

## Coronary Artery Fistula Detected by 64-Slice Multidetector Computed Tomography: Case Report

Yi-Chang Lin, Yi-Ting Tsai, Chih-Yuan Lin, Chung-Yi Lee, Gou-Jieng Hong, Chien-Sung Tsai

Division of Cardiovascular Surgery, Department of Surgery, Tri-Service General Hospital, National Defense Medical Center, Taipei, Taiwan, Republic of China

### ABSTRACT

Coronary artery fistula (CAF), a rare anomaly of a coronary artery, is defined as an anomalous communication between a coronary artery and a cardiac chamber or vessels. Coronary angiography remains the main modality for diagnosing CAF. We present a case of fistulous communication between the left anterior descending coronary artery and the main pulmonary artery. The exact anatomy of the fistula was demonstrated by 64-slice multidetector computed tomography (MDCT). Surgical ligation on a beating heart was carried out. Intraoperative Doppler flow detection was used to evaluate the shunt of the CAF. We prefer MDCT as a new diagnostic modality to provide the detailed anatomy of a CAF.

### INTRODUCTION

Coronary artery fistula (CAF), first described in 1841, is defined as an anomalous communication between a coronary artery and a cardiac chamber or vessels [Fernandes 1992]. Although coronary angiography remains the main modality for imaging the coronary arteries, 64-slice multidetector computed tomography (MDCT) scanning is a practical and noninvasive method for the investigating the relationship of a CAF to other structures [Zeina 2006]. In this report, we present a rare case of fistulous communication between the left anterior descending coronary artery (LAD) and the main pulmonary artery. The exact anatomy of the fistula was demonstrated by 64-slice MDCT by means of multiplanar reconstruction and different 3-dimensional reconstruction techniques.

### CASE REPORT

A 35-year-old nonsmoking woman was admitted to the hospital with a history of chest pain with effort, shortness of breath on exertion, and palpitations, which had first

developed 3 months earlier. At the time of presentation, she was not taking any medications and had no family history of cardiovascular disease. The results of a physical examination were unremarkable, and the results of chest radiography and electrocardiography were normal. A transthoracic echocardiography evaluation demonstrated a nondilated left ventricle

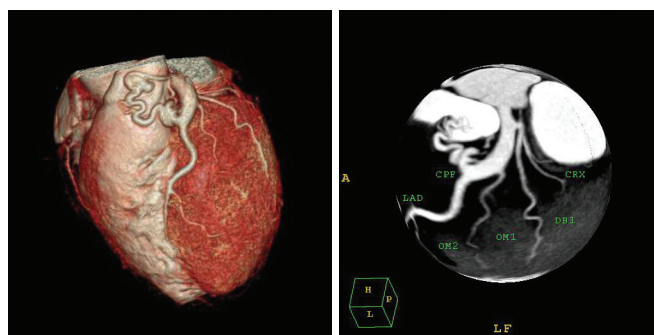


Figure 1. A 3-dimensional computed tomography evaluation (A, B) shows a coronary artery fistula between the left anterior descending artery (LAD) and the main pulmonary artery. CPF indicates coronary artery-pulmonary artery fistula; CRX, left circumflex artery; DB, diagonal branch; OM, obtuse marginal.

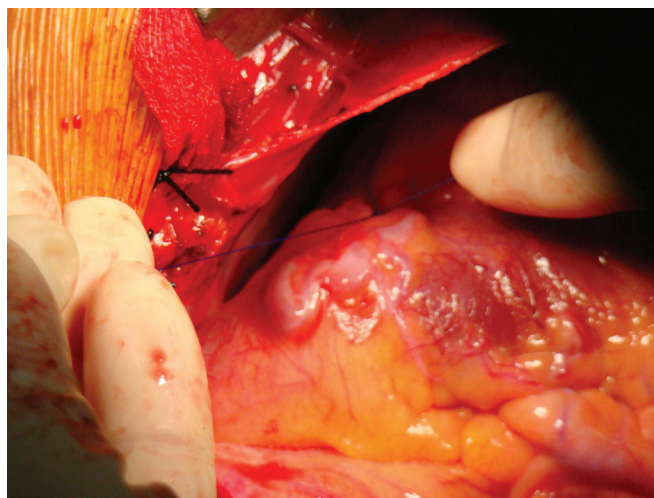


Figure 2. Two interrupted 3-0 Prolene sutures were used to ligate the tortuous coronary artery fistula.

Received October 20, 2009; accepted November 10, 2009.

