Hemangioma of the interatrial septum: CT and MRI features

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Title: Hemangioma of the interatrial septum: CT and MRI features

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Abstract

Hemangioma of the heart is a rare primary benign tumor mainly appearing as enhancing, homogenous, well-circumscribed mass. We report a case of a 61-year-old asymptomatic woman, whose echocardiography showed a cardiac mass, which was described as the atypical myxoma of the right atrium. For further imaging, contrast-enhanced computed tomography and cardiac magnetic resonance imaging were undertaken, which showed a tumor located in the interatrial septum with imaging characteristics of hemangioma. In the literature, cardiac hemangioma is usually described as an intensely enhancing mass. In our opinion, early peripheral puddling of contrast material with filling in on delayed images is a typical pattern of its enhancement. This characteristic, in addition to high signal intensity on T2-weighted images, allows differentiation of a hemangioma from other benign and malignant tumors.

Keywords: cardiac hemangioma; primary cardiac tumor; cardiac magnetic resonance imaging; computed tomography

Introduction

Primary tumors of the heart are rare with an incidence of 0.03% on autopsy [1]. The majority of these cases (approximately 75%) are benign, among which myxoma accounts for 50%. Hemangiomas are only detected in 2-3% of all benign heart neoplasms [2]. Because cardiac hemangiomas are rarely symptomatic, they are often found by chance on autopsy or while imaging, usually with echocardiography, cardiac magnetic resonance imaging (MRI), or computed tomography (CT) [2].

In the literature, cardiac hemangioma is usually described as an intensely enhancing mass [3]. In this paper, we show a typical enhancement pattern of cardiac hemangioma, which can be described as early peripheral puddling with filling in on delayed images. In addition, we provide a brief overview of various diagnostic aspects of this tumor and its differentials in imaging.

Case report

An asymptomatic 61-year-old woman was referred for radiological evaluation of a cardiac tumor, which was incidentally found by transthoracic echocardiography during a routine check-up. At echocardiography, the mass was described as an atypical myxoma of the right atrium and further imaging was required.

Contrast-enhanced cardiac CT was performed using 40-detector row CT scanner (SOMATOM Sensation 40, Siemens Medical Solutions, Erlangen, Germany) with breath-hold technique and ECG gating. Iodinated contrast material (80 mL iopromide 370 mg I/mL) was administered intravenously at rate 5 mL/s, followed by 50 mL of saline chaser using double-power injector. The delay for arterial phase was determined as time-to-peak enhancement of the ascending aorta in test bolus examination (20 mL iopromide 370 mg I/mL and 50 mL of saline flush) plus 4 s, whereas delay for the venous phase was 80 s. CT

scanning revealed a large (54-mm x 66-mm x 54-mm), solid, low-attenuation mass in the interatrial septum with focal areas of intense nodular enhancement in its posterior peripheral part (Fig. 1).

For better tissue characterization, 3.0 Tesla cardiac MRI was performed (MAGNETOM Tim Trio, Siemens Medical Solutions) using body matrix coil, breath-hold technique, and ECG gating. After obtaining axial half-Fourier acquisition single-shot turbo spin-echo (HASTE) images and localizer images in three planes, cine loops of long and short axis views were acquired using steady-state free precession technique (SSFP, TR/TE 48.02/1.51 ms, field of view 340 mm, slice thickness 6 mm, 25 phases per cardiac circle). In addition, anatomical "black-blood" turbo-spin-echo (TSE) T1-weighted (TR/TE 700/28 ms, field of view 340 mm, slice thickness 5 mm) and turbo inversion recovery magnitude (TIRM) T2-weighted images (TR/TE/TI 800/47/180 ms, field of view 340 mm, slice thickness 6 mm) through the tumor were obtained. Due to allergic skin reaction to contrast agent given during CT imaging, no contrast was administrated for MRI, which was performed only 4 days later. Cardiac MRI showed a homogenous, well-circumscribed mass with high signal intensity on T2-weighted images and isointensity compared to myocardium on T1-weighted images (Fig. 2). This intrapericardial tumor arose from the inferior part of the interatrial septum, which was bowed to the right causing slight compression of the right atrium and inferior vena caval orifice. Furthermore, the mass caused narrowing of the right pulmonary veins' orifices into the left atrium. According to contrast-enhanced CT and nonenhanced MRI characteristics, the most likely diagnosis of cardiac hemangioma was established. Due to compression of the inferior vena caval orifice, the patient underwent cardiac surgery and the diagnosis of cavernous hemangioma was histologically verified.

