

# Hamartoma of mature cardiomyocytes in right atrium

## A case report and literature review

Xinqi Zhou, MD<sup>a</sup>, Yangzhao Zhou, MD<sup>a</sup>, Yuan Zhaoshun, MD, PhD<sup>a</sup>, Mu Zeng, MD, PhD<sup>b</sup>, Xinmin Zhou, MD, PhD<sup>a</sup>, Xiaobo Liao, MD, PhD<sup>a,\*</sup>, Zhiyuan Zhang, MD, PhD<sup>a,\*</sup>

### Abstract

**Rationale:** Tumors in the heart are rare. Myxomas, rhabdomyomas, and fibromas are the most common benign cardiac tumors. Hamartoma of mature cardiomyocytes (HMCM) is another benign cardiac tumor, are very rare and have only been reported in a few literatures.

**Patient concerns:** We report a case of 41-year-old male who suffered short of breath for 3 years, and lower limbs edema for 2 years.

**Diagnoses:** Transthoracic echocardiogram (TTE) and cardiac magnetic resonance (CMR) showed a large amount of pericardial effusion and confirmed a mass of 18 × 14 mm on the superior vena cava near the outer edge of right atrium. The patient was first diagnosed as pleural mesothelioma. Surgery was performed to relieve the symptoms and confirm diagnoses. However, during surgery, we found the right atrium is apparently thickened with rough and uneven surface. Histology of right atrium mass indicated it as hamartoma of mature cardiomyocytes.

**Intervention:** We resected the thickened atrial wall completely, reconstructed right atrium with bovine pericardial patch, and resected the pericardium.

**Outcomes:** Patient was discharged 9 days after surgery, and remained asymptomatic during 9 months follow up.

**Lessons:** Hamartoma of mature cardiomyocytes is a rare benign cardiac tumor. There were 26 cases reported until now. The conclusive diagnosis depends on pathological sections. For patients with symptoms, surgery is an effective treatment for HMCM.

**Abbreviations:** CMR = cardiac magnetic resonance, HMCM = hamartoma of mature cardiomyocytes, TTE = transthoracic echocardiogram.

**Keywords:** benign tumor, heart tumor, hamartoma of mature cardiomyocytes

## 1. Introduction

Tumors in the heart are rare. Myxomas, rhabdomyomas, and fibromas are the most common benign cardiac tumors.<sup>[1,2]</sup> Hamartoma of mature cardiomyocytes (HMCM), which is another benign cardiac tumor, is very rare and has only been reported in a few literatures.

In this article, we reported a case of HMCM, in whom the mass located in right atrium. Meanwhile, we analyzed all the cases about HMCM until now, and discussed the features and treatments of the tumor. Patient has provided informed consent for publication of the case.

## 2. Case report

A 41-year-old male had suffered short of breath after regular activity for 3 years, and lower limb edema for 2 years. From February 2018, the symptoms were getting worse. Patient suffered short of breath even at rest and had orthopnea. A large amount of pericardial effusion was found by transthoracic echocardiogram (TTE) in local hospital. The patient was diagnosed as “Tuberculous Pericarditis”, though the TB-Spot test was negative. After the pericardial puncture drainage, anti-infection, anti-tuberculosis treatment, the symptoms were relieved. However, 1 month later, symptoms appeared again.

The patient was first admitted to our department on April 16, 2018. No special changes were found in ECG. TTE and cardiac magnetic resonance (CMR) showed a large amount of pericardial effusion and confirmed a mass of 18 × 14 mm on the superior vena cava near the outer edge of right atrium (Fig. 1A). Positron emission tomography-computed tomography (PET-CT) showed increased glucose metabolism on the superior vena cava near the

Editor: N/A.

The authors have no conflicts of interests to disclose.

<sup>a</sup> Department of Cardiovascular Surgery, <sup>b</sup> Department of radiology, The Second Xiangya Hospital, Central South University, Changsha, Hunan, China.

