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Intraoperative Angiography after Coronary Bypass Grafting in a Patient Presenting with a Single Coronary Artery: A Case Report

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ABSTRACT

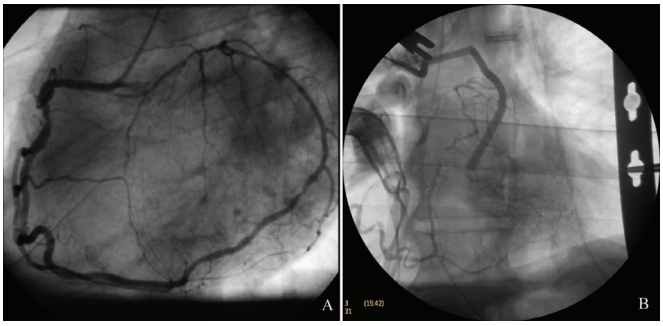
Among coronary artery anomalies, single coronary artery is one of the rarest anomalies. Pulmonary origins of the coronary arteries, coronary artery fistulae, and anomalous aortic origins of the coronary arteries are the most common anomalies requiring surgical intervention. In this case, we describe the performance of bypass grafting after unsuccessful attempts at percutaneous coronary intervention in a 72-year old male patient with single coronary artery arising from the right sinus of Valsalva and with associated diffuse coronary atherosclerosis. Intraoperative angiography was performed to evaluate the revascularization of this anomalous coronary system. The patient remains symptom free 6 months after the operation.

INTRODUCTION

A rare congenital anomaly, single coronary artery (SCA) is defined as only a single coronary artery that arises from the aortic trunk by a single coronary ostium and that is responsible for supplying blood to the entire heart [Angelini 2002]. According to the literature, isolated SCA has an incidence of 0.02% to 0.06% and is discovered accidentally during catheterization or at autopsy [Desmet 1992]. Although most patients presenting with SCA are asymptomatic, they carry a significant risk for severe cardiac events, such as myocardial infarction and sudden cardiac death, even in the absence of occlusive arteriosclerotic disease [Taylor 1992]. We report the case of a patient who presented with an anomalous origin of the left anterior descending coronary artery (LAD) and the left circumflex coronary artery (LCx) arising from the right coronary artery (RCA), associated with diffuse coronary atherosclerosis with severe narrowing in the LAD and LCx. The patient underwent conventional coronary artery bypass grafting after unsuccessful attempts at percutaneous coronary intervention.

CASE REPORT

A 72-year-old man presented with exertional dyspnea and chest pain of 2 months that was aggravated by exercise and alleviated by rest. A physical examination showed a blood pressure of 120/80 mm Hg and peripheral edema. An electrocardiogram demonstrated atrial fibrillation at a heart rate of 102 beats/min, as well as T-wave inversion in aVL, V3 to V5. A transthoracic echocardiography evaluation demonstrated a slightly dilated left ventricle with a decreased left ventricular systolic function (ejection fraction, 37%) and mild mitral and tricuspidal regurgitation. Coronary risk factors included smoking, hypertonia, and diabetes mellitus. Furthermore, a chest radiograph showed large pleural effusions on both sides. After cardiac recompensation, the patient underwent coronary angiography by means of the standard right femoral Judkins technique. During the examination, the left coronary artery could not be intubated, and cannulation of the RCA showed that the LAD and the LCx originated separately from the proximal RCA (Figure A). There was no left main trunk. The anomalous single coronary artery, arising from the right sinus of Valsalva, was associated with diffuse coronary atherosclerosis with critical narrowing in the LAD and LCx. After unsuccessful attempts to treat the culprit lesions via percutaneous coronary angioplasty, bypass surgery was scheduled.



A, Left anterior projection showing the complete anomalous coronary arteries, with a prominent right coronary artery connected with a fully developed left coronary system. B, Right anterior oblique projection showing the left coronary artery branches and the venous bypass. Retrograde perfusion of the left and right system over the left circumflex coronary artery can be observed. The venous cannula for cardiopulmonary bypass placed in the right atrium is seen on the left side of the picture.

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Conventional coronary artery bypass grafting was performed by grafting the left internal thoracic artery to the LAD and a single saphenous vein graft to the medial portion of the LCx. Intraoperative angiography was performed with a digital fluoroscopy device (BV Pulsera; Philips Medical Systems, Best, the Netherlands) after injection of 0.2 mg nitroglycerin to avoid coronary spasm. The contrast dye was delivered via venous bypass to the still-arrested heart. The angiography evaluation showed retrograde perfusion of the left system with contrast reaching the RCA, as well as a patent anastomosis (Figure B). After uneventful operative and postoperative courses, the patient was discharged on postoperative day 12. Six months after the operation, the patient is symptom free.

DISCUSSION

According to the literature, approximately 1% of the general population is affected by coronary artery anomalies [Angelini 2002], of which isolated SCA has an incidence of 0.024% to 0.044%. SCA is discovered accidentally during catheterization or at autopsy [Desmet 1992]. A recent angiographic study of >70,000 patients reported a prevalence of 0.006% for SCA with the LAD originating from the proximal RCA [Tuncer 2006]. This type of SCA can present as 3 different variations of the initial course of the LAD: (1) anterior type, anterior to the right ventricular infundibulum (most common); (2) interarterial type, between the pulmonary trunk and the aorta; and (3) septal type, in the ventricular septum beneath the right ventricular infundibulum [Tuncer 2006]. Although imaging and screening methods, with magnetic resonance imaging holding the greatest appeal, are available for imaging of coronary artery anomalies, coronary angiography is still the gold standard [Angelini 2002].

During coronary angiography, locating and intubation of the left coronary ostium were not possible; however, intubation of the right coronary ostium showed the LAD and LCx arising separately from the proximal RCA. Additionally to the SCA, our patient showed obstructive coronary artery disease with critical narrowing in the LAD and LCx. In our case, coronary bypass surgery was performed after percutaneous coronary intervention had failed. Yokoyama et al [2007] presented a case of successful coronary angioplasty and stent implantation in the right coronary artery of a patient with high-risk unstable angina and a single coronary artery originating from the right coronary sinus. Regarding this rare coronary anomaly, only a few reports of percutaneous coronary intervention exist in the literature. Yokoyama and colleagues point out, however, that in cases of atherosclerotic obstruction associated with coronary anomalies, adequate study of the course of the anomalous vessel is of fundamental importance. In their opinion, the course of a SCA between the pulmonary artery and the aorta should be treated surgically [Yokoyama 2007]. Intraoperative angiography has recently been proposed for patients with acute aortic dissection and endocarditis to reduce the preoperative diagnostic time [Kilian 2008]. We performed intraoperative angiography to assess the patency and retrograde perfusion of this aberrant coronary system.

CONCLUSIONS

Although rarely seen, coronary artery anomalies should always be kept in mind by physicians, especially in younger patients, who present with ischemic heart disease. Furthermore, we believe that coronary bypass grafting may represent the safest and most effective procedure, especially when intraoperative angiography to assess the operative success is available.

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