

## CASE REPORT

DOI: 10.5336/caserep.2024-101365

# Surgical Treatment in a Patient with Two Different Coronary Artery-to-Pulmonary Artery Fistulas and Failure of Endovascular Therapy

İb Mehmet İŞİK<sup>a</sup>, İb Ömer TANYELİ<sup>a</sup>, İb Muhammet B CAVLAK<sup>a</sup>, İb Niyazi GÖRMÜŞ<sup>a</sup>

<sup>a</sup>Necmettin Erbakan University Faculty of Medicine, Department of Cardiovascular Surgery, Konya, Türkiye

**ABSTRACT** Coronary arterial fistulas are rare. They may occur between the coronary arteries themselves or with neighboring large vascular structures. There are congenital or acquired causes in the etiology. Symptoms may vary according to the severity of the shunt. Treatment can be performed with endovascular or surgical procedures. In this study, we report a case of fistula between the pulmonary artery and the right coronary artery and between the pulmonary artery and the left anterior descending coronary artery. It was interesting that the patient had a fistula in two different coronary arteries despite no history of intervention. The fistula was closed by coil embolization two years ago. However, coronary angiography performed after the resumption of his complaints showed that the fistula tract was open. We would like to share the radiologic images and successful surgery of the patient.

**Keywords:** Coronary artery; fistula; pulmonary artery

Coronary arterial fistulas may occur between the coronary arteries themselves or with adjacent large vascular structures. They are observed in 0.002% of the general population.<sup>1</sup>

Shortness of breath, syncope, endocarditis, angina pectoris, myocardial infarction, congestive heart failure, cardiac arrhythmias and sudden death have been reported as symptoms.<sup>2</sup> Prognosis depends on the severity of the shunt and complications such as heart failure, pulmonary hypertension and bacterial endocarditis.<sup>1</sup>

There is consensus that symptomatic patients should be treated. Endovascular methods (coil embolization and stent placement) and surgical options are available.<sup>3</sup>

In this study, we report a case of fistula between the pulmonary artery and the right coronary artery (RCA) and between the pulmonary artery and the left anterior descending (LAD) coronary artery. It was interesting that the patient had a fistula in two different coronary arteries despite no history of intervention. The fistula was closed by coil embolization two years ago. However, coronary angiography performed after the resumption of his complaints showed that the fistula tract was open. We would like to share the radiologic images and successful surgery of the patient.

## CASE REPORT

A 46-year-old man with a past medical history of 10 pack/year smoking and hypertension, no history of

**Correspondence:** Mehmet İŞİK

Necmettin Erbakan University Faculty of Medicine, Department of Cardiovascular Surgery, Konya, Türkiye

E-mail: drmisik@hotmail.com



Peer review under responsibility of Türkiye Klinikleri Journal of Case Reports.

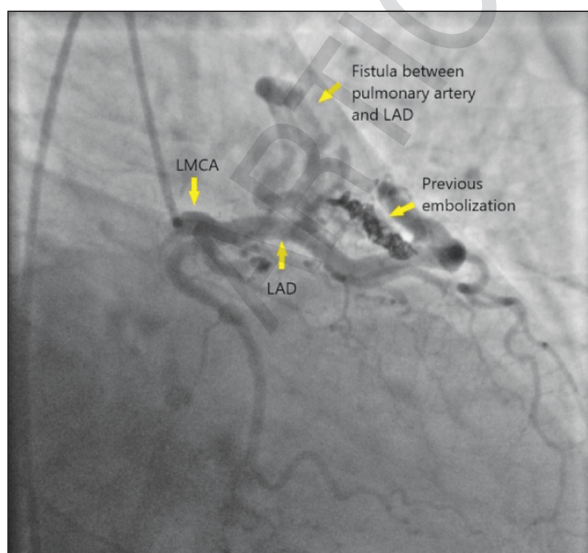
Received: 10 Jan 2024

Accepted: 11 Mar 2024

Available online: 18 Mar 2024

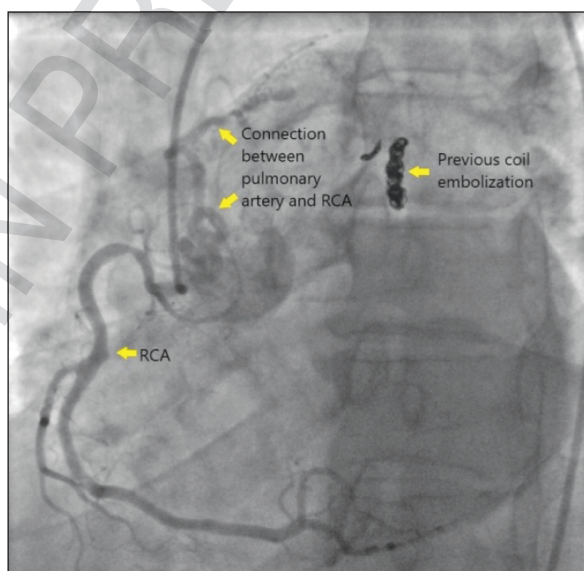
2147-9291 / Copyright © 2024 by Türkiye Klinikleri. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

