



# Transcatheter Embolization of a Large Coronary Artery Fistula in a Child

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## Abstract

Coronary artery fistula is a rare congenital disease of a coronary circulation. The progress is usually favorable, but in case of a large right atrial coronary fistula a volume overload with a progressing heart failure may occur. Conventional treatment involves fistula's closure using cardiopulmonary bypass. We present a case of endovascular closure of a large coronary artery-to-right atrium fistula.

## Keywords

Coronary artery fistula, Congenital heart defect, Catheter intervention, Coronary anomaly

## Introduction

Coronary artery fistula is a rare congenital disease of a coronary circulation. The progression of the fistula in most cases is asymptomatic, and it is often diagnosed as an incidental finding while performing echocardiography, angiography, magnetic resonance imaging (MRI), or cardiac computed tomography (CT) [1]. However, frequent development of complications such as syndrome of coronary blood flow "steal", thrombosis and coronary embolism, progressive heart failure, and atrial fibrillation require early surgical intervention [2]. Currently, this pathology is eliminated using cardiopulmonary bypass [3]. We present a clinical case of successful endovascular closure of right atrial coronary fistula.

## Case Report

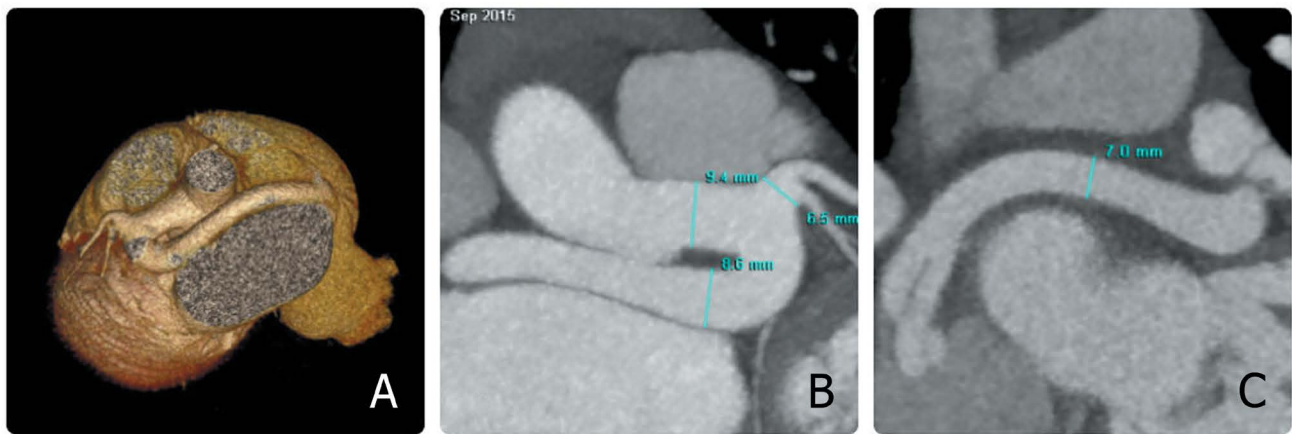
An 11 years old boy, 29 kg, was admitted to the hospital with a diagnosis of atrial coronary fistula, complaining shortness of breath and rapid fatigability on physical exertion. According to chest radiography, the cardiothoracic index was 65%. Trans-thoracic echocardiography showed the left main coronary artery ostium and stem enlargement up to 1 cm, as well as the turbulent flow in the right atrium, according to color Doppler the flow size was 4.8 mm, design pressure in pulmonary arterial by tricuspid annular plane systolic excursion increased to 48 mmHg. The contrast multi-slice computed tomography (MSCT) confirmed the right coronary atrial fistula.

Diffusely dilated vessel 10.5 × 8.5 mm arose from the left sinus of Valsalva that had a U-shaped bend, from which circumflex and left anterior descending coronary artery arose. Retro-aortically between the ascending aorta and the left atrium the dilated vessel was drained into the right atrial cavity as two closely spaced stems, 7 mm and 6 mm in diameter.