Discussion

Hemangiomas of the heart are rare tumors, which account only for 2-3% of all benign cardiac neoplasms [2]. They are made up of a proliferation of endothelial cells and classified histologically according to the size of their vascular channels into three types: capillary, cavernous, and arteriovenous. Cavernous and capillary hemangioma are the most frequent reported forms, whereas a combination of all three features is also commonly seen, as well as fibrous and fatty components [1]. Cardiac hemangioma has been reported to occur in variable locations of the heart involving any cardiac layer, namely endo-, myo- or pericardium [3,4]. The tumor affects all ages, whereas most of the patients are lacking symptoms and, therefore, are diagnosed at random. If symptomatic, cardiac hemangioma can present with arrhythmias, pericardial effusion, congestive heart failure, right ventricular outflow tract obstruction, coronary insufficiency, and sudden death [5]. Diagnosis is usually made by echocardiography, MRI, and CT. Although necessary information for surgery can usually be provided by echocardiography, cardiac CT and MRI are more capable of tissue characterization, evaluation of dimension, invasiveness, and surrounding structures. They, furthermore, allow for detailed delineation of the tumor and its influence on cardiac function. Considering that cardiac hemangioma is not necessarily an indication for surgery, as spontaneous regression and successful medical treatment with corticosteroids have been reported, better noninvasive characterization is worthwhile. Differential diagnosis includes thrombi, myxoma, lipoma, fibroma, cysts, and malignant tumors, such as angiosarcoma. The most likely diagnosis can usually be established using advanced imaging techniques by thorough analysis of tumor location, MRI signal intensity, and contrast enhancement pattern.

Location. The left atrium is the predominant location for cardiac tumors (72%) [6]. However, according to a review of 56 cases, only 7% of cardiac hemangiomas occur in that chamber, whereas the majority of cardiac hemangiomas tend to arise from the right ventricle (36%), left

ventricle (34%), and right atrium (23%) [7]. Differentiation from malignant tumors, which mainly appear in the right atrium, is very important [6]. In our case the tumor was attached to the interatrial septum, a common location for myxoma [7].

MRI characteristics. Isointense signal compared with myocardium on T1-weighted images and homogenously high signal on T2-weighted images are typical signs for cardiac hemangioma [8, 9], but may also occur in myxoma, paraganglioma, malignant fibrous histiocytoma, fibrosarcoma, leiomyosarcoma, and lymphoma [3].

Contrast enhancement. Cardiac hemangioma is usually described as an intensely enhancing mass [3]. We believe that peripheral nodular enhancement early after contrast administration with filling in on delayed images is typical enhancement pattern of this type of tumor. Similar enhancement characteristics were previously described for pericardial hemangioma [8]. This nodular peripheral puddling of contrast material on early images with later filling in from the periphery is pathognomonic for hemangioma of the liver [10]. In our opinion, the absence of tumor blush of cardiac hemangioma described by Kasmani et al. was caused by a very short delay during pulmonary CT angiography [11] and that filling from the periphery would have been observed if delayed scanning had been performed. Due to similar enhancement pattern on CT and MRI examination, contrast administration is not necessary for both procedures, especially in patients with contraindications.

Although imaging techniques cannot replace pathological analysis, recent advances in noninvasive imaging techniques allow better characterization of cardiac masses so that cardiac MRI and multislice CT play a key role in differential diagnosis and preoperative planning. We believe that a mass with high signal intensity on T2-weighted images and characteristic peripheral puddling of contrast material can be with confidence differentiated from other benign and malignant tumors by using advanced imaging techniques.

The authors declare that they have no conflict of interest.

