Right Coronary Artery Fistula to Left Ventricle Treated by Transcatheter Coil Embolization: A Case Report and Literature Review

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Abstract

A coronary artery fistula between a coronary artery and a cardiac chamber is a rare condition. We reported a case of right coronary artery fistula to the left ventricle in a 57-year-old man who had 2-year history of chest pain and exercise dyspnea without significant coronary atherosclerosis with abnormal left ventricular size and function. It was important to recognize this anomaly and our experience showed that transcatheter occlusion of coronary artery fistula was a safe and effective procedure in the presence of symptoms of congestive heart failure, significant left-to-right shunt or refractory to medical treatment.

Key words: coronary artery fistula, transcatheter, coil embolization


Introduction

Coronary artery fistula (CAF) is considered an embryologic persistence of primitive intratrabecular spaces which allows the developing coronary artery to communicate with the other cardiac chambers or vascular structures (1). It is observed in 0.05% to 0.25% of coronary angiographic studies (2), most of which drain into a right heart chamber or into the pulmonary artery (3, 4), while congenital right coronary artery (RCA) into a left heart chamber is less frequent (5). In this study, we describe an unusual case treated by transcatheter coil embolization in right coronary artery fistula to left ventricle, and associated literature is reviewed.

Case Report

A 57-year-old man was admitted to our hospital for coronary angiography with the complaint of chest pain and exercise dyspnea for 2 years. He was a nonsmoker and had none of the classical cardiac risk factors or a positive family history for coronary artery disease (CAD). In addition, he had not experienced chest trauma or thoracic surgery and was not taking any prescribed medications. His blood pressure was 138/82 mmHg and his pulse was 110 beats per minute. On physical examination, no abnormalities were found except for a 2/6 diastolic murmur at apex. His electrocardiogram showed normal sinus rhythm with left ventricular hypertrophy. Laboratory findings were within normal limits including pro-Brain Natriuretic Peptide (pro-BNP 186 pg/mL) and chest radiography revealed mild cardiomegaly. Transthoracic echocardiography showed abnormal left ventricular size (left ventricular internal dimensions in end diastole, LVIDd 65.1 mm) and function (left ventricular ejection function, LVEF 32%) without regional wall motion abnormalities, mild left atrial enlargement with mild mitral insufficiency and mild aortic regurgitation. He achieved maximal exercise treadmill test with the standard Bruce Protocol without ST-segment change. However, during the test, he had a complaint of atypical chest pain. Given the clinical suspicion of CAD, he underwent cardiac catheterization (selective coronary angiography and heart catheterization), which revealed no obvious lesion on its coronary arteries, but there was a stream of dye into the left ventricle via a tiny and tortuous posterior left ventricular branch of RCA during systolic and diastolic phases (Fig. 1, arrow). The oxygen saturation data were normal, and the pulmonary to systemic blood flow ratio (Qp/Qs) was 1. Intracardiac pres-
Coronary artery fistulas have been recognized since 1965 (7). The etiology of CAFs may be congenital, traumatic or iatrogenic, that is, after coronary intervention or valve replacement. Communication between a coronary artery and a cardiac chamber is less frequent. The most prevalent receiving chamber is the right ventricle (45%), followed by the right atrium (25%) and the pulmonary artery (20%) (8). However CAF between the coronary artery and a left chamber is a rare condition. The clinical diagnosis of CAF is difficult because clinical presentation, laboratory and electrocardiographic manifestations are nonspecific. Most patients with CAF, as in the current patient, present with typical angina pectoris without CAD. Both CAF and cardiomegaly can produce myocardial ischemia and angina, and their association could aggravate the ischemia. The main mechanism of myocardial ischemia seems to be related to the coronary steal phenomenon (9, 10).

CAFs mostly remain asymptomatic. The treatment of CAF is essentially medical; conservative management with continued follow-up of these patients appears to be appropriate (11). Surgical correction is exceptional and may be considered in only severe forms with refractory to medical treatment. In the presence of symptoms of congestive heart failure, significant left-to-right shunt and arrhythmias, other major cardiac lesions, concomitant CAD, elective closure of coronary fistula are generally accepted. Clinical symptoms of coronary ischemia, such as exertional angina or dyspnea are the primary indication for closure of a fistula (9). The first successful transcatheter coil embolization of a coronary artery fistula was performed in 1982 (7). Our experience shows that transcatheter occlusion of coronary fistula is a safe and effective procedure that is at least as successful as surgical treatment. Nevertheless, the technique may not be successful in every case. It is essential to select the optimal embolization method in relation to the size and location of the fistula, and to prepare a range of devices to cope with unexpected requirements and avoid multiple occlusion procedures.

Conclusion

In summary, coronary artery fistula between a coronary artery and a cardiac chamber is a rare condition. Its clinical

After coil embolization therapy, the patient’s symptoms improved and his cardiac enzymes remained normal. He was prescribed aspirin 3 mg/kg daily for 6 months to prevent thromboembolic events and other medicines such as beta blocker and angiotensin-converting enzyme inhibitor to reverse the myocardial remodeling. Two months after the procedures, the patient reported no symptoms and was doing well. At six months after operation, he had normal heart size on chest X-ray and his echocardiography showed LVIDd 63.0 mm with LVEF 45%.

Discussion

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Figure 1. Selective angiography of the right coronary artery showed one fistula (arrow) originating from the posterior left ventricular branch of the right coronary artery with drainage into the left ventricle.

Figure 2. Complete fistula thrombosis. Coronary angiography (arrow) showed that the fistula was embolized by 3 coils.

Pressures were within normal limits.

Embolization was performed with standard coils (Micro Vention Inc., Tustin, CA, USA). The procedure was performed as previously described (6). A 6F MAC 3.5 guiding catheter (Medtronic, Santa Rosa, CA, USA) was placed on the right coronary artery ostium using the antegrade approach method and the fistula vessel with origin and drainage was shown in the coronary angiogram (Fig. 1). The guiding wire, a standard 180 cm-length guidewire, Fielder (Asahi Intec, Aichi, Japan), for coils, was introduced into the fistula. To obtain complete occlusion, 3 coils (1 of 2 mm/4 mm and 2 of 3 mm/6 mm) were implanted so as to merge together forming a conglomeration. They were placed sufficiently distant from the drainage opening to prevent migration into the left ventricle. During the procedure, 6,000 U heparin (100 U·kg<sup>-1</sup>) was routinely given. After one week, coronary angiography was repeated to confirm incomplete closure of the fistula and the quality of the occlusion (Fig. 2, arrow).
and echocardiographic presentation is nonspecific. The transcatheter occlusion of coronary artery fistula is a safe and effective procedure, but it is essential to select the optimal embolization method and coils.

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References