

Coronary Arteriovenous Fistula Complicated with Dilated Pulmonary Sinus Confirmed by Multidetector-row CT¹

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Congenital coronary arteriovenous fistula (CAVF) is a rare condition which is characterized by abnormal communication of the coronary artery with the right ventricle, right atrium, left atrium, left ventricle or pulmonary artery. In this paper, we report a case of a 68-year-old woman complaining of resting chest pain for one week. Initially, after performing a coronary arteriogram, the case was diagnosed as a CAVF combined with a pulmonary artery aneurysm. However, a multidetector-row CT (MDCT) was also performed, and the structure initially diagnosed as a pulmonary artery aneurysm was identified as a dilated pulmonary sinus. Subsequently, the patient was treated successfully with a simple ligation.

Index words : Computed tomography (CT), angiography
Coronary vessels, abnormalities
Coronary arteriovenous fistula

CAVFs are rare abnormalities present in all congenital cardiac lesions (1, 2). CAVFs found in adults are often accompanied by an aneurysmal dilatation of the coronary artery. This case, however, displays an interesting finding; that the CAVF originates in the left anterior descending coronary artery and drains into the dilated anterior pulmonary sinus. This was confirmed by MDCT.

Case Report

A 68-year-old woman presented with resting chest

pain for one week. The chest pain was limiting her ability to participate in regular daily activities. Physical examination revealed blood pressure of 140/90 mmHg, pulse of 70 beats/min, respiration of 20 breaths/min, and body temperature of 36.5 °C. The patient's breathing and cardiac sounds were normal. Upon admission, laboratory tests including a blood chemistry profile, coagulation studies and complete blood count, as well as cardiac enzymes were performed. The results of the tests were all found to be normal. An electrocardiogram revealed a sinus tachycardia of 70 beats/min with no S-T or T wave changes.

The initial chest radiogram showed an enlarged cardiac silhouette (cardiothoracic ratio, 0.57). The transthoracic and transesophageal echocardiography revealed hypertrophy of the left ventricle. A cardiac catheterization was performed in order to delineate the coronary arterial abnormality. The patient displayed a proximal left anterior descending coronary-pulmonary artery fistula with an aneurysmal dilatation of the pulmonary artery and a coronary steal due to decreased blood flow

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Received October 27, 2004 ; Accepted March 11, 2005

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from the fistula (Fig. 1A). Ed. Note: confirm wording. The pulmonary aneurysm was measured at 3.2 cm in diameter. A MDCT (SOMATOM Volume Zoom, Siemens, Forchheim, Germany) was performed in order to further evaluate the CAVF with aneurysm. However, the MDCT showed that the CAVF was composed of a single source vessel and a single draining vessel (Figs. 1B - D). The structure thought to be a pulmonary artery aneurysm was actually a dilated anterior pulmonary sinus and the pulmonary trunk itself. A simple ligation, without a cardiopulmonary bypass, was performed. Following the operation, the patient made a full recovery without any postoperative complications and her chest pains subsided.

Discussion

CAVF was first described by Krause (3) in 1865, but it was not until 1958 that Fell and colleagues (4) described the first successful surgical treatment. CAVFs are rare abnormalities with an estimated frequency of 0.27% to 0.4% of all congenital cardiac lesions (5, 6) The causal factors are unknown, but most CAVFs are thought to originate as congenital anomalies or, less commonly, as a result of injury during coronary intervention or a surgical procedure. During embryonic development, coronary arteries communicate with veins through an ordinary capillary network. In addition, the arteries give off branches to the intratrabecular spaces, the sinusoids, which in turn communicate with the cavities of the ven-

