CJC Open 6 (2024) 1028–1031

Case Report

Giant Pericardial Hemangioma With a Large Central Fibrotic Core

Nonthikorn Theerasuwipakorn, MD, MSc,[a,b] Sunisa Peenakhon, MD,[c] Pachara Varachotisate, MD,[c] Wissanu Srinu, MD,[c] and Wasinee Promratpan, MD, MSc[a,d]

[a] *Division of Cardiovascular Medicine, Department of Medicine, Faculty of Medicine, Chulalongkorn University, King Chulalongkorn Memorial Hospital, Bangkok, Thailand*

[b] *Cardiac Center, King Chulalongkorn Memorial Hospital, Bangkok, Thailand*

[c] *Department of Medicine, Faculty of Medicine, Chulalongkorn University, King Chulalongkorn Memorial Hospital, Bangkok, Thailand*

[d] *Division of Cardiology, Department of Medicine, Maharaj Nakhon Si Thammarat Hospital, Nakhon Si Thammarat, Thailand*

Pericardial hemangioma is a very rare cardiac tumour that carries a relatively desirable prognosis if properly treated. Correct diagnosis and good surgical planning, which can be aided by multimodality imaging, are important parts of successful treatment. We present a case of a middle-aged man with a pericardial mass that displayed typical findings of hemangioma in various imaging modalities. This case highlights the necessity of using multimodality imaging, particularly computerized tomography and cardiac magnetic resonance imaging, to make a correct diagnosis leading to definite treatment.

A 53-year-old, previously healthy man presented with progressive dyspnea for 4 months. Physical examinations, including cardiopulmonary examination, were normal. Laboratory investigations and electrocardiography yielded unremarkable results. Plain chest radiography depicted a mass-like opacity in the left lower lung zone, silhouetted with a left cardiac border. (Fig. 1A) Transthoracic echocardiography showed a large echogenic pericardial mass with a central hypoechoic core adjacent to the anterolateral wall of the left ventricle (Fig. 1B). No hemodynamic consequence to blood flow in the heart occurred, based on Doppler echocardiography. Computed tomography (CT) of the chest demonstrated an 11.8 × 8.5 × 10.1 cm isodense mass (42 Hounsfield units at the periphery), with a large internal hypodense portion (19 Hounsfield units at the central core), and partial peripheral nodular enhancement at the left-sided pericardium (Fig. 1C; Supplemental Fig. S1). The provisional diagnoses were angiosarcoma, hemangioma, and other vascularized tumours.

Given that this mass caused the symptoms, and malignancy could not be excluded, the patient was advised, and provided informed consent for the heart team to undertake sternotomy with pericardial mass removal. Unfortunately, the first operation failed, as the surgeon was not confident enough to *en bloc* resection the mass that appeared to adhere to the left atrium in the operative field. Moreover, the benignity of the mass was still unclear. Coronary angiography and cardiac magnetic resonance (CMR) were prescribed, to characterize the mass further. Coronary angiography illustrated normal coronary arteries, with evidence of a feeding vessel from the left anterior descending artery to the mass and tumour blush (Fig. 1D). Regarding CMR, the mass was well-circumscribed, with an isointensity on T1-weighted images, and hyperintensity on T2-weighted images (Fig. 1, E and F) First-pass perfusion images depicted a focal rapid enhancement at the periphery of the mass, corresponding with the evidence of a feeding vessel from coronary angiography (Supplemental Fig. S2A) The periphery of the mass was enhanced homogeneously in late gadolinium enhancement images, but the central core was not (Fig. 1G). Precontrast parametric mappings demonstrated high T1 and T2 values of the mass (equal to the blood in the cardiac chamber), with the highest at the central core (Fig. 1H; Supplemental Fig. S2B). Based on CMR findings, pericardial hemangioma and angiosarcoma were the most and second-most likely diagnoses, respectively.

After confirming that the mass had not infiltrated the adjacent organs, the second operation was performed under meticulous planning, and it excised the entire mass successfully, without complication. The mass was a rubbery consistency and appeared to be well circumscribed, and dark brown in color, with a yellowish central core (Fig. 2, A-C). Histology

Received for publication April 15, 2024. Accepted May 21, 2024.

Corresponding author: Dr Nonthikorn Theerasuwipakorn, Division of Cardiovascular Medicine, Department of Medicine, Faculty of Medicine, Chulalongkorn University and Cardiac Center, King Chulalongkorn Memorial Hospital, Rama IV Road, Bangkok, 10330, Thailand. Tel.: +66-2-256-4000; fax: +66-2-256-4356.