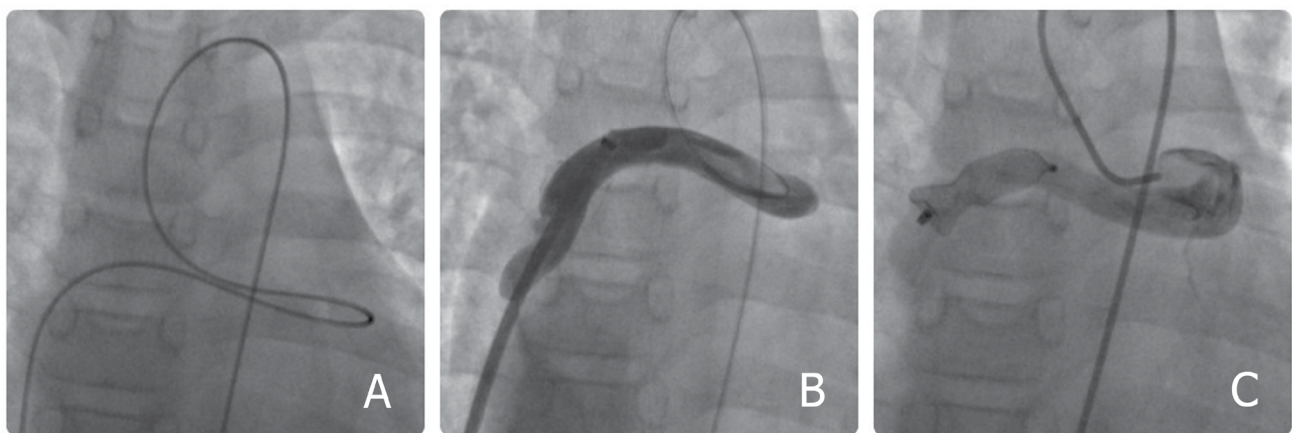
For further investigation the patient was sent for cardiac catheterization. The study was performed with spontaneous breathing without oxygen. Vascular access was via the right femoral vein and the left femoral artery. The diagnostic catheters 4 Fr Terumo were used. Right atrial coronary fistula was contrasted, with maximum expansion up to 13 mm. When performing selective coronary angiography, stenosing pathology of the coronary arteries was not revealed. A normal anatomy of the venous return to the true coronary sinus, which was located in the right atrium, was determined. RA pressure was 14/8 (11) mmHg, RV pressure was 50/3 (23) mmHg. Blood oxygenation test from the cardiac chambers and great vessels showed Qp/Qs of 1.6. (Figure 1).

Trans-arterial access was used to conduct the catheter Whisper 0.014" through the fistula into the right atrium and the IVC; the catheter then was captured with a lasso-type trap and taken out via the venous access, creating an arteriovenous loop. Through a venous access a delivery system SFP8 Fr was advanced along the catheter, to deliver PDA Occluder «Life Tech» XJFD1012 into the fistula. Occlude was positioned into the fistula, proximal to the trunk division, so that the entire fistula opening was closed. Control angiography showed minimal contrast release through the body of the occluder. The pressure in the RV was 30/4 mmHg. There were no complications during the procedure. Duration of the operation was 35 minutes, fluoroscopy lasted 12 minutes. (Figure 2).

Compression bandage was applied at the places of vascular access, after the procedure the child was taken to the general division, and the bandage was removed after 12 hours. On auscultation, no diastolic murmur was detected, and according to echocardiography no abnormal discharge into RA was revealed, the fistula was closed off. After 4 days the child was discharged in satisfactory condition.



**Figure 1:** Multi-slice computed tomography (MSCT) of right atrial coronary fistula (CF). (A) A three-dimensional reconstruction of the CF, outlet view; (B) MSCT, frontal view, relation of the fistula and left coronary artery; (C) Frontal view, shown is location of coronary fistula with two separate trunks into the right atrium.



**Figure 2:** (A) "Arteriovenous loop" was created to conduct the delivery system using trans-venous access; (B) The delivery system was positioned in the CF; (C) Control angiography showed that PDA occluder completely closed the CF.

In 6 months after surgery control echocardiography was performed, according to which there was no discharge through the fistula.

## Discussion

Right atrial coronary fistula is a rare congenital abnormality with a frequency of 0.08-0.1% of all congenital heart defects. It was first described by Krause in 1865. The first successful surgery was performed in 1947 by Bjork and Crafoord. The natural progressing of the disease is usually favorable, but in case of a large right atrial coronary fistula a volume overload occurs with an advanced heart failure and pulmonary hypertension. Therefore, Qp/Qs ratio of more than 1.5 is an absolute indication for a surgical treatment [4]. The patient described in this case report had all the signs of volume overload of the right heart cardiothoracic index was 65%, the pressure in the RV 50/3 (23) mmHg, Qp/Qs ratio was 1.6, which was an indication for surgical treatment.

Currently, many ways of treating coronary fistulas are suggested, conventional approach with cardio-pulmonary bypass and embolization of small coronary fistulas using adhesive solution or different occlusion device. [5,6]. Computed Tomography performed before surgical correction showed fistula's location to the right atrium, and coronary angiography provided information regarding coronary anatomy. Having considered all the advantages of endovascular treatment compared cardiac surgery with cardio-pulmonary by pass,

we performed embolization of right atrial coronary fistula using the PDA occlude with a good clinical and angiographic outcome. Control echocardiography study in 6 months found no residual shunts. Our case report shows that, with suitable anatomy of right atrial coronary fistula, endovascular embolization is an applicable and safe procedure.

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