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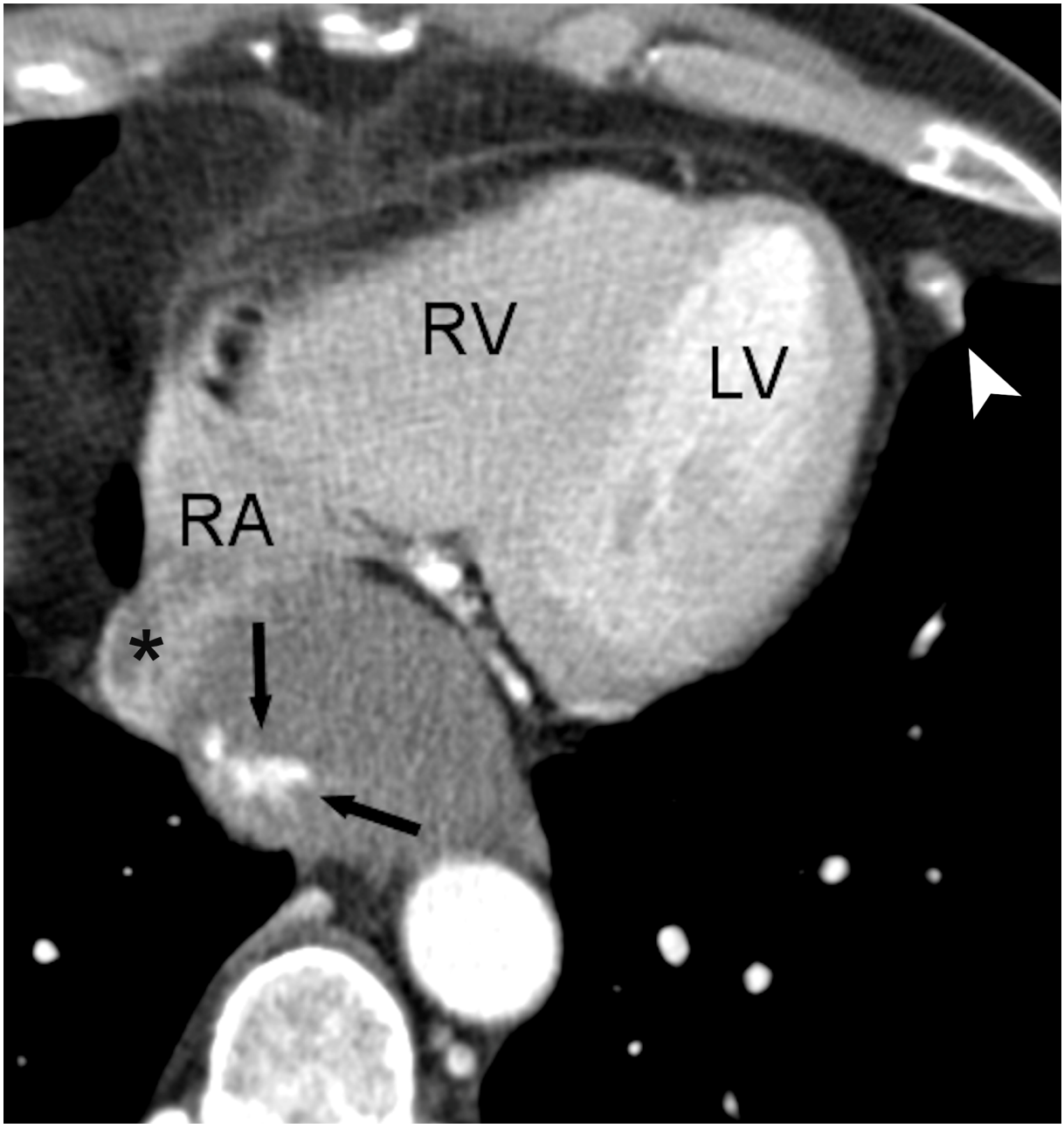