E-mail: n.theerasuwipakorn@gmail.com

See page 1031 for disclosure information.

https://doi.org/10.1016/j.cjco.2024.05.009

Novel Teaching Points

- Pericardial hemangioma is a very rare cardiac tumour that has a relatively desirable prognosis if properly treated.
- Multimodality imaging, particularly CT and CMR, can provide a correct diagnosis and allows for good surgical planning.
- Peripheral enhancement with central sparing typically is found in a large hemangioma, with a size of > 3-5 cm, and rarely is reported in cardiac hemangioma. This rare finding in cardiac hemangioma may be explained by the smaller mass size at the presentation, compared to hepatic hemangioma.

from the periphery of the mass showed numerous irregular blood-filled spaces, with endothelial lining and dense fibrotic tissue surrounding the spaces, consistent with cavernous hemangioma (Fig. 2D). The central core was composed of loose fibrotic tissues (Fig. 2E). The postoperative period was uneventful. The patient was discharged on the seventh day after the operation. At the 3-month follow-up visit, the patient was doing well and could perform an exercise with no restriction.

Cardiac hemangioma is a rare cardiac tumour, accounting for 2.8% of primary cardiac tumours.[1] Pericardial hemangioma is the rarest subtype, with < 20 case reports of it to date.[2] Clinical manifestations of pericardial hemangioma can vary, from being asymptomatic to being life-threatening conditions, depending on the size and location of the mass. Dyspnea and pericardial effusion are common presentations.[2] Multimodality imaging is necessary to make an accurate diagnosis. Plain chest radiography is acquired in most cases as a routine investigation, owing to its accessibility and noninvasiveness; however, it cannot diagnose the type of mass and sometimes may overlook small masses. Echocardiography is considered the first-line modality, as it can assess the mass size, location, and effect on cardiac structures and functions, including hemodynamic consequences. Given the advancement of noninvasive imaging modalities, coronary angiography rarely is utilized, unless the coronary artery system needs to be evaluated. Feeding vessels and tumour blushing (cotton-wool or snowy-tree appearance) may be revealed after contrast injection.[3] To narrow down or make the diagnosis of mass subtypes, CT and CMR are the most-useful modalities, as hemangioma has typical findings in

