

# Linear Fat Deposition in the Middle Layer of the Left Ventricular Myocardium: Computed Tomographic Findings

Song Soo Kim, MD<sup>1</sup>  
Sung Min Ko, MD<sup>2</sup>  
Meong Gun Song, MD<sup>3</sup>

We report here a case of streaky fat deposition in the middle layer of the left ventricular myocardium, without any underlying etiology, and this was seen on computed tomography coronary angiography. This report suggests that left ventricular middle layer fat deposition should be investigated in order to determine its etiology, the pathogenesis and the prognosis.

## Index terms:

Fat  
Computed tomography (CT)  
Myocardium

DOI:10.3348/kjr.2010.11.5.571

## *Korean J Radiol* 2010; 11:571-573

Received December 24, 2009; accepted after revision March 5, 2010.

<sup>1</sup>Department of Radiology, Chungnam National University Hospital, Chungnam National University School of Medicine, Daejeon 301-721, Korea; Departments of <sup>2</sup>Radiology and <sup>3</sup>Thoracic Surgery, Konkuk University Hospital, Konkuk University School of Medicine, Seoul 143-729, Korea

## Corresponding author:

Sung Min Ko, MD, Department of Radiology, Konkuk University Hospital, Konkuk University School of Medicine, 4-12 Hwayang-dong, Gwangjin-gu, Seoul 143-729, Korea.  
Tel. (822) 2030-5500  
Fax. (822) 447-8726  
e-mail: ksm9723@yahoo.co.kr

**T**he human heart can contain various amount of fat. There have been many reports regarding fat deposition or infiltration after pathologic conditions such as old myocardial infarction (MI), arrhythmogenic right ventricular dysplasia (ARVD) and cardiomyopathy (1-3). Additionally, recent reports have demonstrated that fatty tissue intermingled with myocardial tissue is present within the right ventricle (RV) in over 50% of healthy elderly people (1). However, little is currently known regarding a fat streak in the middle layer of the left ventricular (LV) myocardium in patients without a clinical history of MI or ARVD. In this study, we report a case of LV middle layer fat deposition that was detected on cardiac computed tomography (CT).

