

Coronary Fistula to the Left Ventricle: Assessed by Computed Tomography

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Coronary artery fistulas are rare and are most often diagnosed by echocardiography or by cine-angiography. However, the computed tomography angiography (CTA) of coronary arteries has been gaining ground. The incidence of this disease is very low, with a more frequent occurrence of fistulas originating in the right coronary artery. There is a higher incidence of coronary artery fistulas to right heart chambers, with coronary artery fistulas to the left ventricle (LV) being rare. Treatment can be surgical or percutaneous.

This report describes a case of coronary fistula to left ventricle diagnosed by CT angiography of coronary arteries in a hypertensive and asymptomatic 46-year-old male, who was tested positive for ischemia in an exercise test. The CT angiography ruled out coronary obstructive disease, but it revealed a coronary fistula to the left ventricular cavity.

Introduction

Coronary fistulae (CF) are direct connections from one or more coronary arteries to cardiac chambers or a large vessel¹. Congenital anomalies are more common than acquired anomalies², being found in up to 0.2% of routine cine-angiography³.

Most patients are asymptomatic³, but some people may experience the following symptoms: fatigue, dyspnea, palpitations and ischemic chest pain. By means of auscultation, it is possible to hear continuous murmurs that are similar to those of patent ductus arteriosus⁴.

As additional propaedeutics, the ECG may be normal. The diagnosis is usually made by echocardiography, especially when there is dilation of the coronary artery involved or high output coronary flow⁵, with cine-angiography being the gold standard for diagnosis, revealing anatomical details that are important to the treatment².

This report describes a rare case of coronary fistula to left ventricle diagnosed by CT angiography of coronary arteries.

Keywords

Cardiovascular diseases; arterio-arterial fistula; heart ventricles; diagnosis; tomography, computed.

Case report

It refers to a 46-year-old, obese, hypertensive and dyslipidemic male patient. In the physical examination, the patient's heart rate was regular at three different stages and the BP was 160 x 100 mmHg. At the outpatient clinic, in the examination for coronary artery disease (CAD), the patient was asymptomatic.

The ischemic test result obtained by means of an exercise test was positive. Therefore, in order to rule out CAD, a CT angiography of the coronary arteries was carried out and it revealed markedly dilated and tortuous coronary arteries, besides a large fistula connecting the anterior descending artery to the right coronary artery and a single confluence for the LV cavity adjacent to the posterior mitral valve leaflet (Figures).

Methods

The examination and clinical history of the patient in the digital archive of images (PACS) were reviewed. The patient's authorization to use the images for a case report was obtained.

The equipment used was manufactured by Philips Medical Systems - model Brilliance 16-MDCT.

With the patient lying on his back, in respiratory pause (apnea of 15 seconds), in electrocardiographic (ECG) synchronization, 0.75-mm thick tomographic slices of the heart were obtained by using 80 ml of nonionic iodinated contrast (Optiray 350 mg/ml) in an infusion pump at 5 ml/second, followed by 40 ml of 0.9% saline solution, at the same infusion rate. The images were viewed in the workstation from Philips Medical Systems, Brilliance CT model. Multiplanar reconstructions (MPR), curved multiplanar reconstructions (Curved MPR) and 3D reconstructions with volume rendering technique (VR) were performed (Figures 1 and 2).

Discussion

The incidence of coronary fistula among congenital heart diseases is low, totaling only 0.2% to 0.4%. It was first described in 1886 and the first surgical correction was successfully performed in 1947¹. The congenital origin is even more frequently seen than the acquired origin² and associated anomalies may occur. Associations with patent ductus arteriosus, tetralogy of Fallot, ventricular septal defect and acquired cardiopathies have already been described in the literature⁵. The acquired origins may be infectious, traumatic or iatrogenic². There were also reports of coronary fistulas associated with permanent pacemaker electrodes by erosion, after cardiac surgery, coronary angioplasty or acute myocardial infarction⁴.