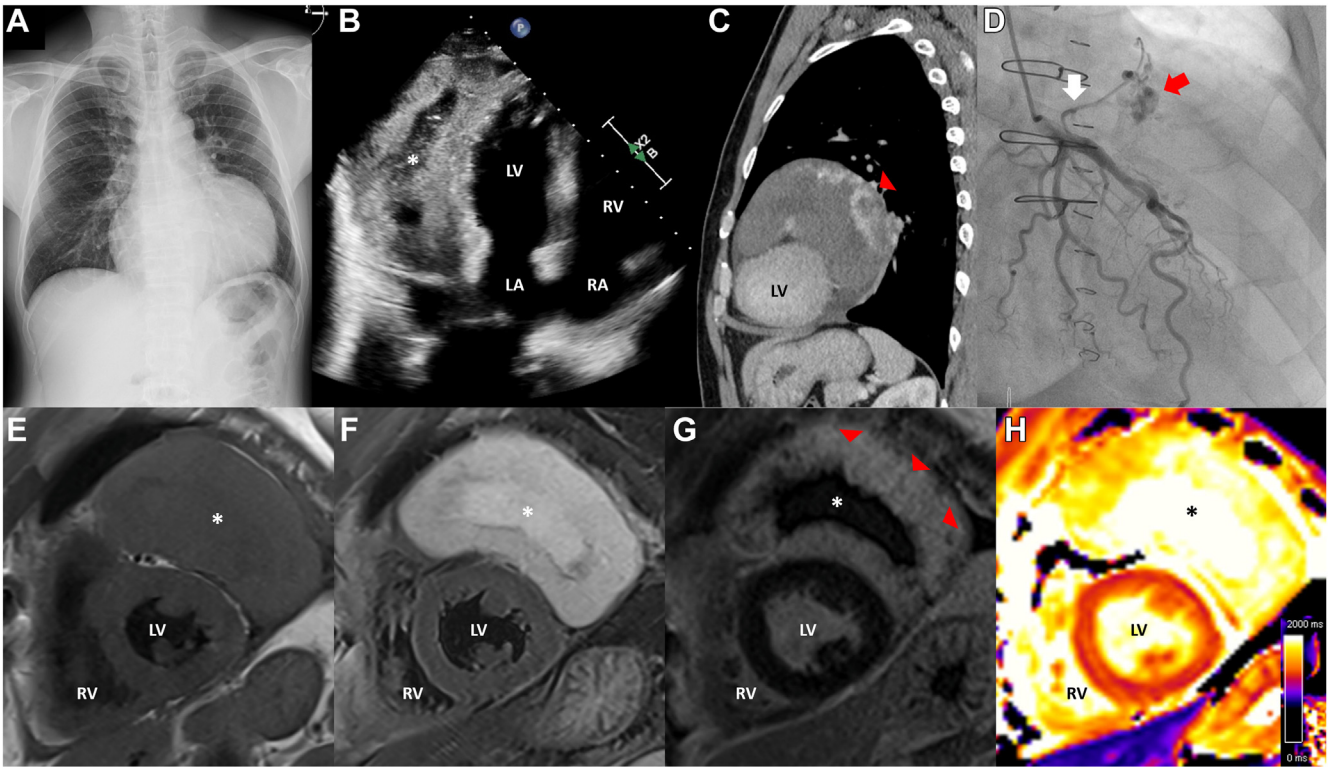

Figure 1. (**A**) Plain chest radiography depicts a mass-like opacity in the left lower lung zone silhouetted with a left cardiac border. (**B**) Two-dimensional transthoracic echocardiography in a 4-chamber view (Mayo format) shows a large echogenic pericardial mass with a central hypoechoic core (**asterisk**) adjacent to the anterolateral wall of the left ventricle (LV). (**C**) Computerized tomography of the chest in the sagittal plane demonstrated an 11.8 × 8.5 × 10.1 cm isodense mass with a large internal hypodense portion and partial peripheral nodular enhancement (**arrowhead**) at the left-sided pericardium. (**D**) Coronary angiography in the right anterior oblique caudal plane illustrated normal coronary arteries with evidence of a feeding vessel from the left anterior descending artery to the mass (**white arrow**) and tumour blush (**red arrow**). (**E**) Pericardial mass from cardiac magnetic resonance imaging in the short-axis view showed isointensity on T1-weighted images, (**F**) hyperintensity on T2-weighted images, (**G**) peripheral enhancement (**arrowhead**) with central core sparing (**asterisk**) on late gadolinium enhancement images, and (**H**) high T1 value (with the highest at the central core, **asterisk**) on precontrast parametric mapping images. LA, left atrium; RA, right atrium; RV, right ventricle.

