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Case Report

Basal septal perforator vein mimicking the "late iodine enhancement" in delayed phase cardiac CT for myocardial scar assessment

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ABSTRACT

Delayed-phase cardiac CT is a useful tool for scar detection, based on differences in the volume of distribution of iodine. Although it covers the entire heart, provides uniform, high isotropic spatial resolution, and therefore may be useful for detecting small late iodine enhancement (LIE), we need to correctly differentiate small LIE and pseudo-lesions mimicking LIE. In this case report, we demonstrate basal septal perforator vein mimicking LIE in delayed phase cardiac CT. Left ventricular myocardium includes not only septal vein and artery but also capillaries, arterio- and venoluminal vessels, and sinusoids, etc. which connect to septal veins. To avoid misinterpretations of myocardial LIE on the delayed phase images, we need to understand those anatomical features.

Introduction

Late gadolinium enhancement (LGE) of cardiac MRI represents myocardial fibrosis and may be related to the clinical outcome of various heart diseases [1]. LGE on cardiac MRI permits detection of scar pattern that can differentiate between ischemic and nonischemic injury; that is, the presence of subendocardial or transmural LGE supports a diagnosis of ischemic cardiomyopathy. Delayed-phase cardiac CT also allows for myocardial fibrosis detection based on late iodine enhancement (LIE) and could represent an interesting substitute for cardiac MRI. This is because iodinated contrast materials have pharmacokinetics similar to those of gadolinium-containing

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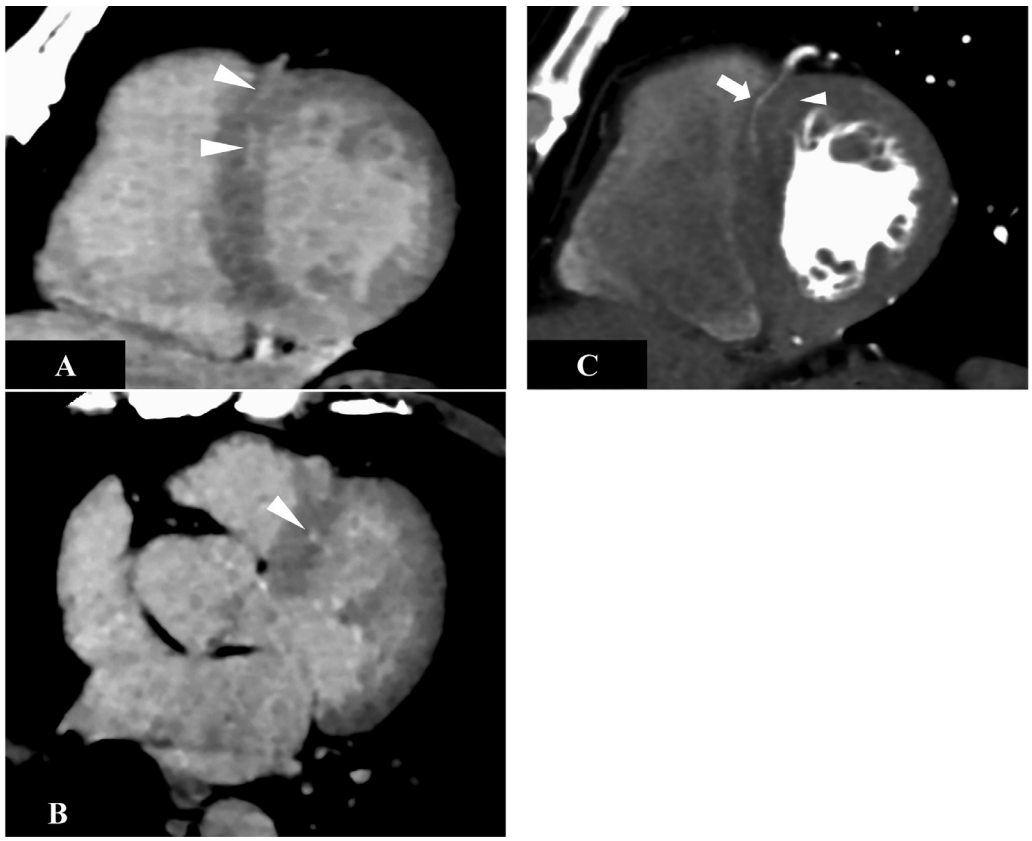