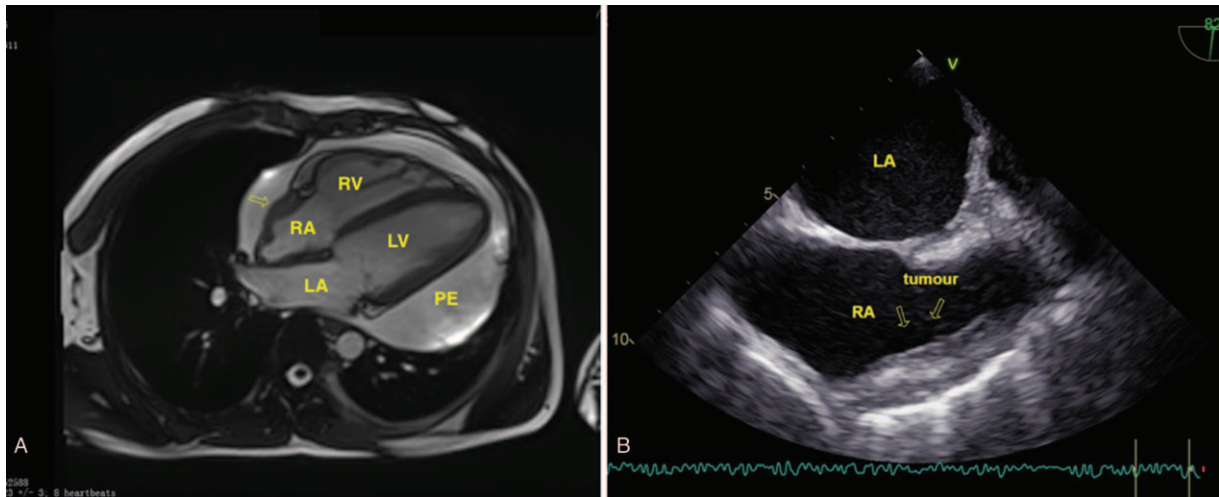
\* Correspondence: Zhiyuan Zhang, and Xiaobo Liao, Department of Cardiovascular Surgery, The Second Xiangya Hospital, Central South University, No. 139 Middle Renmin Road, Changsha, Hunan 410011, PR China (e-mails: Zhiyuanzhang@csu.edu.cn, baileyliaws@qq.com).

Copyright © 2019 the Author(s). Published by Wolters Kluwer Health, Inc. This is an open access article distributed under the terms of the Creative Commons Attribution-Non Commercial-No Derivatives License 4.0 (CCBY-NC-ND), where it is permissible to download and share the work provided it is properly cited. The work cannot be changed in any way or used commercially without permission from the journal.

Medicine (2019) 98:31(e16640)

Received: 19 January 2019 / Received in final form: 27 May 2019 / Accepted: 8 July 2019

