

# Coronary artery fistulas and coil embolization

## *Koroner arter fistülleri ve spiral ile embolizasyonu*

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### Introduction

Congenital coronary artery fistulas, which have been known since 1865, appear among congenital heart diseases as frequently as 0,08-0,4% (1-5). McNamara and Gross have stated that fistulas stem from right main coronary artery (5-9), from left main coronary artery (%32), left coronary artery (%2) and from a single coronary artery (%7). These fistulas drain away via right ventricle (%52), right atrium %24, left atrium or pulmonary vein and left ventricle (%2). In this study, we present a rare case of fistula, arising from the left main artery and draining away into pulmonary artery, which was effectively closed with spiral.

### Case Report

A 12-year-old male patient, 6 years ago while being followed up with a diagnosis of prenatal encephalopathy, had been diagnosed as having continuous systolic murmur with a magnitude of 2/6 noticed in the 3-4 intercostals spaces on the edge of left sternum. The patient underwent detailed examination at cardiology clinic and the diagnoses of mitral valve prolapsus and coronary artery fistula were established. The patient was referred to our hospital with complaints of weakness, getting tired quickly, asthma and chest pain for the last six months. At the time of referral to the hospital his height was 1.55 meters and weight - 37 kg. His family history was remarkable because his sister suffered from atrial septal defect. The first examinations conducted in our clinic indicated that the pulse of the patient was 80/min rhythmic, blood pressure was 105/70 mmHg, and continuous blowing murmur with a magnitude of 2/7 was found in the left 3-4 intercostal space. Electrocardiography (ECG) showed the existence of incomplete right bundle branch block, biphasic T waves in V 2-3. 1+ Mitral valve deficiency (1+) and minimal left ventricular dilatation with ejection fraction of 59% were found on echocardiography. His hemogram and blood chemistry were found to be normal. Heart catheterisation and coronary angiography revealed fistula between the left main coronary artery and pulmonary artery and also between the right coronary artery and the

pulmonary artery (Fig. 1,2). His pulmonary artery pressure was 19 mmHg and oxygen saturation was measured as - 94%. Taking into consideration the fact that both coronary artery fistulas were very thin and it was anatomically difficult to close them, it was decided to perform coil embolization. A 5 F introducer, 5 F JL, JR catheters and a guiding wire with a diameter of 0.35 mm were used for catheterisation and coronary angiographies. A 5F Judkins left catheter, a guiding wire with a diameter of 0.35 mm, and 2 pieces of 5X5 Gianturco coils (William Cook Europa, Bjaeveroskov, Denmark) were used for the process of embolization. Right before the procedure, the patient was given 100 U/kg heparin. Since the fact that fistula origin from the left main coronary increases the risk of blocking the main coronary during embolization, the first coil was left in more distal part. However, when the control angiographies conducted just afterwards and after 20 minutes showed that the fistula was hardly ever closed and it was still filling pulmonary artery, we have decided to leave the second coil in proximal part (Fig. 3). Within twenty minutes after the placement of the second coil, 4 control angiographies were performed. When we observed that fistula was completely closed we finished the procedure (Fig. 4-5).

### Discussion

Coronary fistula appears as frequently as one in five hundredth during coronary angiography and always shows hemodynamic signs (3,6). Some researchers argue that the diagnosis of fistula is a surgical indication regardless of the existence of symptom (8,9). Early closure is mandatory to prevent such complications as refractory congestive heart failure, which generally appears in the 2nd and 3rd decades of life, myocardial ischemia or endocarditis. Fistula embolization with coil is a serious alternative to surgical treatment. However, it is a very complicated and difficult procedure. Because of the rarity of the defect, the literature reports are few. Petrosyan JS conducted the very first successful fistula embolization in the world in our centre in 1982 (7). If there are such anatomic characteristics such as large, aneurysmatically dilated coronary ostium, dilated coronary artery, restrictive stenosis of fis-

tula, distal localization of the drainage orifice and absence of concomitant organic heart pathology, embolization may be an appropriate technique. In the absence of stenosis, proximal or lateral localization of the drainage orifice, presence of several drainage orifices, a large aneurysm of an anomalous coronary artery, especially localized distally, single coronary artery and

concomitant organic heart disease exist, embolization may be difficult and the risk of complication is high. In such circumstances, if possible benefits and risks should be weighed; the choice of routine surgical treatment would be less risky. Of course, surgeon's experience plays an important role in this choice. Coil embolization of the fistula ought to be made dis-