Correspondence: Chien-Sung Tsai, MD, Chief Director, Division of Cardiovascular Surgery, Department of Surgery, Tri-Service General Hospital, 325, Cheng-Kung Rd, 2nd Section, Taipei 114, Taiwan, Republic of China; +886-2-87927212; fax: +886-2-87927403 (e-mail: [show23@mail.nmcmsh.edu.tw](mailto:show23@mail.nmcmsh.edu.tw)).

with normal function and mild dilatation of the right ventricle, with an end-diastolic diameter of 36 mm. Hematologic and biochemical indices were unremarkable. Because we suspected coronary artery disease, we performed 64-slice MDCT, which identified a fistula originating from the LAD and draining to the pulmonary artery (Figure 1). There was no evidence of any coronary artery disease.

The patient underwent surgical intervention. A median sternotomy was carried out. The fistula was identified near the origin of the LAD. The flow detector used to evaluate fistulous flow (VeriQ system; Medi-Stim, Oslo, Norway) revealed a flow rate of 132 mL/min. The fistula was closed directly with 3-0 Prolene double suture (Figure 2) on the beating heart. The patient's postoperative course was uneventful, and she was discharged home on the 12th postoperative day. Her condition remains stable 6 months after the operation.

## DISCUSSION

CAF is rare, with a reported incidence varying from 0.6% to 1.5% of patients who visit a catheterization laboratory [Kardos 1997]. The majority of these fistulas originate from the right coronary artery, followed by the LAD and the left circumflex coronary artery [Gowda 2006]. The right ventricle is most common drainage site, followed by the right atrium, the pulmonary artery, and the left ventricle [Shimaya 1997]. CAFs can be congenital or acquired. Congenital CAFs are thought to arise because of incomplete embryonic development, and acquired CAF can be due to inflammation, trauma, atherosclerosis, or collagen disease [Abe 1996]. Most cases of CAF are asymptomatic and are discovered as an incidental finding. The symptoms associated with CAFs include dyspnea, angina, palpitations, congestive heart failure, infectious endocarditis, cardiac arrhythmia, and fistula rupture.

Although the main diagnostic technique to detect CAF is coronary angiography, it may fail to demonstrate the relationship of the CAF to other structures and drainage sites. In addition, coronary angiography has a high cost and an invasive nature. New noninvasive imaging modalities, such as MDCT, have become alternative methods for evaluating the detailed anatomy of CAFs [Zeina 2006]. In our case, MDCT was used first as a noninvasive tool to screen for coronary artery disease, and the CAF was found incidentally. The result of this case provides evidence that MDCT can be a powerful tool,

not only for screening coronary artery disease but also for detecting coronary artery anomalies.

Most symptomatic patients with a CAF are treated with surgical ligation or transcatheter closure. Other indications for CAF closure are arrhythmias, infectious endocarditis, and fistula rupture with cardiac tamponade. In patients without symptoms, indications for surgery are right ventricular volume overload or significant shunt flow (ratio of pulmonary blood flow to systemic blood flow >1.5) [Versaci 2009]. Coronary angiography shows both anatomic and physiological information, such as flow quantification, which is helpful when deciding the right time for treatment in asymptomatic patients. In our case, we did not use coronary angiography to evaluate physiological data because the patient was obviously symptomatic. Instead, Doppler flow detection was used to provide the evidence of high shunt flow during the operation. To our knowledge, this report is the first of intraoperative measurement of fistula flow with a flow detector.

In conclusion, CAFs have traditionally been diagnosed with coronary angiography. MDCT provides a detailed anatomy of a CAF, especially in complex vascular malformations, which can be helpful for therapeutic planning.

## REFERENCES

- Abe T, Kamata K, Nakanishi K, Morishita K, Komatsu S. 1996. Successful repair of coronary artery-coronary sinus fistula with aneurysm in an adult. *Ann Thorac Surg* 61:1520-3.
- Fernandes ED, Kadivar H, Hallman GL, Reul GJ, Ott DA, Cooley DA. 1992. Congenital malformations of the coronary arteries: the Texas Heart Institute experience. *Ann Thorac Surg* 54:732-40.
- Gowda RM, Vasavada BC, Khan IA. 2006. Coronary artery fistulas: clinical and therapeutic considerations. *Int J Cardiol* 107:7-10.
- Kardos A, Babai L, Rudas L, et al. 1997. Epidemiology of congenital coronary artery anomalies: a coronary arteriography study on a central European population. *Cathet Cardiovasc Diagn* 42:270-5.
- Shimaya K, Suzuki Y, Inoue Y. 1997. Right coronary artery aneurysm with associated arteriovenous fistula. *Int J Cardiol* 58:192-4.
- Versaci F, Del Giudice C, Sperandio M, Simonetti G, Chiariello L. 2009. A case of coronary artery fistula visualized by 64-slice multidetector CT. *Nat Clin Pract Cardiovasc Med* 6:57-60.
- Zeina AR, Blinder J, Rosenschein U, Barneir E. 2006. Coronary-pulmonary artery fistula diagnosed by multidetector computed tomography. *Postgrad Med J* 82:e15.