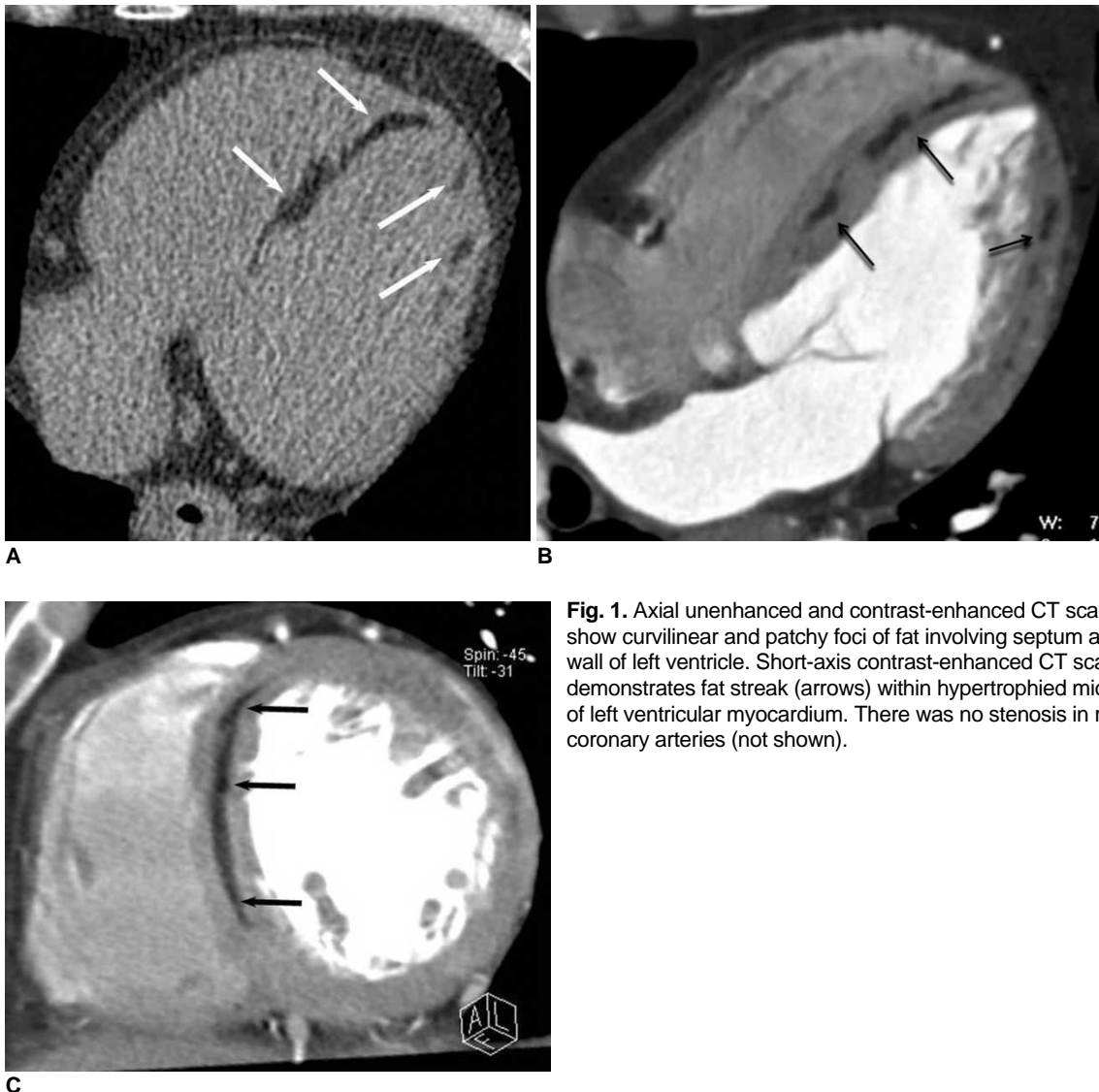
## CASE REPORT

A 51-year-old man was admitted for chest discomfort and hematemesis. Her previous medical history included hypertension, type 2 diabetes mellitus, duodenal ulcer and chronic pancreatitis with pseudocyst. He had been a heavy smoker for 45-pack years, and he had a history of heavy alcohol consumption (although the patient was not currently drinking). The echocardiography (ECG) revealed normal sinus rhythm without Epsilon waves or a prolonged QRS complex. On abdomen CT, an incidental finding of regional hypoattenuated lesions involving the myocardium of the LV was noted (not shown). The patient denied any cardiac problems. Contrast-enhanced ECG-gated 64-slice multidetector CT coronary angiography (CA) was conducted in order to rule out old MI or ARVD. CTCA revealed a curvilinear middle layer fat deposition in the LV septum and a patchy middle layer fat deposition in the LV lateral wall without any associated wall thinning (Fig. 1). No stenotic lesions were noted in the coronary arteries, nor was fat deposition detected in the RV free wall. The end-diastolic volume (135 ml), the end-systolic volume (45 ml) and the ejection fraction (67%) were measured on the LV functional analysis with multiphase reconstruction of the image data set using cardiac CT. There were no regional wall motion abnormalities. Echocardiography and cardiac MRI were not conducted because the patient did not desire any further workup.

**DISCUSSION**

The differential diagnosis for the presence of LV myocardial fat includes old MI, ARVD, cardiac lipoma, lipomatous infiltration, hypertrophic cardiomyopathy, dilated cardiomyopathy and the sequelae of myocarditis or toxicity (2-6). Although fat deposition may be encountered under the benign condition of fatty replacement of the RV or as a normal variant, fat is generally not observed in the LV wall without a history of MI (7). The presence of myocardial fat was observed in up to 6% of the CT examinations conducted on ischemic heart disease patients and the typical CT findings of LV myocardial fat in old MI included linear or curvilinear foci of fat attenuation within the subendocardial portion of the LV myocardium, LV wall thinning and/or calcification (7). Another study reported that fat in the LV myocardium was detected at a

frequency of 22% on the CT imaging of old MIs and it is more frequently associated with a longer postinfarct period, milder coronary artery stenosis and more regional wall motion abnormalities (6). ARVD is clinically characterized by ventricular arrhythmias with left bundle branch blockage, and the relevant CT findings are as follows: (i) dilation of the RV, (ii) fatty tissue in conspicuous trabeculae of the RV, and particularly in the anterior wall, apex and inferior wall, and (iii) a scalloped appearance of the RV wall (8). Hypertrophic cardiomyopathy may be associated with the presence of myocardial fat in a thickened LV wall, with this fat deposition being observed on CT in up to 11% of the cases (9). Dilated cardiomyopathy may also be associated with myocardial fat deposition, as seen on CT, in up to 18-24% of the cases (5, 9). Cardiac lipoma is a true neoplasm that is composed of an encapsulated mass of mature adipose tissue, and cardiac lipomatous infiltra-



