Tzu Chi Medical Journal 23 (2011) 90–92

Contents lists available at ScienceDirect

Tzu Chi Medical Journal

journal homepage: www.tzuchimedjnl.com

Case Report

Coronary artery fistula: A rare congenital disorder detected by multidetector computed tomography

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ARTICLE INFO

Article history:
Received 21 September 2010
Received in revised form
4 November 2010
Accepted 13 January 2011

Key words:
Computed tomography
Coronary artery
Fistula

ABSTRACT

Conventional angiography is generally considered the standard procedure for diagnosis of coronary artery disease. With improvements in multidetector computed tomography (CT), CT coronary angiography (CTCA) is a new and rapidly emerging noninvasive imaging technique for coronary imaging. We report the three rarest types of congenital coronary artery fistulae detected by CTCA. CTCA is a practical tool for diagnosis of coronary artery anomalies and reveals the origin, course, termination, and connections of the fistula.

1. Introduction

Coronary artery fistula (CAF) is defined as a direct precapillary connection between a branch of a coronary artery and the lumen of a cardiac chamber, coronary sinus, superior vena cava, pulmonary artery, or pulmonary vein close to the heart. In the general population, CAFs have an estimated prevalence of 0.002% [1]. The most common drainage sites in order of decreasing frequency are the right ventricle (41%), right atrium (26%), pulmonary artery (17%), coronary sinus (7%), left atrium (5%), left ventricle (3%), and superior vena cava (1%) [2].

At our institution, patients undergoing multidetector computed tomographic coronary angiography should have resting heart rates of less than 65 beats/min to maximize the time of least motion during mid-diastole. Our protocol for coronary angiography with a 64-detector CT scanner is injection of approximately 60–120 mL of nonionic hypoosmolar contrast material (iohexol) at a rate of 5 mL/sec, followed by 30 mL of 0.9% saline solution.

We report three cases of the rarest types of CAF detected by multidetector CT (MDCT) (LightSpeed VCT, GE Healthcare, Milwaukee, WI, USA). These patients were referred for nonspecific chest pain and conventional coronary angiography was not indicated. One patient received conventional coronary angiography months later and the fistula was confirmed. CT images of these types of fistula are rarely demonstrated in the current literature.

2. Case reports

2.1. Case 1

A 57-year-old man came to our department complaining of nonspecific chest pain. He had a history of hypertension and received regular medication. Cardiac CT (Fig. 1) showed a fistula connecting the left circumflex (LCX) artery and the left atrium. The patient received conventional angiography 3 months later (Fig. 1) for new-onset angina and exercise intolerance. The fistula was proved during angiography.

2.2. Case 2

A 40-year-old man came for noninvasive coronary evaluation because of chest pain. Three-dimensional reformatted cardiac CT (Fig. 2) showed a tortuous and dilated distal LCX artery. Maximum intensity projection imaging (Fig. 2) showed a direct connection from the tortuous distal LCX to the left ventricle.

2.3. Case 3

A 36-year-old man complained of dyspnea and left upper chest tightness radiating to the left upper arm for 2 years. The symptoms

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1016-3190/$ – see front matter
doi:10.1016/j.tcmj.2011.02.002