<http://dx.doi.org/10.1097/MD.00000000000016640>

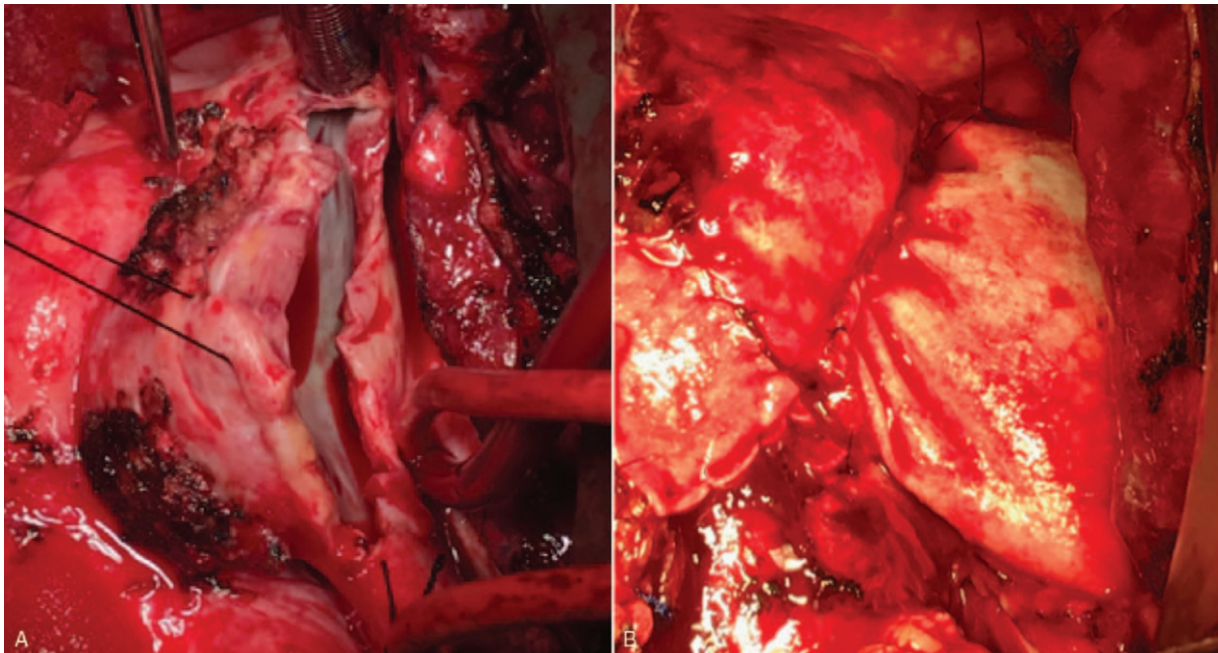


**Figure 1.** (A) Cardiac magnetic resonance (CMR) showed thickened right atrium free wall (arrow) and severe pericardial effusion. (B) Transesophageal Echocardiography (TEE) during operation showed the right atrium free wall was apparently thickened (arrow). LA=left atrium, LV=left ventricle, PE=pericardial effusion, RA=right atrium, RV=right ventricle.

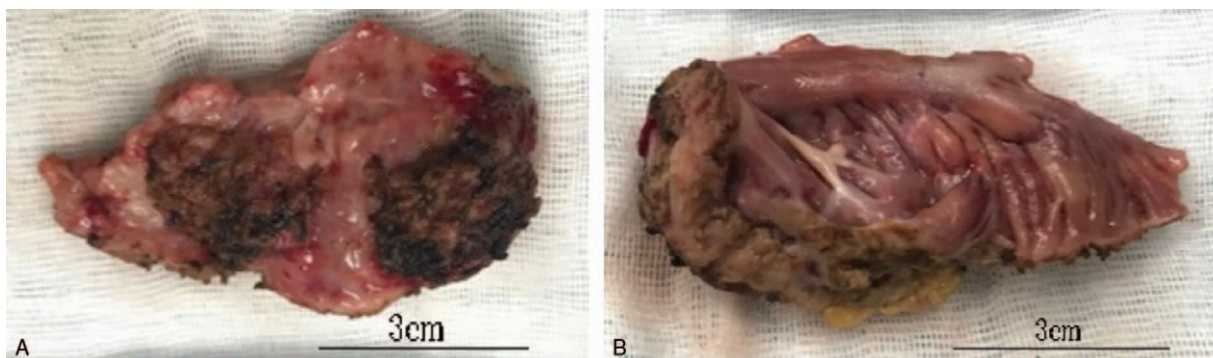
outer edge of right atrium. The patient was first diagnosed as pleural mesothelioma.

