background: Double blood supply to the anterior descending artery is a rare finding of coronary angiography. However, infective endocarditis (IE) combined with anomalous double blood supply to the anterior descending artery has not been reported.

Case presentation: A 58-year-old male previously diagnosed with IE came to the emergency department with complaints of chest tightness and dyspnea. Further examination confirmed severe aortic valve regurgitation combined with IE and anomalous double blood supply to the anterior descending artery. The cardiopulmonary bypass surgery was performed by direct perfusion through the normal left and right coronary openings. After surgery, the heart started beating again normally without any cardiogenic ischemic events.

Conclusion: Cardiopulmonary bypass by direct perfusion was safe in the patient with anomalous double blood supply to the anterior descending artery.

INTRODUCTION

Abnormal origin of the anterior descending branch, with a single root originating from the right coronary artery, is reported a few times [Jiang 2020], but dual supply to the anterior descending branch is rare [Lee 2020]. An asymptomatic patient without coronary stenosis is rarer. In the present report, we describe a patient with infective endocarditis (IE) who was confirmed, using preoperative coronary angiography

and coronary computed tomography angiography (CCTA), to have the anomalous double blood supply to the anterior descending artery. Intraoperative myocardial perfusion routinely was performed, and the recovery was smooth.

CASE DESCRIPTION

A 58-year-old male previously diagnosed with IE came to the emergency department with complaints of chest tightness and dyspnea. Cardiac auscultation exhibited a diastolic murmur at the aortic valve area. An electrocardiogram on admission showed sinus rhythm with T waves in leads I, aVL, and V4-V6. Further examination using echocardiography confirmed severe aortic valve regurgitation, due to a bacterial clump. The echocardiography also revealed normal left ventricular ejection fraction (60%) with normal ventricular wall motion. Laboratory tests of troponin I and creatine kinase-MB (CK-MB) excluded myocardium infarction. CCTA (Figure 1) indicated that the middle and distal portions of the left anterior descending (LAD) coronary artery had poor imaging while the circumflex and right coronary arteries (RCAs) seemed normal. (Figure 1) However, the collateral branch from the RCA, instead of the distal parts of LAD, appeared in the anterior interventricular groove to support the nearby myocardium (right anterior descending (RAD) artery). Consistently, coronary artery angiography (CAG) (Figure 2) showed that the distal portion of LAD disappeared as well, and the occlusion of LAD was nearly misdiagnosed. (Figure 2) However, according to the result of CCTA, we confirmed the presence of RAD using CAG. Intriguingly, during the aortic valve replacement surgery, the distal part of the anterior descending artery could be seen on the epicardial surface, along with the large collateral vessel from the RCA. (Figure 3) Therefore, the part of the myocardium usually nourished by the distal LAD artery was mainly supported by the RAD artery in this patient. The cardiopulmonary bypass surgery was performed by direct perfusion through the normal left and right coronary openings. After surgery, the heart started beating normally again without any cardiogenic ischemic events. Finally, the patient recovered and was discharged from the hospital. Follow up was performed three months after the surgery and showed normal results.

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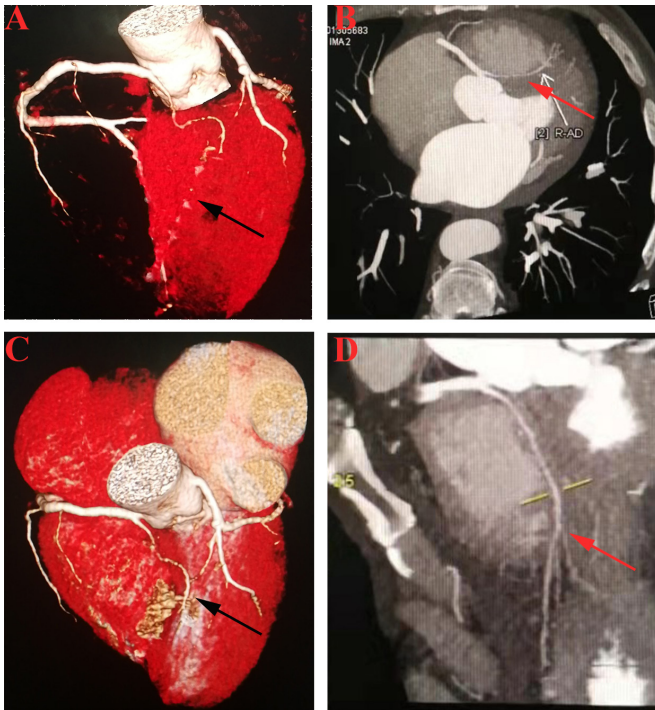


Figure 1. CCTA showed that RAD originated from RCA, which appeared in the anterior interventricular groove to support the nearby myocardium. The arrows indicate RAD.

Written consent for submission and publication of this case report, including images, was obtained from the patient.

DISCUSSION

According to previous studies [Talanas 2009; Kunimoto 2009; Kosar 2006; Turhan 2004; Erbay 2003], a double LAD artery originating from both the right and left coronary arteries is an extremely rare congenital coronary artery anomaly with an angiographic prevalence ranging from 0.01 to 0.03%. It was mainly divided into four types: Types I–III are similar in their early bifurcation of the proximal LAD artery into two vessels. Type IV is described as the presence of two separate LAD arteries, a LAD proper artery and a long LAD artery originating from the right sinus of Valsalva or the RCA [Turhan 2004; Spindola-Franco 1983]. In our case, the LAD artery was tiny, and it supplied only a portion of the anterior interventricular wall, whereas the RAD branch originating from the proximal RCA supplied most of the myocardium distal to the anterior interventricular wall. CT angiography provided direct visualization of the dual LAD distribution of the Type IV variant of the Spindola-Franco and colleagues classification, in which the first LAD originated from the left main and the second LAD originated from the same ostium with the RCA.