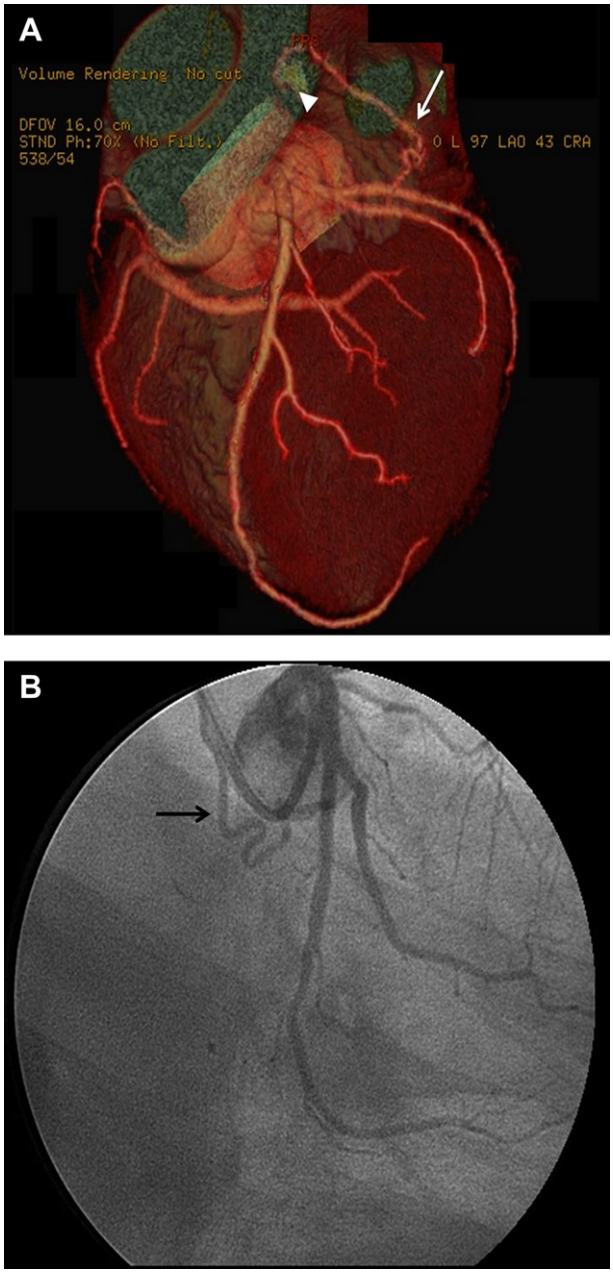

Fig. 1. (A) Volume rendering cardiac computed tomography shows a tortuous artery (arrow) originating from the left circumflex artery coursing to the outpouching of the left atrium (arrowhead). (B) Left coronary angiography proves the fistula (arrow). CAU = caudal; CRA = cranial; DFOV = dual field of view; LAO = left anterior oblique; STND = standard.

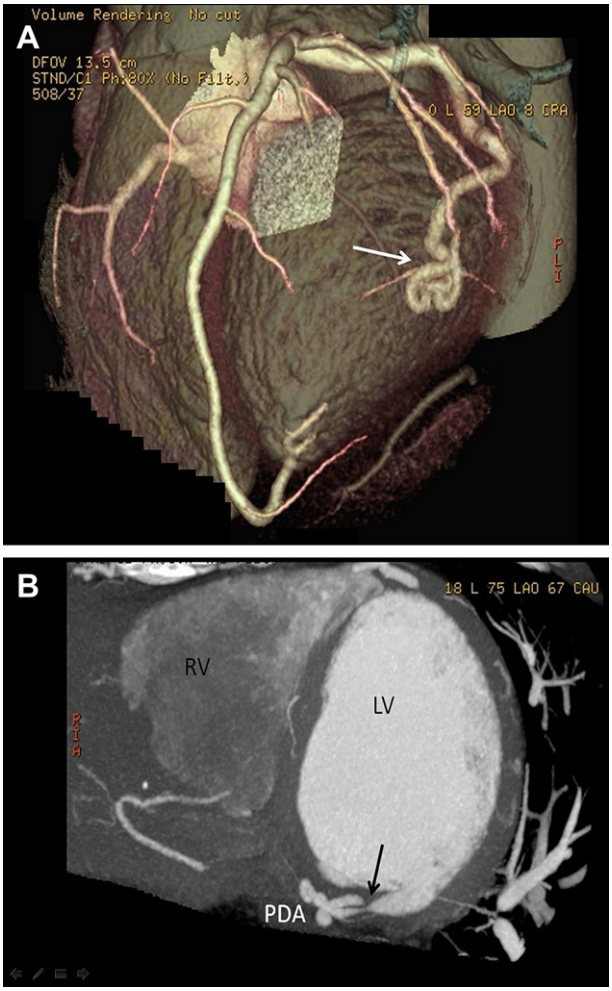

Fig. 2. (A) Volume rendering cardiac imaging reveals a dominant left coronary system. The PDA is dilated and tortuous (arrow), and originates from the left circumflex artery. (B) Reformatted two-dimensional cardiac computed tomography clearly defines the connection (arrow) between the LV and PDA. CAU = caudal; CRA = cranial; DFOV = dual field of view; LAO = left anterior oblique; LV = left ventricle; PDA = posterior descending artery; RV = right ventricle; STND = standard.

lasted for minutes with spontaneous relief. The frequency of the symptoms had been increasing and he came for evaluation. Cardiac CT showed an abnormal vessel connecting the distal right coronary artery and the superior vena cava (Fig. 3). Because there was no surgical emergency, regular follow-ups were arranged.

3. Discussion

Fast spiral MDCT can be used to obtain isotropic volume data, and high-quality two- and three-dimensional multiplanar reformatted images can be created to accurately and systematically delineate both normal and pathologic morphologic features of the cardiovascular system.