**Fig. 1.** Axial unenhanced and contrast-enhanced CT scans (A, B) show curvilinear and patchy foci of fat involving septum and lateral wall of left ventricle. Short-axis contrast-enhanced CT scan (C) demonstrates fat streak (arrows) within hypertrophied mid septum of left ventricular myocardium. There was no stenosis in right or left coronary arteries (not shown).

tion is an unencapsulated mass of fatty tissue in the myocardium (10).

In our case, multiple curvilinear fat and nodular fat were distributed in the middle layer of the LV myocardium without coronary stenoses and without relation to the vascular territory or LV wall thinning. We detected no evidence of ARVD, such as Epsilon waves on ECG or the above-mentioned CT findings. Hypertrophic cardiomyopathy was excluded based on the CT findings. Carpenter (10) previously insisted that the term 'fat infiltration' is a misnomer, implying invasion of the myocardium by epicardial adipose tissue, whereas the fat probably arises from metaplasia of the connective tissue. In our case, fat infiltration might be a misnomer, but we cannot prove that this is the result of metaplasia or that it is a consequence of any other causes. We have no satisfactory explanation for this finding. We have no idea regarding its incidence, the manner in which such patients should be managed or its prognosis. We assume that myocardial fat that is detectable by CT might be involved anywhere within the normal myocardial wall.

In conclusion, we report herein an unusual case of a curvilinear streak of fat deposition in the middle layer of the LV myocardium without any identified causes on CTCA. This report indicates that LV middle layer fat deposition should be further investigated in order to determine its etiology, pathogenesis and prognosis.

## References

1. Fontaine G, Fontaliran F, Zenati O, Guzman CE, Rigoulet J, Berthier JL, et al. Fat in the heart. A feature unique to the human species? Observational reflections on an unsolved problem. *Acta Cardiol* 1999;54:189-194
2. Tandri H, Bomma C, Calkins H, Bluemke DA. Magnetic resonance and computed tomography imaging of arrhythmogenic right ventricular dysplasia. *J Magn Reson Imaging* 2004;19:848-858
3. Gaerte SC, Meyer CA, Winer-Muram HT, Tarver RD, Conces DJ Jr. Fat-containing lesions of the chest. *Radiographics* 2002;22:S61-S78
4. Heyer CM, Kagel T, Lemburg SP, Bauer TT, Nicolas V. Lipomatous hypertrophy of the interatrial septum: a prospective study of incidence, imaging findings, and clinical symptoms. *Chest* 2003;124:2068-2073
5. Kaminaga T, Naito H, Takamiya M, Hamada S, Nishimura T. Myocardial damage in patients with dilated cardiomyopathy: CT evaluation. *J Comput Assist Tomogr* 1994;18:393-397
6. Ahn SS, Kim YJ, Hur J, Lee HJ, Kim TH, Choe KO, et al. CT detection of subendocardial fat in myocardial infarction. *AJR Am J Roentgenol* 2009;192:532-537
7. Zafar HM, Litt HI, Torigian DA. CT imaging features and frequency of left ventricular myocardial fat in patients with CT findings of chronic left ventricular myocardial infarction. *Clin Radiol* 2008;63:256-262
8. Kimura F, Sakai F, Sakomura Y, Fujimura M, Ueno E, Matsuda N, et al. Helical CT features of arrhythmogenic right ventricular cardiomyopathy. *Radiographics* 2002;22:1111-1124
9. Kaminaga T, Naitou H, Hamada S, Takamiya M. Detection of myocardial fatty components with ultrafast CT. *Nippon Igaku Hoshasen Gakkai Zasshi* 1993;53:28-34 [Japanese]
10. Carpenter HM. Myocardial fat infiltration. *Am Heart J* 1962;63:491-496