coronary or vascular intervention. His family history was also unremarkable. In 2021, he was admitted to the cardiology outpatient clinic with complaints of exertional dyspnea, angina pectoris, left arm numbness and palpitations. On coronary angiography, the left main coronary artery, LAD and RCA were ectatic. Fistula was observed between the pulmonary artery and RCA and between the LAD and pulmonary artery. Circumflex artery was reported as normal. It was interesting that fistula developed in two different coronary arteries despite no history of any interventional procedure. In 2021, coil embolization was performed to the lesion in the LAD. Control imaging showed disappearance of flow in the fistula area. Embolization could not be achieved for the fistula between the RCA and pulmonary artery despite repeated attempts. He was discharged in this condition. Two years after coil embolisation, the patient's complaints resumed. New coronary angiography showed that the fistula tract between LAD-pulmonary artery and RCA-pulmonary artery was patent (Figure 1, Figure 2). Ejection fraction was 60%, tricuspid regurgitation was minimal, and pulmonary artery pressure was 33 mmHg. As the patient's clinical complaints persisted and the fistulas were open, the decision for surgery was made by the cardiology and cardiovascular surgery council. Informed consent was obtained from the patient. Me-

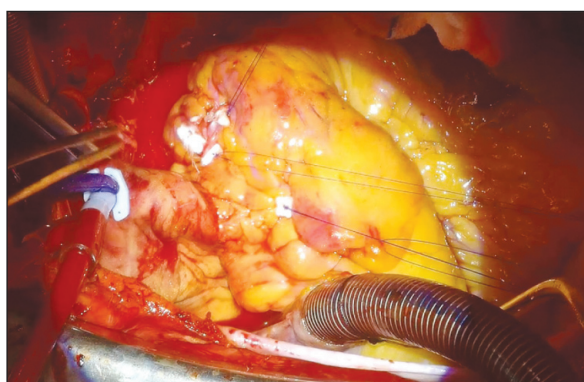


**FIGURE 1:** Fistula angiography image between LAD and pulmonary artery. LMCA: Left main coronary artery; LAD: Left anterior descending.

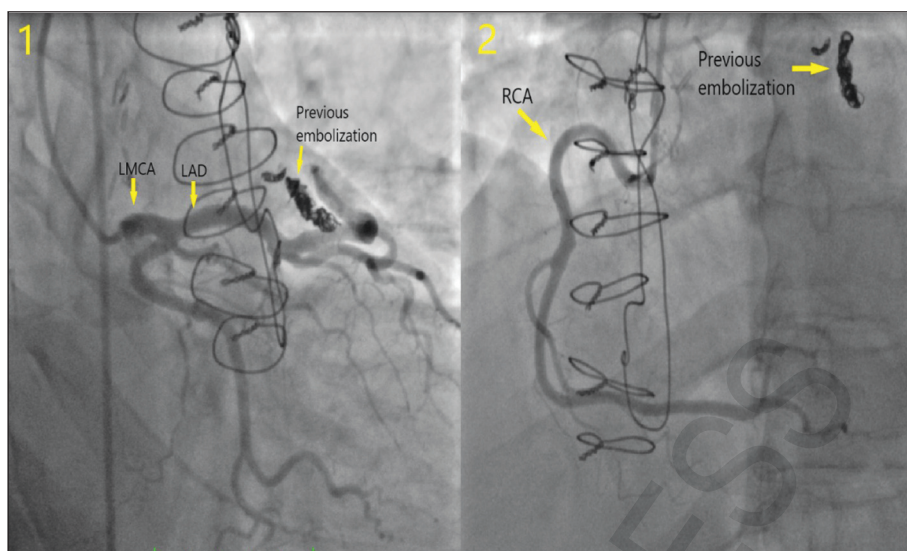
dian sternotomy was performed in the hybrid operating room under general anesthesia. After cardiac arrest, the portion of the LAD connected to the pulmonary artery was sutured with 5/0 plegit polypropylene close to the pulmonary artery. Then, the coronary artery branch exiting proximal to the RCA and forming a fistula with the pulmonary artery was closed by suturing with 5/0 pleated polypropylene from the proximal side (Figure 3). A sheath was placed in the right femoral artery and control coronary angiography was performed. Coronary angiography showed closure of the fistula and collateral circulation (Figure 4). The surgery was terminated with standard procedure and the patient was trans-



**FIGURE 2:** Fistula angiography image between RCA and pulmonary artery. RCA: Right coronary artery.



**FIGURE 3:** Image of closing fistulas with plegit sutures during surgery.



**FIGURE 4:** Postoperative angiography image.  
 LMCA: Left main coronary artery; LAD: Left anterior descending; RCA: Right coronary artery.

ferred to the intensive care unit. The patient was extubated at the 8<sup>th</sup> postoperative hour and discharged on the 4<sup>th</sup> postoperative day.