Fig. 1 – (A) Delayed-phase cardiac CT. Short-axial delayed phase image (basal slice, slice thickness 5 mm), basal septal perforator vein mimicking late iodine enhancement (arrow heads). (B) Delayed-phase cardiac CT. Axial (x-y) delayed phase image (slice thickness 3 mm), basal septal perforator vein (arrow head). (C) Coronary CTA. Short-axial coronary CTA image (basal slice, slice thickness 5 mm), septal perforator artery (arrow). Note slightly enhanced septal perforator vein (arrow head).

contrast materials. Although delayed-phase cardiac CT covers the entire heart, provides uniform, high isotropic spatial resolution, and therefore may be useful for detecting small LIE, we need to correctly differentiate small LIE and pseudolesions mimicking LIE. In this case report, we demonstrate basal septal perforator vein mimicking LIE in delayed-phase cardiac CT.

Case report

A 63-year-old, 60-kg (body weight) male with a history of type 2 diabetes showed electrocardiogram abnormalities and hypokinesis of the inferior wall in echocardiography, suspecting old inferior myocardial infarction. The patient underwent coronary CT angiography (coronary CTA) with an axial scan using a third-generation, 320×0.5 mm detector-row CT unit (Aquilion One Genesis edition; Canon Medical Systems, Otawara, Japan) to rule out coronary artery disease. We administered metoprolol tartrate (20 mg; Lopressor; Novartis Pharma, Tokyo, Japan) orally 60 minutes before scanning and nitroglycerin (0.3 mg; Nitropen; Nippon Kayaku, Tokyo, Japan) sublingually 5 minutes before data acquisition to dilate the coronary arteries. We delivered 81 mL of high-concentration iodinated contrast agent (iopamidol 370 mgI/ml). Delayed-phase cardiac CT scan was performed with 120 kVp and 750 mA for diastolic phase (75 % of R-R intervals) to detect myocardial scar 7 minutes after contrast agent injection. Heart rate during the delayed-phase cardiac CT scan was 57 beats per minute. We reconstructed CT images using a model-based iterative reconstruction algorithm (Forward projected model-based Iterative Reconstruction SoluTion Brain Low Contrast Detectability or FIRST Brain LCD) with the noise reduction strength of "standard".

In short-axial delayed-phase images (Fig. 1A, basal slice, slice thickness 5 mm), linear LIE was suspected in mid-layer of the basal septum (arrow heads). However, in axial (x-y) delayed-phase images (Fig. 1B, slice thickness 3 mm), the enhancement was round shape suggesting a vessel (arrow head). In addition, side-by-side interpretation of the delayed phase images and coronary CTA images (Fig. 1C, basal short-axis: slice thickness 5 mm) revealed that the vessel was basal septal perforator vein which was accompanied by septal perforator artery (arrow).

Discussion

LIE is a useful tool for scar detection, based on differences in the volume of distribution of iodine, an extracellular agent [2–4]. Our case demonstrated that the finding may be misinterpreted if readers assess the myocardium on short-axial delayed phase images alone. Axial (x-y) delayed phase images and side-by-side interpretation of the delayed phase images and coronary CTA images may be useful to avoid misinterpretation of myocardial LIE. In general, septal veins can communicate with the left ventricle through venoluminal vessels and sinusoids [5]; thus, to identify the communication may be useful for the interpretation. Left ventricular myocardium includes not only septal vein and artery but also capillaries, arterio- and venoluminal vessels, and sinusoids, etc. which connect to septal veins. To avoid misinterpretations of myocardial LIE on the delayed phase images, we need to understand those anatomical features.

In this case, the patient showed no coronary artery disease and myocardial LIE, and received outpatient follow-up without therapeutic interventions. Coronary CTA and delayed phase cardiac CT may be useful tools for management and treatment of patients with suspected cardiomyopathies of ischemic or nonischemic etiologies.

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