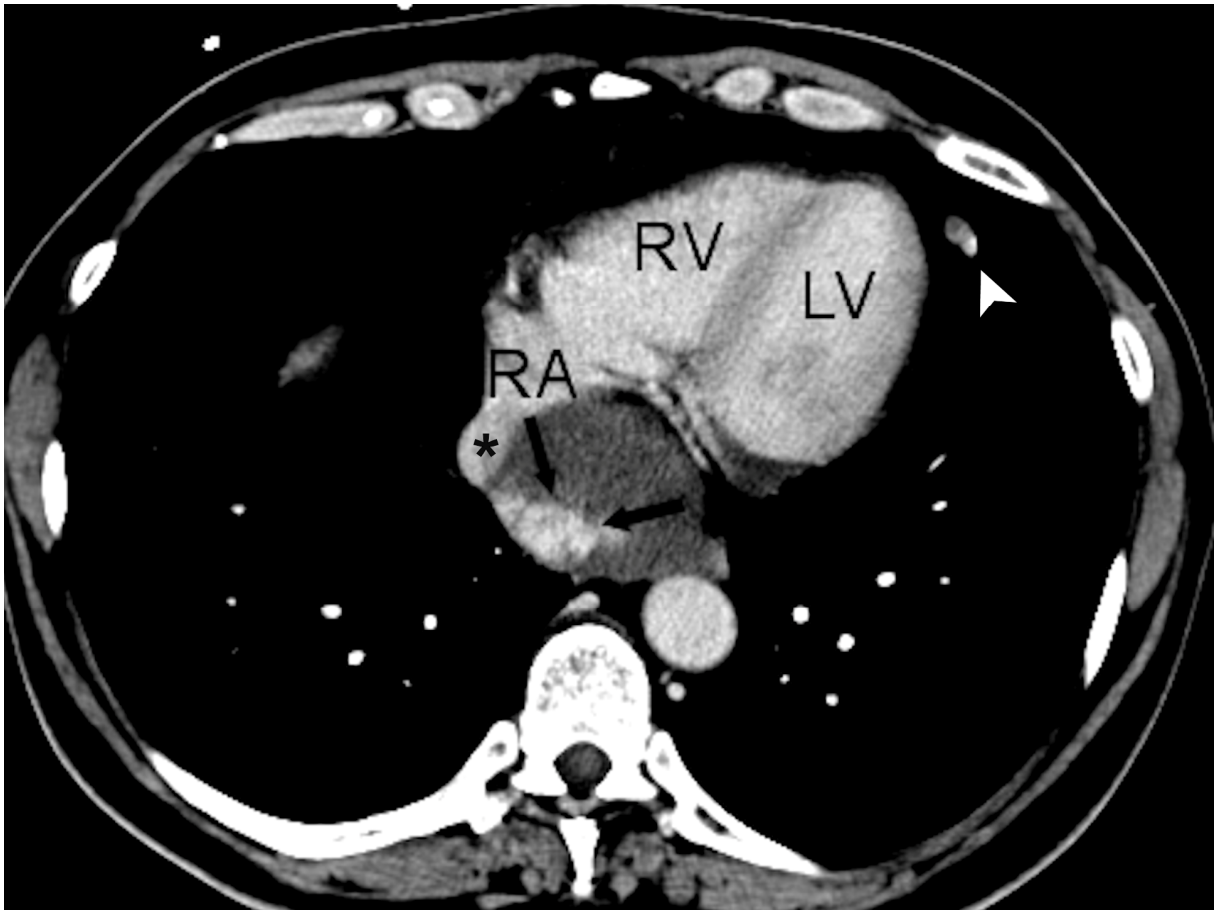
Figure captions:

1. Arterial (a) and venous (b) phase of CT scan showing a mass arising from the interatrial septum. The mass bows the interatrial septum to the right and compromises the orifice of the inferior vena cava (asterisk). The mass is low-attenuating with nodular peripheral puddling of contrast agent (arrows). Nodular part of a pleuropericardial adhesion (arrowhead). RA right atrium; RV right ventricle

1a

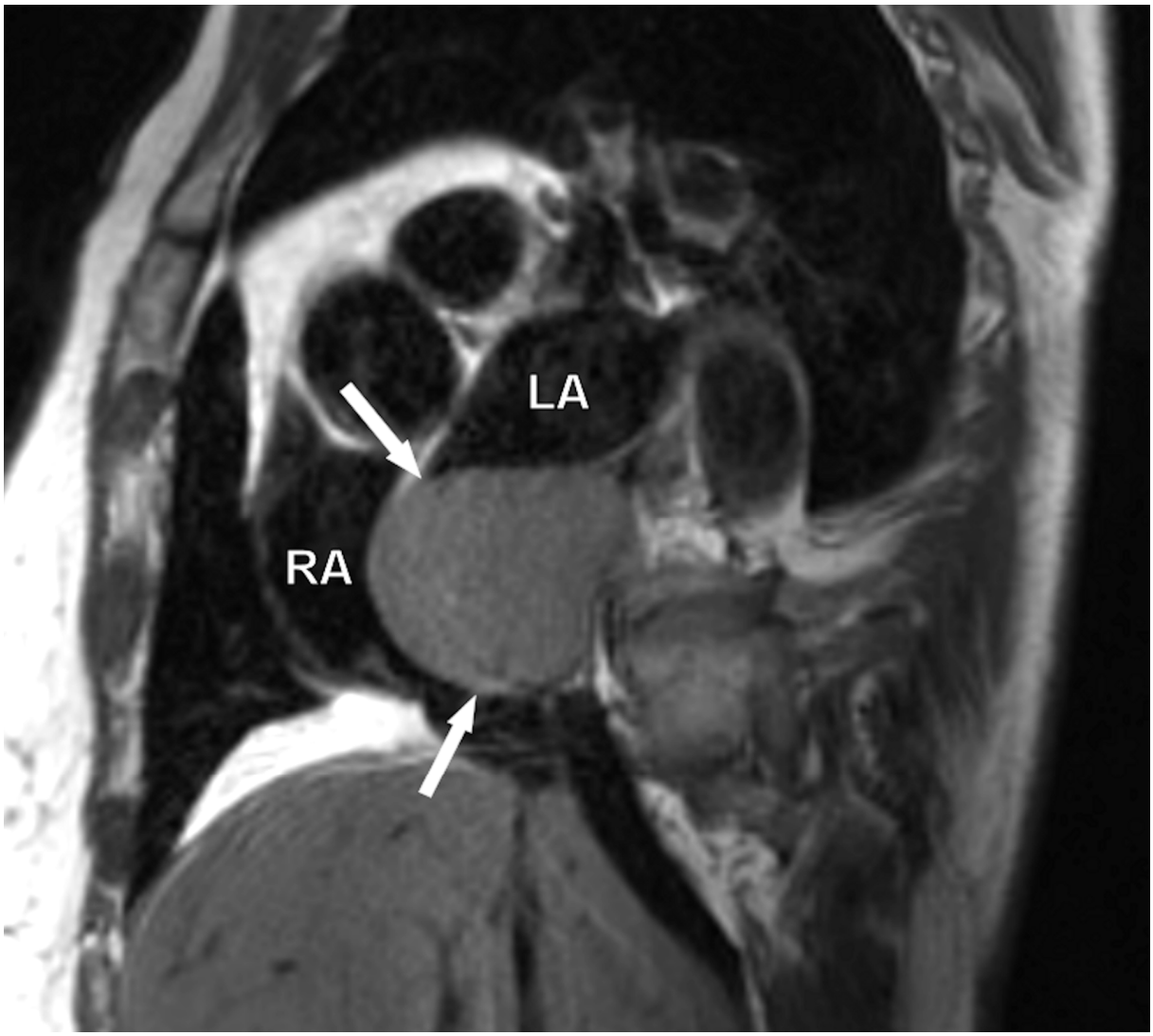


1b



2. ECG-gated cardiac MRI shows a homogenous, well-circumscribed tumor (arrows). On the TSE T1-weighted short-axis image (a) the mass in the inferior part of the interatrial septum appears to be isointense to mildly hyperintense compared with the myocardium, whereas marked hyperintensity can be observed on the axial TIRM T2-weighted image (b). LA left atrium; RA right atrium

2a



2b