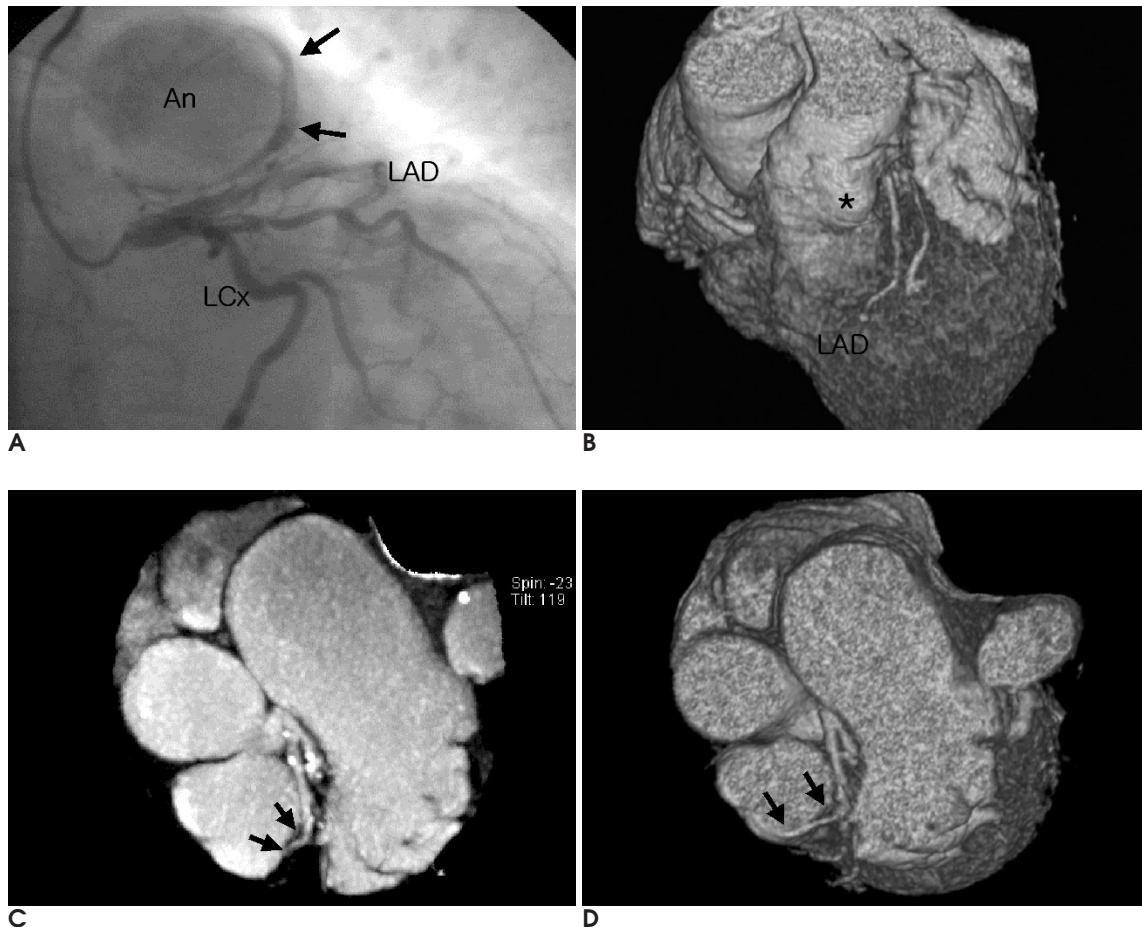


Fig. 1. A 68-year-old woman with a CAVF complicated by a dilated pulmonary anterior semilunar cusp.

A. Coronary angiography on AP caudal view shows the CAVF (arrows), suspected of originating in the proximal LAD, which forms an aneurysm with a diameter of 3.2 cm (An) on the main pulmonary artery. The LAD shows a coronary steal which is the result of decreased blood flow from the fistula.

LAD : left anterior descending artery, LCx : left circumflex coronary artery.

B. Three-dimensional (3D) CT image shows the CAVF with the dilated anterior pulmonary sinus (asterisk).

C, D. Maximal intensity projection (MIP, Fig. C) and 3D CT (Fig. D) images represent the CAVF (arrows) arising from the proximal LAD and draining into the anterior pulmonary sinus.

tricles. Later, the sinusoids shrink into a normally calibrated capillary network, and communication with the cavities of the heart is transferred to thebesian veins.