To relieve heart compression and confirm the diagnosis, we performed surgery. During the surgery, we found the pericardial cavity was enlarged with a large amount of yellow effusion. However, instead of mass outside the heart, we found the right atrium and right atrium appendage were apparently thicker. And the surface was rough and uneven. Intraoperative transesophageal echocardiography (TEE) showed the right atrium free wall was apparently thickened. We got a small piece of right atrium tissue, and sent it for pathology examination. HE staining

showed the mass contained mainly haphazardly arranged adult cardiomyocytes with enlarged nucleus. Fibrous tissue and leukomonocytes were found among the myofibers (Fig. 4). The pathological findings indicated it as hamartomas of mature cardiac myocytes (HMCM). Under cardiac-pulmonary bypass, we incised the right atrium, and found the mass was palpable around the right atrial appendage and the right atrioventricular sulcus with the size of  $8 \times 4$  cm (Fig. 3). We resected the mass to normal atrial tissue, reconstructed right atrium with bovine pericardial patch, and resected the pericardium (Fig. 2B). Postoperative echocardiography and MRI indicated the mass



**Figure 2.** Intraoperative view of the mass (A) Right atrium was incised; the atrial wall was apparently thickened, with tough and uneven surface. (B) We resected the mass to normal atrial tissue, reconstructed right atrium with bovine pericardial patch.



**Figure 3.** The mass was completely resected with the size of 8 × 4 cm. (A) The surface of mass was tough and uneven. (B) Arrangement of pectinate muscles was normal.

was completely resected. The patient was discharged 10 days after surgery, and had no symptoms or pericardial effusion during 9 months follow up.

### 3. Discussion

Hamartoma of mature cardiac myocytes (HMCM) is a rare benign cardiac tumor. The pathological changes were first described in 1988.<sup>[3]</sup> However, the term of HMCM was first raised by Burke et al.<sup>[11]</sup> The lesion is characterized by disorganized hypertrophic mature myocytes with variable interstitial fibrosis and adiposity and thick-walled arteries.<sup>[1,3,4]</sup>

We reviewed PubMed and MEDLINE databases from March 1947 to Oct 2018 with the key words “cardiac” or “heart” and “hamartoma”, and a total of 25 patients affected by HMCM were identified.<sup>[1-19]</sup> We analyzed all patients reported and the case in this article. The tumor can affect all age groups, with mean age of  $32 \pm 22.5$  years (range 9 months to 76 years). Males were mainly affected (62%, 16/26).

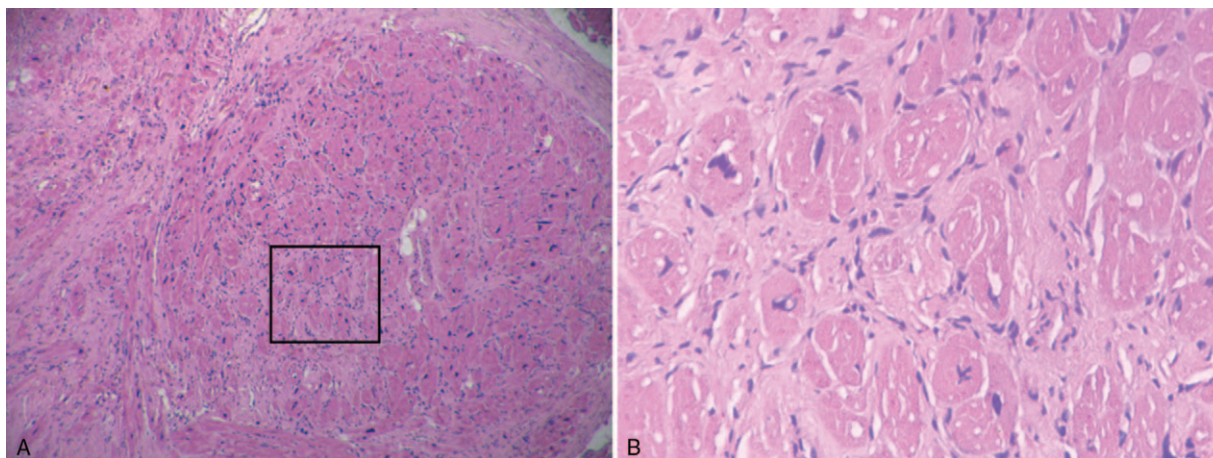
The 46% patients (12/26) are asymptomatic. In these patients, lesions are found by autopsy or incidentally in heart examination or in other cardiac surgery. For the patients with symptoms, the most common symptom is chest pain or chest tightness (35%, 9/26). Others include palpitation (19%, 5/26),

dyspnea (15%, 4/26), dizziness (8%, 2/26), and syncope (4%, 1/26). Pericardial effusion is found in 4 patients (15%, 4/26), in whom tumors all locate in the right side of heart.