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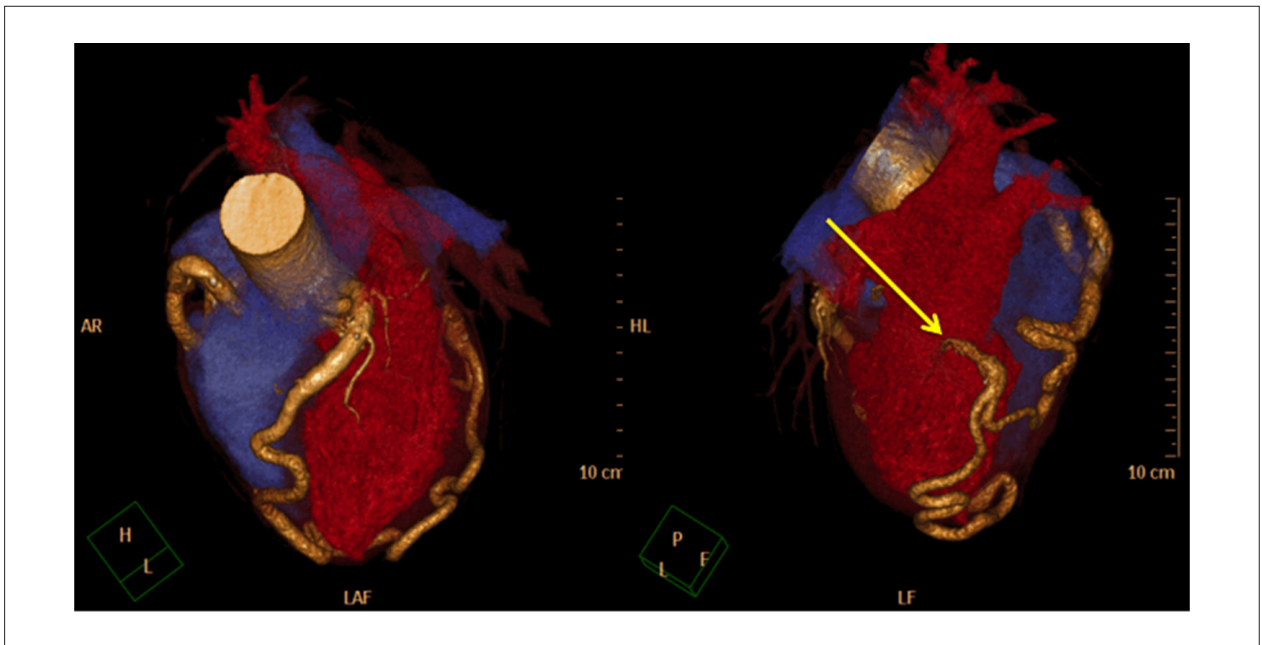


Figure 1 - 3D Volume Rendering showing dilated coronary arteries and fistula to left ventricle (yellow arrow).

