Coronary artery fistulas to cardiac chambers are rare medical conditions and in most cases, are found incidentally (1–7). Although the majority of cases are asymptomatic, some may cause coronary steal. For several decades, the conventional coronary angiography has been the best diagnostic modality for identifying coronary artery fistulas. However, with recent advances, the coronary angiography was replaced by the development of an electrocardiographically gated multi-detector row computed tomography (MDCT) (1, 8–10). We present a patient with a rare variation of the left anterior descending coronary artery to the left ventricular fistula, which was diagnosed by a 64-multi-detector row coronary CT angiography.

**Index words:** Tomography, X-Ray Computed Coronary Angiography Coronary Artery Disease Fistula

Coronary artery fistulas to cardiac chambers are rare medical conditions and in most cases, are found incidentally (1–7). Although the majority of cases are asymptomatic, some may cause coronary steal. For several decades, the conventional coronary angiography has been the best diagnostic modality for identifying coronary artery fistulas. However, with recent advances, the coronary angiography was replaced by the development of an electrocardiographically gated multi-detector row computed tomography (MDCT) (1, 8–10). We present a patient with a rare variation of the left anterior descending coronary artery to the left ventricular fistula, which was diagnosed by 64-MDCT.

**Case Report**

A 67-year-old man was referred from a private clinic to our institution for the evaluation of long standing chest pain. The patient had a medical history of hypertension. Moreover, an echocardiography showed a normal ventricular ejection fraction and a good wall motion, except for aortic valve degeneration with mild mitral valve regurgitation. Upon examination, the patient was found to have a blood pressure of 130/84 mmHg and a pulse rate of 52 beats per minute without a murmur.

For his cardiac evaluation, a coronary CT angiography (CCTA) was performed with a 64-slice multi-detector system (Brilliance 64; Phillips Medical System, Cleveland, Ohio, U.S.A.). An 18 gauge intravenous catheter was placed in an antecubital vein for venous access. To achieve a target heart rate of 65 beats per minute or fewer, the patients received a 25 mg oral dose of atenolol (Tenormin; Hyundai Pham, Seoul, Korea) at 30 minutes before the study. In addition, 0.6 mg of Nitroglycerin (Nitroglycerin SL TAB, Myungmoon Pham, Seoul, Korea) was administrated sublingually before the scan initiation. The following imaging and reconstruction parameters were used: 1) a detector collimation of 0.2 mm, 2) a voltage of 120 kV, 3) an effective current of 1000 mA, 4) a relative pitch of 0.2 seconds, a rotation time of 0.4 seconds, a slice thickness of 0.9 mm,
and a reconstruction interval 0.45 mm. In total, 80 milliliters of nonionic contrast material (iopromide, Ultravist 370; Schering, Berlin, Germany) was injected through an antecubital vein at a rate of 5 mL/s via a dual-syringe injector (Stellant D; Medrad, Indiana, Pa, U.S.A.). The injection was immediately followed by a 40-mL saline flush at a rate of 5 mL/s. For timing purposes, automated bolus tracking software was used with the commencement of image acquisition when the contrast density reached a predefined threshold of 150 Hounsfield units in the ascending aorta. The post-processing techniques, including multi-planar reformation, maximum-intensity projections, and volume-rendered reconstructions, were performed on a PC-based 3-dimensional software (Rapidia 2.8; Infinit, Seoul, Korea).

On CCTA, there was a tortuous distal artery from the distal left anterior descending artery (LAD), which was connected into the base of the left ventricle (Fig. 1). We diagnosed it as a coronary artery to left ventricular fistula.

**Discussion**

Congenital coronary anomalies are rare conditions and are diagnosed incidentally by a coronary angiography or autopsy. Coronary artery anomalies may be found incidentally in 0.3–1% of the healthy population. Coronary artery fistulas account for 15% of all coronary artery anomalies (1, 2). Approximately 60% of these fistulas arise from the right coronary artery (RCA). In most cases, it terminates in the right side of the heart in 90% of the cases. Drainage to the left ventricle is the least common (2).

Only five cases of the LAD to left ventricular fistulas have been reported in the previous English literature thus far. The LAD to the left ventricular fistulas arose...
from single or multiple origins of the left coronary artery (3-7). When the fistula connection is to a left-sided cardiac chamber, a coronary artery fistula that drains to the left ventricle produces hemodynamic changes similar to aortic insufficiency. Myocardial perfusion may be decreased for the portion of the myocardium, which is supplied by the abnormally connecting coronary artery and this situation represents a hemodynamic steal [1, 2].

For the several decades, the diagnosis of coronary artery anomalies was made with a conventional coronary angiography. However, with progress in the method (MDCT), the CCTA has been accepted as the new standard method for visualizing the origin, while the 3-D display of the anatomy is in contrast with demonstrating the 2-D display of the anomalous artery in the conventional angiography (8-10). For patients with atypical chest pain, the non-invasive CCTA is helpful for a physician to exclude a cardiac etiology with a high negative predictive value. The physicians can understand the complex anatomy of coronary anomalies better and hence, contemplate interventions made, thoroughly based on 3-D volume rendered images [9].

Our case had two limitations. First, we could not clarify the hemodynamic significances or myocardial changes relating to the fistula, because additional imaging studies such as conventional coronary angiography or nuclear perfusion testing were not performed. Second, follow-up results were not obtained. Despite these limitations, our case demonstrated the ease of diagnosis of this rare variation with use of the CCTA. To our knowledge, we present the first case of LAD to the left ventricular fistula which was diagnosed by CCTA.

References