In most cases, HMCM is a single mass, and can locate in the left heart (46%, 12/26), right heart (35%, 9/26), inter ventricular septum (8%, 2/26). Multiple lesions are found in 3 cases. The size of tumor varies from 1 to 91 mm.

ECG changes are found in most patients (65%, 17/26), including T waves depression, ST-T changes, premature atrial and ventricular contraction, ventricular, or supraventricular tachycardia. However, the changes are varied and usually non-specific. Echocardiography can identify most of the mass, except 1 case, in which, the tumor is too small, around 1 cm. Cardiac magnetic resonance (CMR) and computed tomography can provide precise information about mass size and location. However, since the morphology of HMCM varies and can be well circumscribed or infiltrated to normal myocardium, it is difficult to distinguish it from other cardiac lesions, such as fibroma, hypertrophic cardiomyopathy, or rhabdomyoma just by CMR.<sup>[3,12,15,16]</sup>

Conclusive diagnosis of HMCM is pathological section. Under microscopic views, although fibrous tissue and adipose tissue can be found in the mass, however, unlike fibroma, typical HMCM mass is predominately consist of cardiomyocytes. Cells of



**Figure 4.** (A, B) Haematoxylin-Eosin (HE) staining showed the resected mass contained mainly enlarged mature cardiomyocytes in haphazard arrangement. Some nucleuses of the cardiomyocytes were enlarged. Fibrotic tissue and mature adipose were infiltrated in the cardiac fibers.

HMCM are disorganized, usually haphazardly arranged. Compare with cardiac rhabdomyoma, which is composed of immature cardiomyocytes, HMCM contains mature myocytes with enlarged nucleus.<sup>[1,6]</sup>

Except for the patients diagnosed by autopsy, all other patients received surgery. Surgeries include completely resection, partially resection, mainly depend on the size and location of the mass. One patient received heart transplantation, since the mass locates from the middle to the distal part of left ventricle lateral wall, and remove the mass would impact the heart function.<sup>[12]</sup> Prognosis of HMCM is good. And surgery is an effective treatment. No perioperative mortality is reported. Patients receiving surgery are all alive and no recurrence are found during follow up (range 2 months to 14 years).

In our case, even though the patient had severe symptoms and received TTE and CMR before surgery; however, since doctors have no experience with HMCM, mass in the right atrium was not found at first. Surgical decision was made mainly to relieve symptoms related to pericardial effusion and confirm diagnosis. Diagnosis of HMCM was made during surgery. Consider the pericardial effusion was caused by the mass, we decided to resect the mass completely. The surgery is effective, during 9 months follow up, the patient showed no pericardial effusion and symptoms.

In conclusion, hamartoma of mature cardiomyocytes is a rare benign cardiac tumor. There were 26 cases reported until now. Numbers and location of the mass varies in different cases. The conclusive diagnosis depends on pathological sections. For patients with symptoms, surgery is an effective treatment for HMCM.