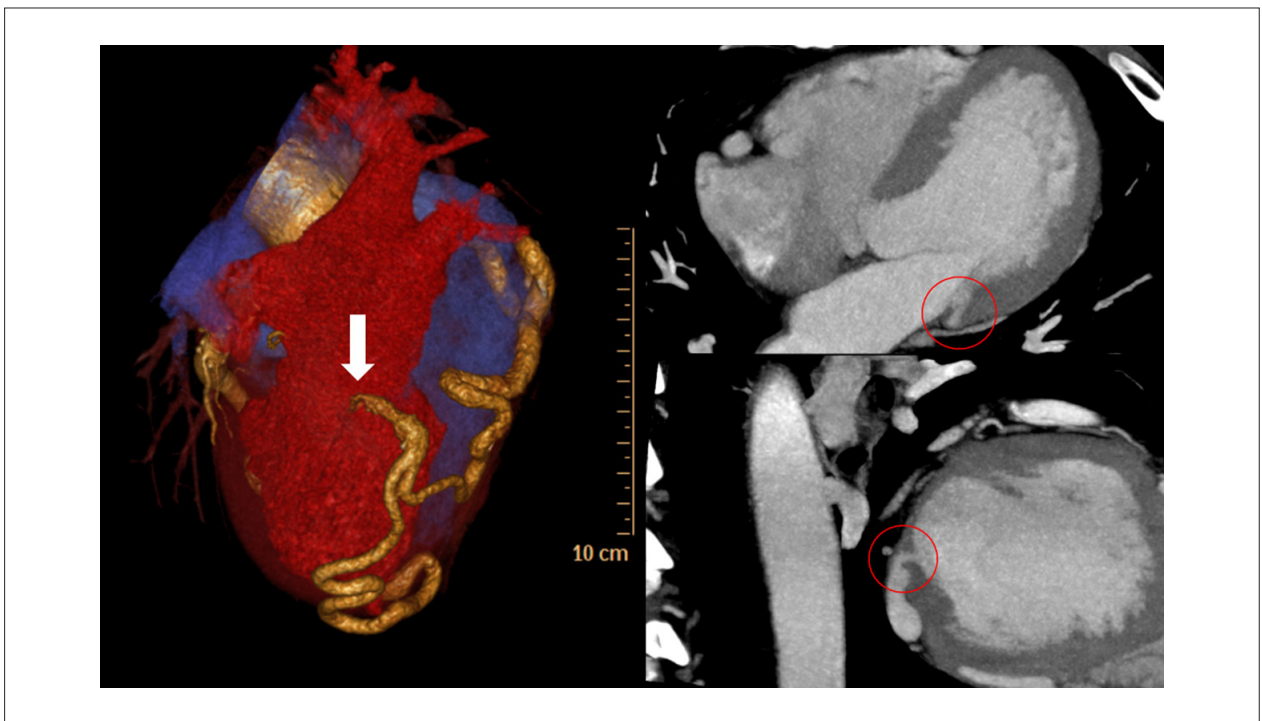


Figure 2 - Curved MPR showing the communication of the fistula with the left ventricular cavity (red circles). 3D Volume Rendering showing the coronary fistula (white arrow) and curved MPR showing the communication of the fistula with the left ventricular cavity (red circles).

The fistulas originated from the right coronary artery are more frequent (70%) and may also occur in the left coronary artery or in both arteries. Generally, drainage is carried out for low-pressure chambers³. Thus, the incidence of communication with right chambers is higher, between 39 and 41% for the right ventricle, between 26 and 33% for the

right atrium, between 15 and 20% for the pulmonary artery, the coronary sinus and the superior vena cava^{3,5}. Fistulas to the LV are very rare, with an incidence of only 3%^{6,7}.

The coronary arteries develop early in the embryogenesis, between the 6th and 8th weeks. The first structure of the coronary arteries consists of a myocardial capillary network,

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which is made up of endothelial cells. The coronary arterial system is formed around the truncus arteriosus, and its main structure begins to develop more in the portion that will become the future aorta, when its bipartition occurs and it joins the myocardial capillary network⁶. Coronary fistulae can develop when there is a persistence of embryonic intertrabecular spaces and sinusoids, however, when the main coronary artery remains attached to the pulmonary trunk, we are faced with an anomalous origin of coronary artery^{4,7,8}.

The pathophysiology and clinical profile depend on the magnitude of the blood flow through the fistula and its location. Most patients are asymptomatic (55%)³. However, when there are clinical manifestations, such manifestations are related to heart failure or dyspnea on exertion. Continuous, superficial and intense murmur in a classic location of patent ductus arteriosus may be a finding of the physical examination^{4,8}. The "coronary flow withdrawal" phenomenon may also occur and, in such cases, the symptoms would be chest pain or signs of ischemia detected by the conventional electrocardiogram or during exercise testing, such as in the case observed. The ischemic event is not dependent on the size of the fistula and it has been described even with a small flow⁵.

The differential diagnosis of coronary artery fistula shall be made with patent ductus arteriosus, aortic insufficiency, sinus of Valsalva aneurysm and pulmonary or chest wall fistula.

Fistulas can be diagnosed by echocardiography, which can display a dilated coronary artery, where the abnormality arises, and even the fistula itself, including the entrance to a chamber or vessel, in addition to a continuous turbulent systolic and diastolic flow⁸. However, coronary angiography is the method of choice for the diagnosis, although details of the relationship between the fistula and other structures cannot be revealed by this technique². Still, the CT angiography of the coronary arteries may play an important role in the diagnosis and therapy of this pathology, because, due to its ability to describe important details of the coronary anatomy and its relationship with other structures of the heart, it can be considered a promising diagnostic imaging method for this and other clinical applications. In addition, the combination of CT angiography with stress SPECT myocardial perfusion

imaging study is an option that may reveal even more pathophysiological details in the diagnosis, revealing minimal degrees of ischemia².

With regard to treatment, although experts advise that the fistula be mechanically repaired (open or percutaneous procedure), this is recommended for symptomatic cases, with no guidelines for asymptomatic patients. However, there are some publications that recommend the correction even in asymptomatic patients, considering the size and diameter of the defect, in order to prevent premature coronary artery disease in the affected vessel⁸. Asymptomatic and minimally symptomatic elderly patients seem to benefit from drug therapy. Recommended regimens include traditional antianginal agents, such as beta blockers, aspirin and calcium channel blockers. Vasodilator agents, such as nitrates, have been reported to exacerbate the coronary steal phenomenon, being relatively contraindicated in the case of such patients⁶.

Based on the cases reported in the literature, it is not possible to establish a standardized management. There is consensus that the surgical treatment should always be carried out, because we do not know exactly the natural progression of the disease, or the frequency of complications that may occur. The spontaneous closure of the fistula is very rare, but it has been described⁵. Some authors argue that endocarditis prophylaxis should be carried out in such individuals⁴. The treatment can be surgical or percutaneous, depending on the flow, ischemia and complication risks⁵.

Potential Conflict of Interest

No potential conflict of interest relevant to this article was reported.

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Study Association

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