## DISCUSSION

Fistulas seen in the coronary arteries may be congenital or iatrogenic. Congenital fistulas constitute 48.7% of all coronary anomalies.<sup>4</sup> Iatrogenic fistulas are mostly encountered as a complication of coronary angiography. The number of puncture attempts, posterior arterial wall penetration and large puncture needle increase the occurrence of iatrogenic fistula.<sup>5</sup> Proper performance of vascular interventions, good anticoagulation and regular blood pressure control decrease the risk of fistula development.<sup>6</sup> It was interesting that this case did not have any history of coronary angiography intervention or trauma. In addition, it was also rare for two separate coronary arteries to form a fistula with both pulmonary arteries. The fact that the patient's complaints started in the last few years makes it unlikely that the pathology was congenital. In this case, fistulization of ectatic coronary arteries with the pulmonary artery secondary to hypertension is considered as a possible cause of fistula development.

Although there are no clear criteria in the treatment approach, it has been reported that endovascular or surgical intervention should be considered for symptomatic patients, cases with high-output heart failure and fistulas that do not close spontaneously within the first year.<sup>6</sup> Endovascular methods have advantages such as early mobilization, short hospital stay and less risk of infection.

Transcatheter embolization can be performed in cases with nontortuous vessels, accessible coronary artery feeding the fistula, absence of large branches to be inadvertently embolized, and absence of multiple fistulous structures. Surgery is another treatment option for cases that are not suitable for endovascular interventions. In a study comparing surgical technique and transcatheter approach, similar residual fistula rates were reported in post-procedural follow-up.<sup>7</sup> In the same study, recurrence rates were found to be higher with the transcatheter approach. Therefore, surgical closure is reported to be a safe and effective method.<sup>7</sup>

In this case, endovascular treatment was used as the primary method for closure of the coronary fistula. However, the high flow rate of the fistula probably caused reopening of the closed tract after a

while. In high-flow fistulas, there is also the possibility of embolization of the introduced occlusive material into the other wing of the circulation. In this patient, a second endovascular procedure was not considered because of the presence of two fistulas and the failure of the previous embolization. Although open surgery has some complications, the fact that it produces radical solutions for the benefit of the patient and can produce successful results in cases where no solution can be found can be considered as its advantages.

### Source of Finance

*During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.*

### Conflict of Interest

*No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.*

### Authorship Contributions

**Idea/Concept:** Mehmet Işık, Niyazi Gümüş; **Design:** Mehmet Işık, Muhammet B. Cavlak, Niyazi Gümüş; **Control/Supervision:** Mehmet Işık, Niyazi Gümüş; **Data Collection and/or Processing:** Mehmet Işık, Muhammet B. Cavlak; **Analysis and/or Interpretation:** Mehmet Işık, Muhammet B. Cavlak, Ömer Tanyeli; **Literature Review:** Mehmet Işık, Muhammet B. Cavlak, Ömer Tanyeli; **Writing the Article:** Mehmet Işık, Muhammet B. Cavlak; **Critical Review:** Mehmet Işık, Muhammet B. Cavlak, Ömer Tanyeli; **References and Fundings:** Mehmet Işık, Muhammet B. Cavlak; **Materials:** Mehmet Işık, Niyazi Gümüş, Ömer Tanyeli.

## REFERENCES

1. Dodge-Khatami A, Mavroudis C, Backer CL. Congenital Heart Surgery Nomenclature and Database Project: anomalies of the coronary arteries. *Ann Thorac Surg.* 2000;69(4 Suppl):S270-97. PMID: 10798435.
2. Al-Hijji M, El Sabbagh A, El Hajj S, AlKhouli M, El Sabawi B, Cabalka A, et al. Coronary Artery Fistulas: Indications, Techniques, Outcomes, and Complications of Transcatheter Fistula Closure. *JACC Cardiovasc Interv.* 2021;14(13):1393-406. PMID: 34238550.
3. Işık M, Tanyeli Ö, Dereli Y, Taban VB, Altınbaş Ö, Görmüş N. Gradual treatment of arteriovenous fistula in femoral vessels as a complication of coronary angiography. *Braz J Cardiovasc Surg.* 2018;33(6):631-3. PMID: 30652754; PMCID: PMC6326445.
4. Challoumas D, Pericleous A, Dimitrakaki IA, Danelatos C, Dimitrakakis G. Coronary arteriovenous fistulae: a review. *Int J Angiol.* 2014;23(1):1-10. PMID: 24940026; PMCID: PMC4051882.
5. Pitta SR, Prasad A, Kumar G, Lennon R, Rihal CS, Holmes DR. Location of femoral artery access and correlation with vascular complications. *Catheter Cardiovasc Interv.* 2011;78(2):294-9. PMID: 21413114.
6. Piper WD, Malenka DJ, Ryan TJ Jr, Shubrooks SJ Jr, O'Connor GT, Robb JF, et al; Northern New England Cardiovascular Disease Study Group. Predicting vascular complications in percutaneous coronary interventions. *Am Heart J.* 2003;145(6):1022-9. PMID: 12796758.
7. Kiefer TL, Crowley AL, Jaggars J, Harrison JK. Coronary arteriovenous fistulae: the complexity of coronary artery-to-coronary sinus connections. *Tex Heart Inst J.* 2012;39(2):218-22. PMID: 22740735; PMCID: PMC3384048.