### Author contributions

**Conceptualization:** Xiaobo Liao.

**Data curation:** Xinqi Zhou, Yangzhao Zhou, Xiaobo Liao, Zhiyuan Zhang.

**Formal analysis:** Yangzhao Zhou, Zhiyuan Zhang.

**Investigation:** Xinqi Zhou, Zhiyuan Zhang.

**Methodology:** Zhaoshun Yuan.

**Project administration:** Zhiyuan Zhang.

**Resources:** Mu Zeng, Xinmin Zhou, Xiaobo Liao.

**Software:** Yangzhao Zhou, Zhiyuan Zhang.

**Supervision:** Xiaobo Liao, Zhiyuan Zhang.

**Validation:** Zhiyuan Zhang.

**Visualization:** Zhaoshun Yuan.

**Writing – original draft:** Xinqi Zhou.

**Writing – review & editing:** Xiaobo Liao, Zhiyuan Zhang.

### References

- [1] Burke AP, Ribe JK, Bajaj AK, et al. Hamartoma of mature cardiac myocytes. *Hum Pathol* 1998;29:904–9.
- [2] Menon SC, Miller DV, Cabalka AK, et al. Hamartomas of mature cardiac myocytes. *Eur J Echocardiogr* 2008;9:835–9.
- [3] Tanimura A, Kato M, Morimatsu M. Cardiac hamartoma. A case report. *Acta Pathol Jpn* 1988;38:1481–4.
- [4] Dell'Amore A, Lanzanova G, Silenzi A, et al. Hamartoma of mature cardiac myocytes: case report and review of the literature. *Heart Lung Circulation* 2011;20:336–40.
- [5] Sturtz CL, Abt AB, Leuenberger UA, et al. Hamartoma of mature cardiac myocytes: a case report. *Mod Pathol* 1998;11:496–9.
- [6] Case records of the Massachusetts General Hospital/Weekly clinicopathological exercises. Case 31-1999. A 33-year-old man with wide-complex tachycardia and a left ventricular mass. *N Engl J Med* 1999;341:1217–24.
- [7] Dinh MH, Galvin JM, Aretz TH, et al. Left ventricular hamartoma associated with ventricular tachycardia. *Ann Thorac Surg* 2001;71:1673–5.
- [8] Gilman G, Wright RS, Glockner JF, et al. Ventricular septal hamartoma mimicking hypertrophic cardiomyopathy in a 41-year-old woman presenting with paroxysmal supraventricular tachycardia. *J Am Soc Echocardiogr* 2005;18:272–4.
- [9] Fealey ME, Edwards WD, Miller DV, et al. Hamartomas of mature cardiac myocytes: report of 7 new cases and review of literature. *Hum Pathol* 2008;39:1064–71.
- [10] Movahedi N, Boroumand MA, Sotoudeh Anvari M, et al. Mature cardiac myocyte hamartoma in the right atrium. *Asian Cardiovasc Thorac Ann* 2008;16:e47–48.
- [11] Galeone A, Validire P, Gayet JB, et al. Hamartoma of mature cardiac myocytes of the pulmonary infundibulum. *Interact Cardiovasc Thorac Surg* 2009;9:1029–31.
- [12] Hsu PS, Chen JL, Hong GJ, et al. Heart transplantation for ventricular arrhythmia caused by a rare hamartoma. *J Heart Lung Transplant* 2009;28:1114–5.
- [13] Zhang F, Yin N, Yin B, et al. Giant right atrial cystic hamartoma: a case report and literature review. *BMJ Case Rep* 2009;2009.
- [14] Raffa GM, Malvindi PG, Settepani F, et al. Hamartoma of mature cardiac myocytes in adults and young: case report and literature review. *Int J Cardiol* 2013;163:e28–30.
- [15] Abuzaid AS, Gakkhal M, Montgomery E, et al. Cardiac hamartoma: a diagnostic challenge. *CASE (Philadelphia, Pa)* 2017;1:59–61.
- [16] Ayoub C, Luis SA, Maleszewski JJ, et al. Advanced cardiac imaging techniques assist in characterizing a cardiac mass and directing management. *Echocardiography (Mount Kisco, N Y)* 2017;34:1744–6.
- [17] Godinho AR, Dias P, Almeida PB, et al. A rare primary cardiac benign tumour: diagnosis by non-invasive cardiac imaging. *Acta Cardiol* 2017;72:345–6.
- [18] Hadravská S, Dubová M, Miesbauerová M, et al. Hamartoma of mature cardiac myocytes. Autopsy case report. *Cesk Patol* 2017;53:185–7.
- [19] Negri F, De Luca A, Pappalardo A, et al. Cardiac hamartoma. *J Card Surg* 2018;33:640–2.