Most fistulas originate in the right coronary artery, with a smaller number originating in the left coronary artery. Left main coronary artery-to-pulmonary artery fistulas are unusual, comprising less than 10% of cases. Most coronary fistulas drain into either the pulmonary artery or the right ventricle, though right atrium, right ventricle outflow tract, left atrium, and left ventricle drainage sites have been reported (7). CAVFs in adults are often accompanied by aneurysmal dilatation of the coronary artery. The majority of aneurysms have been secondary to a coronary artery fistula with shunt, and the exact causal factor is still unclear. Ed. Note: the meaning is unclear, rephrase highlighted area. An angiographic review of CAVFs found 26% to have evidence of aneurysmal dilatation (8). Shear stress due to increased flow velocity and turbulence may predispose a vessel to accelerated atherosclerosis and thrombosis, resulting in occlusion of distal flow, increased intraluminal pressure, dilatation, and rupture of the weakened wall (8).

Most CAVFs are asymptomatic. Symptoms are more likely to develop in older patients or those with a larger CAVF. However, patients with myocardial ischemia, angina, congestive heart failure, bacterial endocarditis, cardiac arrhythmia, or fistula rupture can show signs of associated chest pain and tamponade (5, 6).

Current treatment options include careful observation, surgical ligation with or without cardiopulmonary bypass, ligation with bypass of the involved coronary artery, and transcatheter embolization. Surgical ligation has been very successful. There is general agreement that symptomatic patients, such as our patient, should be treated. It is well accepted that all symptomatic patients should be treated with surgical ligation or closure, and the same applies to those who experience complications. Treatment for asymptomatic fistulas without significant shunting remains controversial (9, 10). In these cases, accurate imaging diagnosis using a coronary MD-

CT may play an important role in determining the form of treatment and also to help prevent the use of more aggressive approaches to the closure of CAVFs.

We report an uncommon case of an adult displaying a left CAVF with a dilated pulmonary anterior semilunar cusp confirmed by MDCT. Accurate preoperative diagnosis of the fistula may decrease mortality or complication rates. Recently, improved CT, such as MDCT, has made careful preoperative determination of the size, location, and extent of the fistula possible. Therefore, coronary MDCTs will play a more important role in determining treatment options.

References

1. Baltaxe HA, Wixson D. The incidence of congenital anomalies of the coronary arteries in the adult population. *Radiology* 1977;122:47-52
2. Gillbert C, Van Hoof R, Van de Werf F, Piessens J, De Geest H. Coronary artery fistulas in an adult population. *Eur Heart J* 1986;7:437-443
3. Maitre B, Jouveshomme S, Isnard R, Riquet M, Pavie A, Derenne JP. Traumatic coronary-pulmonary artery fistula, 23 years after a stab wound. *Ann Thorac Surg* 2000;70:1399-1400
4. Fell EH, Weinberg M Jr, Gordon AS, Gasul BM, Johnson FR. Surgery for congenital coronary artery arteriovenous fistulae. *AMA Arch Surg* 1958;77:331-335
5. Liberthson RR, Sagar K, Berkoben JP, Weintraub RM, Levine FH. Congenital coronary arteriovenous fistula. Report of 13 patients, review of the literature and delineation of management. *Circulation* 1979;59:849-854
6. Gandy KL, Rebeiz AG, Wang A, Jagers JJ. Left main coronary artery-to-pulmonary artery fistula with severe aneurysmal dilatation. *Ann Thorac Surg* 2004;77:1081-1083
7. Armsby LR, Keane JF, Sherwood MC, Forbess JM, Perry SB, Lock JE. Management of coronary artery fistulae. Patient selection and results of transcatheter closure. *J Am Coll Cardiol* 2002;39:1026-1032
8. Said SA, el Gamal MIH. Coronary angiographic morphology of congenital coronary arteriovenous fistulas in adults. *Cathet Cardiovasc Diagn* 1995;35:29-35
9. Tkebuchava T, Vonsegesser LK, Vogt PR, Jenni R, Arbenz U, Turina M. Congenital coronary fistulas in children and adults: diagnosis, surgical technique and results. *J Cardiovasc Surg* 1996;37:29-34
10. Cheung DLC, Au WK, Cheung HHC, Chiu CSW, Lee WT. Coronary artery fistula: long-term results of surgical correction. *Ann Thorac Surg* 2001;71:190-195