Figure 1. Fistula between the left main coronary artery and the pulmonary artery

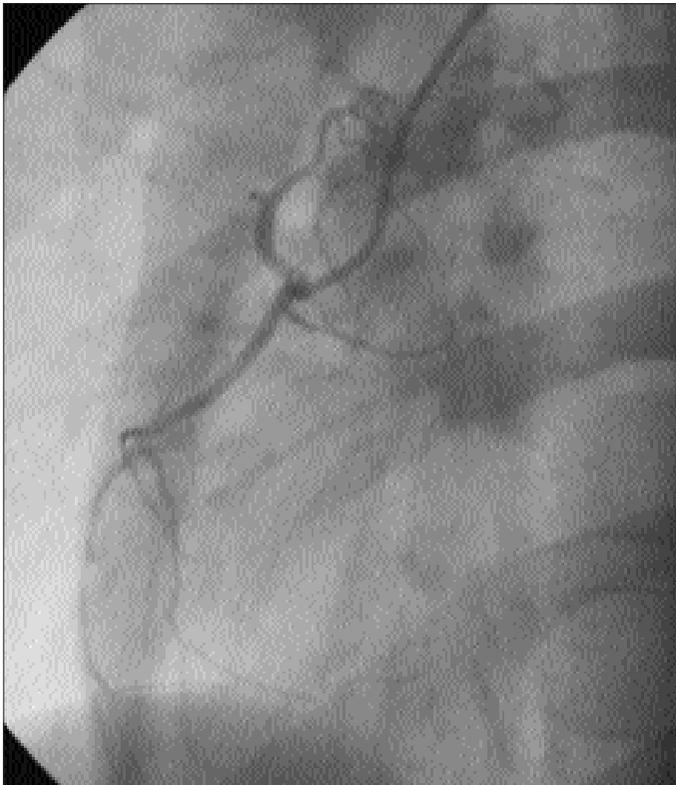


Figure 2. Fistula between the right coronary artery and the pulmonary artery

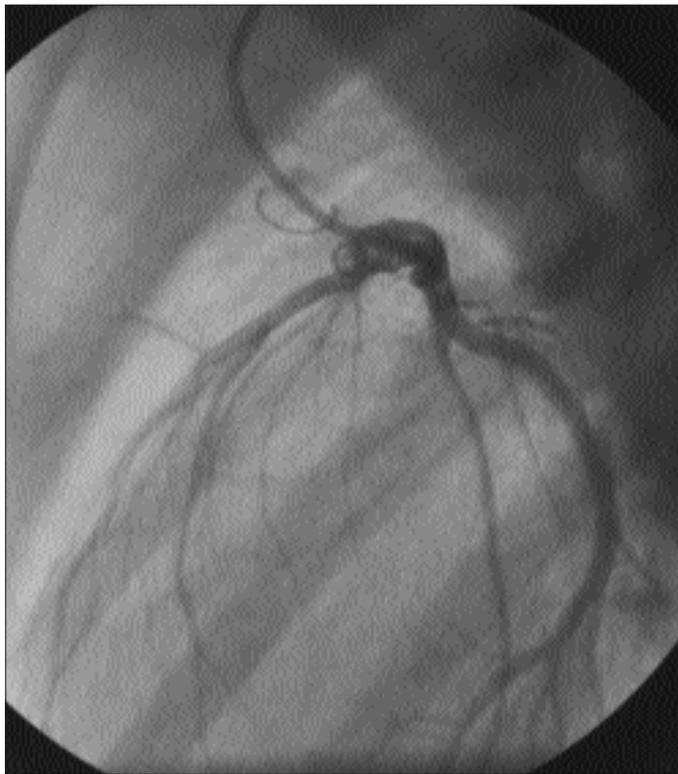


Figure 3. Control angiography after 20 minutes shows residual flow (after implantation of first coil)



Figure 4. After implantation of two coils

tally and be conducted far from drainage orifice so as to prevent both the closure of normal coronary arteries and the migration of coil into the other orifices. This generally makes it difficult to determine the definite specification of the location for sufficient occlusion. The size of the coil to be implanted ought to be at least 30% greater than the diameter of the calculated fistula to prevent reposition and migration of it. It is difficult that guidewire and catheter go distally through thin-walled coronary artery turnings and get permanently fixed in the location where occlusion is considered. There are risks of coronary artery perforation and embolization of normal coronary artery. Also there is a potential coronary complication due to catheter manipulation in coronary arteries. The frequent monitoring of ECG is necessary, because during the procedure temporary myocardial ischemia may be specified. If this ischemia is long-term, to give nitrate or  $\beta$  blocker in appropriate doses is a better choice instead of withdrawing the catheter or the guidewire. Insufficient embolization, femoral thrombosis, the migration of the coil into pulmonary system are other potential complications. Before the procedure, materials must be ready in case of coil migrates into pulmonary system. Although it is possible to remove the coils that migrate into pulmonary system with "snare", this may not always be possible.



**Figure 5. Angiography view after embolization of fistulas with 2 coils (successful closure)**

Gianturco coils, platinum micro coils, independent silicon, latex balloons or a combination of coils and balloons can be used as coronary fistula embolization materials (10-12). Of these, Gianturco coil, which was employed in this case, is used most often. Up to 20 spirals have been used in our embolizations so far (13). However, 1-2 spirals may mostly be sufficient depending upon the size of fistula. In this case an effective result achieved with 2 coils.

When we, as an experienced center in this field, consider our short and long-term results, we can say that occlusion is an effective alternative to routine surgery (14). It offers an additional advantage over surgery in terms of low cost.

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