A left ventricular lipoma diagnosed on three-dimensional electrocardiogram-gated cardiac computed tomography

Hiromitsu Hayashi · Fumitaka Hidaka · Tomonori Kiriyama · Hidetaka Sato · Ryo Takagi · Shinichiro Kumita

Department of Radiology and Center for Advanced Medical Technology, Nippon Medical School, 1-1-5 Sendagi, Bunkyo-ku, Tokyo 113-8603, Japan
Tel. +81-3-3822-2131 ext. 6755; Fax +81-3-5685-1795
e-mail: hhayashi@nms.ac.jp

Received: January 12, 2007 / Accepted: December 14, 2007

Abstract Cardiac lipomas are extremely rare primary benign cardiac tumors. We describe a patient with a chief complaint of ventricular tachycardia associated with a lipoma arising in the left ventricular myocardium. The cardiac lipoma was qualitatively evaluated and its location was accurately determined noninvasively with the use of three-dimensional images reconstructed from data acquired by electrocardiogram-gated cardiac computed tomography (CT). Our experience suggests that high-resolution three-dimensional CT imaging may facilitate the determination of strategies for surgical treatment.

Key words Cardiac lipoma · Cardiac tumor · Computed tomography · Multidetector-row computed tomography · Cardiac computed tomography

Introduction

Cardiac tumors are extremely rare and can be divided into benign and malignant lesions. Myxomas are the most common type of cardiac tumor, while lipomas are rare. Imaging studies have an important role in the diagnosis of cardiac lipomas. Computed tomography (CT) and magnetic resonance imaging (MRI) allow tumors to be evaluated noninvasively. However, the precise tumor location is often difficult to evaluate three-dimensionally on the basis of two-dimensional source images.

We conducted electrocardiogram (ECG)-gated cardiac CT examination for preoperative assessment in a patient with a lipoma arising in the left ventricular myocardium. Three-dimensional CT images were very useful for understanding the spatial relationship between the tumor and important anatomical structures, such as the coronary arteries, and facilitate accurate decision-making for treatment planning before surgery.

Case report

A 55-year-old man consulted a general physician because of palpitations of sudden onset. Ventricular tachycardia was diagnosed. The frequency of ventricular tachycardia decreased in response to treatment with oral amiodarone hydrochloride. However, episodes of ventricular tachycardia recurred recently, and he transiently went into shock with decreased blood pressure to 40 mmHg. The patient was referred to our hospital to receive further evaluation and treatment. A cardiac tumor had been diagnosed at another hospital 4 years previously, but the details were unclear. He was also receiving antihypertensive drugs to treat hypertension. The results of blood chemical tests on admission were normal. On ECG, the patient had sinus rhythm at a rate of 60 beats/min. A chest film revealed a bulge at the left cardiac border. ECG-gated cardiac CT examination was conducted to further evaluate the heart.

A 16-row Multidetector-row CT scanner (LightSpeed Ultra 16, GE Healthcare, Tokyo, Japan) was used. Scanning was done at an X-ray tube rotation speed of 0.5 s per rotation, 0.625 mm × 16-detector-row X-ray collimation and a scan pitch of 0.325. A 70 ml bolus of iopamidol 370 (Iopamiron 370; Nihon Schering, Osaka, Japan) was injected at a rate of 3 ml/s with an autoinjector (Autoenhance A-250, Nemoto Kyorindo, Tokyo, Japan), followed by 30 ml of saline solution at a rate of 3 ml/s. Scanning was started when the CT value exceeded 100 Hounsfield units within the region of interest, which was set at the ascending aorta. The image-acquisition time was about 15 s. Axial images were reconstructed at 70% of the R-R cycle, corresponding to mid-diastole phase. Axial images were transferred to an image processing workstation (Advantage Windows, version 4.0, GE Healthcare) for three-dimensional image processing. Three-dimensional images...
were reconstructed by the volume rendering and curved planar reformation techniques.

The volume-rendering technique clearly revealed a protrusion of the anterior wall of the left ventricle due to a cardiac tumor of the left ventricle, just below the bifurcation of the left anterior descending coronary artery and the first diagonal branch (Fig. 1). On a short-axis image of the left ventricle, a tumor composed of adipose tissue was observed in the anterior wall of the left ventricle, with a size of $50 \times 42 \times 44$ mm. The mean attenuation value within the tumor was $-120$ Hounsfield units. No significant enhancement within the tumor was observed on contrast-enhanced CT examination. The bottom of the tumor reached the inside of the left ventricular chamber. Curved planar reformation images restructured along the course of the left anterior descending artery showed that the artery was displaced by the tumor. However, a thin layer of myocardium remained between the tumor and the left anterior descending artery, indicating no sign of invasion (Fig. 2). Because sufficient information about the relationship between coronary artery and the tumor was obtained, invasive coronary angiography was not performed. We concluded that the lipoma in the left ventricular myocardium caused the ventricular tachycardia. Ventricular tachycardia decreased with use of amiodarone hydrochloride orally, but was not completely suppressed. Surgical resection was thus performed.

When the pericardium was incised, a tumor was found in the myocardium, just beneath the bifurcation of the left anterior descending artery and the diagonal branch, consistent with the preoperative assessment. When the epicardium overlying the tumor was incised, the thin, displaced myocardium of the left ventricle appeared. A yellowish tumor was found on incision of the myocardium. Macroscopic examination and frozen-section diagnosis showed that the tumor was a lipoma (Fig. 3A). To avoid damaging the left anterior descending artery and its septal branches, part of the tumor near the ventricular septum was allowed to remain. To avoid penetration of the left ventricle, a thin layer of the lower part of the tumor was preserved. The tumor was thus incompletely resected; approximately one fourth of the entire tumor remained. No feeding vessels of the tumor were found. On final pathological examination, mature fat cells were found in the tumor, with no immature lipoblasts or heteromorphic cells. Some myocardial bundles were sporadically seen inside the fat tissue. These findings were consistent with the notion that the lipoma arose in the myocardium (Fig. 3B).

Because the intramyocardial lipoma could not be completely resected, prophylactic treatment with oral amiodarone hydrochloride was continued. The ventricular tachycardia was successfully controlled and the patient was discharged on postoperative day 12.

**Discussion**

Cardiac tumors are extremely rare, found at a frequency of only 0.001%–0.28% at autopsy.\(^1\) The incidence of