A CAF is usually found incidentally on cardiac catheterization or at autopsy because most patients are initially asymptomatic. Some, however, may present with myocardial ischemia, myocardial infarction, congestive heart failure, or sudden death [3]. The clinical symptoms of CAF vary depending on their anatomy, the relative size of the fistula to other vascular structures, and their flow reserve. Even if a patient is initially asymptomatic, symptoms, such as fatigue, dyspnea, and chest pain, are seen in the course of time. In 80% of patients older than 50 years with a high-flow reserve fistula, congestive heart failure, and angina pectoris are seen because of myocardial ischemia [4].

With more frequent use of MDCT in chest and cardiac imaging, the number of incidentally found CAF has been increasing. CT coronary angiography can have added value in the diagnosis of cardiac anomalies. It can be used to systematically evaluate the aorta, pulmonary artery, pulmonary vein, cardiac chambers, and ventriculoarterial connections.

As cardiac catheterization alone may not have been adequate for evaluating the anatomy in the present cases, MDCT was useful for clarifying the precise anatomy of the CAF and anomalous vessels. The diagnostic performance of MDCT angiography has significantly improved with the latest 64-slice CT, with resultant high qualitative and quantitative diagnostic accuracy [5].

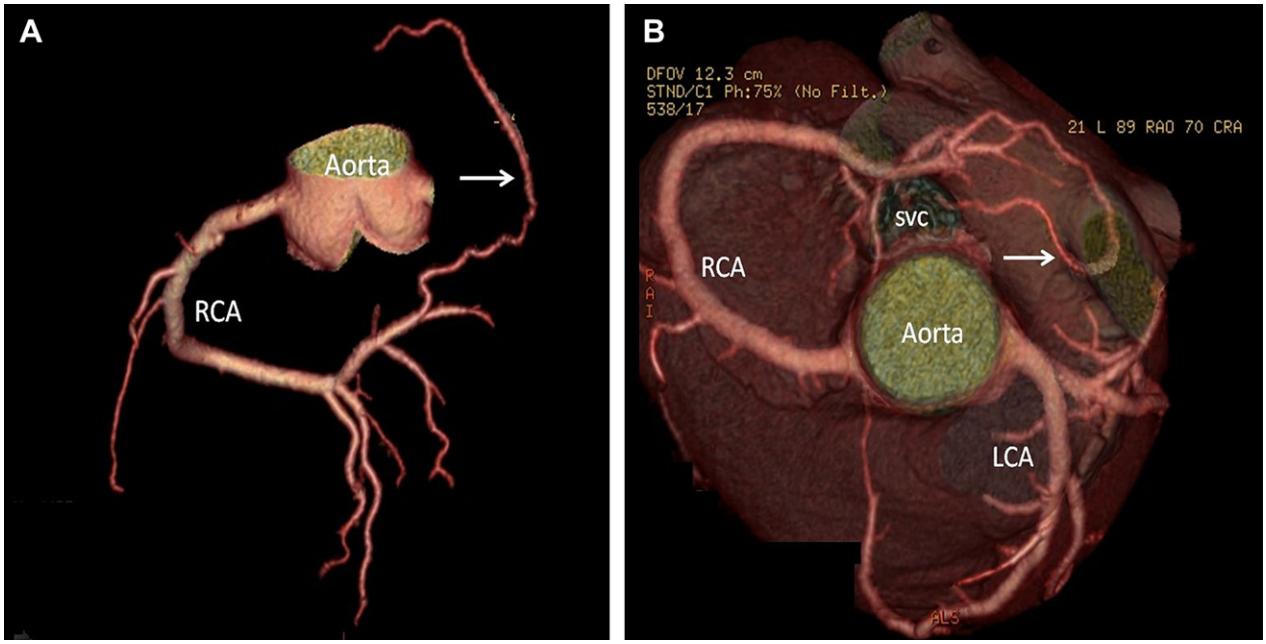

Fig. 3. (A) Volume rendering cardiac imaging shows an abnormal elongation and cranial course of the distal RCA (arrow). (B) Volume rendering cardiac imaging shows the abnormal vessel emptying into the SVC. CAU = caudal; CRA = cranial; DFOV = dual field of view; LAO = left anterior oblique; LCA = left coronary artery; RCA = right coronary artery; SCA = superior vena cava; STND = standard.

Both surgery and transcatheter closure are effective treatments for a CAF [6–8]. Ata et al [8] considered that every CAF should be treated because severe complications may develop. All the three presented patients received conservative treatment and regular follow-up without immediate surgical or transcatheter closure.

In conclusion, although cardiac catheterization is the gold standard diagnostic method for determining the origin and the course of a CAF, MDCT angiography can be an alternative and better method for determining the accurate relationship of anatomic structures because of its spatial resolution.

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