Dual-supplied anterior descending branches are very rare coronary malformations, and most are associated with atherosclerosis or coronary stenosis [Bitigen 2007]. Coronary CTA

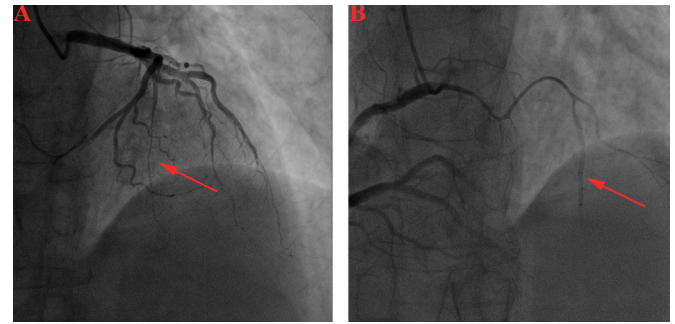


Figure 2. CAG showed that the distal portion of LAD disappeared (A), and RAD originated from RCA, which appeared in the anterior interventricular groove (B).

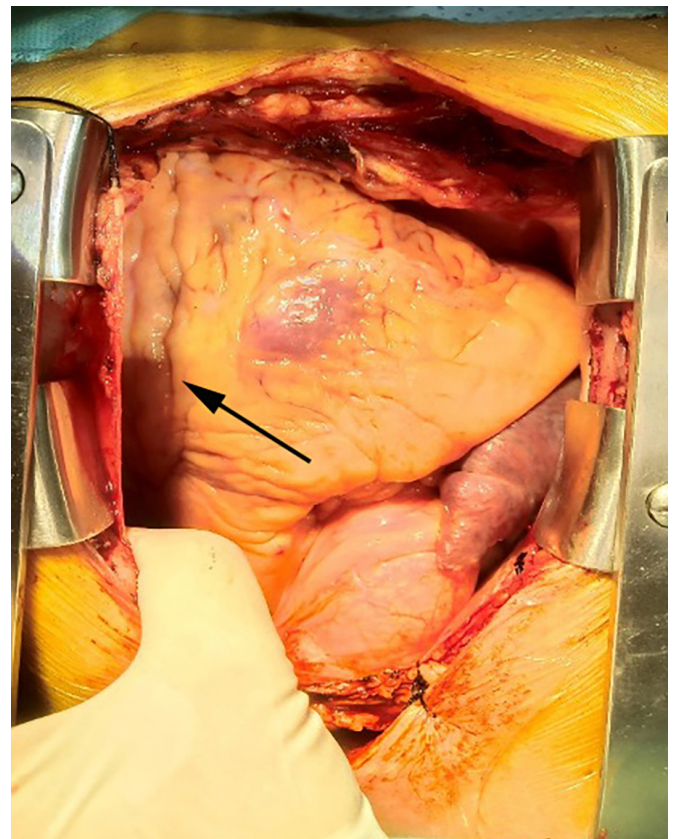


Figure 3. We could see RAD on the epicardial surface after thoracotomy. The arrows indicate RAD.

and coronary angiography are the gold standards for diagnosis. In this case, the interruption of the anterior descending branch easily could be misdiagnosed as middle and distal anterior descending branch occlusion. Right coronary angiography showed that a branch from the proximal main branch rapidly turned to the middle and distal anterior descending branch and sent out septal branches to supply to the left ventricle anterior wall and septum. However, a loop formed by an acquired occlusion is not the same as an innate anomaly. The collateral circulation formed after the occlusion of the



Video 1: Coronary artery Angiography showing that the distal portion of LAD disappeared. (<https://vimeo.com/747284044>)

anterior descending branch was mainly from the posterior descending branch that bypassed the apex and retrograded to supply to the myocardium in the middle and distal segments of the anterior descending branch. Our case was unique because it was not associated with atherosclerosis or coronary stenosis.

This is the first report of a unique patient to our knowledge. This patient needed extracorporeal circulation due to IE. Coronary artery malformations were found by routine preoperative coronary angiography and further verified by coronary CTA. However, unlike previous studies, this patient had no significant coronary stenosis. Thereby, direct intraoperative perfusion of histidine-tryptophan-ketoglutarate (HTK) fluid was routinely performed without special treatment for coronary arteries. The patient's heart was stopped and restarted smoothly, and the postoperative recovery was satisfactory. Therefore, this case report provides treatment suggestions for patients with such abnormalities who might need to undergo open-heart cardiopulmonary bypass surgery.

CONCLUSION

We report a case of IE requiring surgical treatment. Preoperative coronary angiography and CTA revealed type VI coronary malformation without complications of atherosclerosis or coronary stenosis. Therefore, we performed CCTA and coronary angiography, which confirmed whether the patient had coronary occlusion or stenosis and whether cardiopulmonary bypass was required. Figuring out a way to protect the myocardium during the surgery is of great significance.



Video 2: Coronary artery Angiography showing that RAD appeared in the anterior interventricular groove. (<https://vimeo.com/747285934>)

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