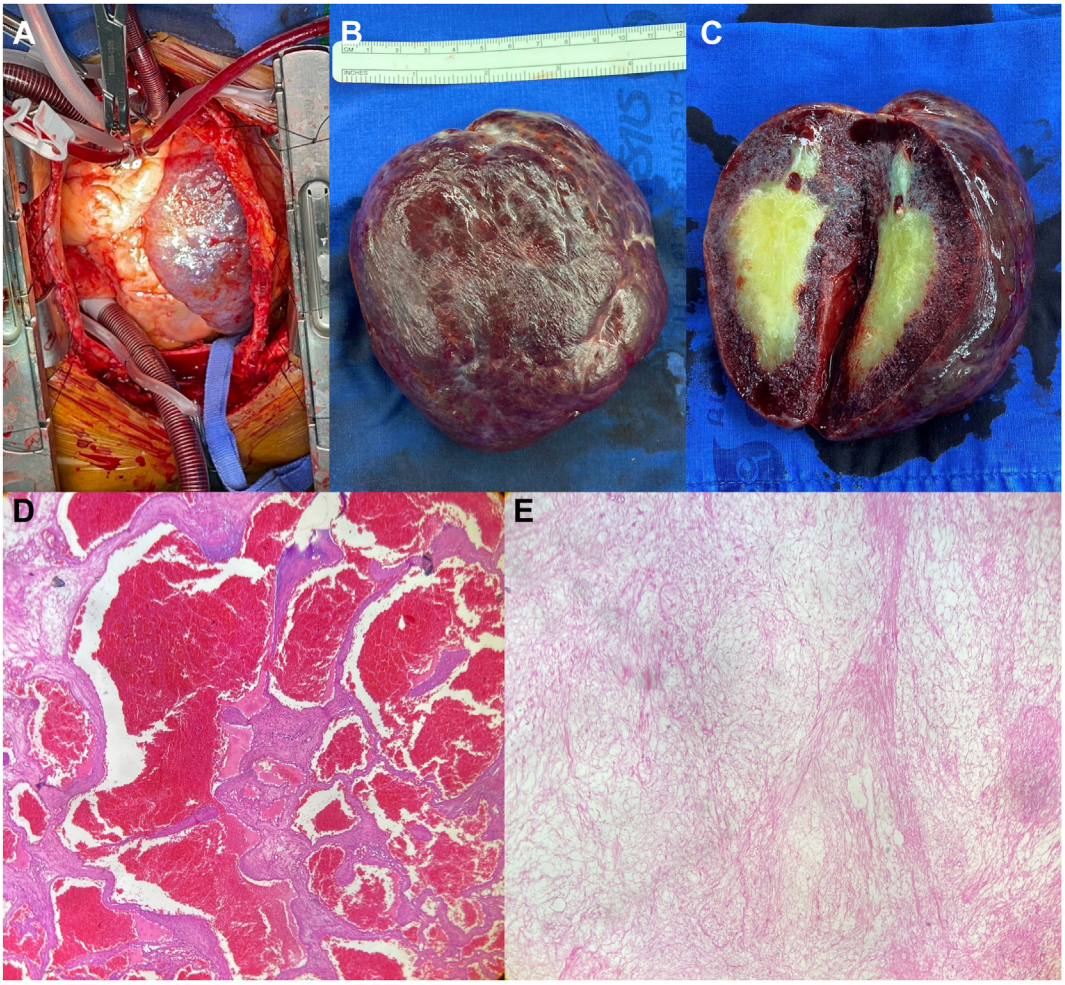

Figure 2. (**A-C**) Gross pathology demonstrated a well circumscribed mass with a dark brown color and a yellowish central core. (**D**) Histology from the periphery of the mass showed numerous irregular blood-filled spaces, with endothelial lining and dense fibrotic tissue surrounding the spaces, consistent with cavernous hemangioma. (**E**) The central core was composed of loose fibrotic tissues (eosinophilic linear structures).

these modalities.[4] In addition, both CT and CMR are crucial for planning the operative strategy.

The characteristics of cardiac hemangioma, including the pericardial ones, are similar to those of hemangioma in other locations. Hemangioma appears to be well circumscribed and isodense, with a density (and also the Hounsfield units) equal to that of blood in noncontrast CT, and it becomes enhanced with peripheral nodular and centripetal filling patterns after contrast administration.[4] In CMR, hemangioma classically displays hypointensity to isointensity on T1-weighted images, and hyperintensity on T2-weighted images.[5] Parametric mappings, including native T1 and T2 mappings, directly indicate that T1 and T2 relaxation times enhance the tissue-characterization property of CMR and can help differentiate the mass types. Masses composed of fat (lipoma, liposarcoma), methemoglobin (recent hemorrhage), and melanin (melanoma) have a low T1 relaxation time, whereas masses composed of fibrosis (fibroadenoma, fibrotic core) and blood (hemangioma, angiosarcoma) have a high T1 relaxation time. T2 relaxation time has a high volume of fluid-filled cystic lesions and hypervascularized tumours (eg, hemangioma, angiosarcoma).[6]

The following 3 patterns of enhancement were described in hepatic hemangioma, which may be applied to cardiac hemangioma: (i) rapid homogeneous enhancement on first-pass perfusion images (also known as flash-filling hemangioma, which is typically found in small hemangioma); (ii) peripheral nodular enhancement, with progressive centripetal filling to homogeneous enhancement (most common patterns); and (iii) peripheral nodular enhancement with persistent central lack of enhancement (typically found in large hemangioma, with a size > 5 cm).[5] Unlike in hepatic hemangioma, an enhancement with central sparing rarely is reported in cardiac hemangioma. To our knowledge, our case is the second one of pericardial hemangioma that exhibited this enhancement pattern.[7] An unenhanced central core is an area of scarring and fibrosis, owing to insufficient blood supply, that is usually formed within a large mass of $>$ 3-5 cm.[5] Given that pericardial and mediastinal spaces are smaller than intra-abdominal space, patients with pericardial hemangioma generally develop symptoms earlier, and with a smaller mass. The definite treatment of pericardial hemangioma is to complete mass removal, particularly when symptoms occur. Our case nicely demonstrates classic image findings of pericardial hemangioma, and it

emphasizes the necessity of multimodality imaging, particularly CT and CMR, for making a correct diagnosis leading to definite treatment.

Acknowledgements

The authors acknowledge the support for article processing provided by the Cardiac Center, King Chulalongkorn Memorial Hospital, Bangkok, Thailand.

Ethics Statement

The research reported has adhered to the relevant ethical guidelines.

Patient Consent

This is a retrospective case report using de-identified data; therefore, the IRB did not require consent from the patient.

Funding Sources

The Cardiac Center, King Chulalongkorn Memorial Hospital, Bangkok, Thailand supported the article processing charge for this article.

Disclosures

The authors have no conflicts of interest to disclose.

References

1. Li W, Teng P, Xu H, Ma L, Ni Y. Cardiac hemangioma: a comprehensive analysis of 200 cases. Ann Thorac Surg 2015;99:2246-52.
2. Seitz A, Ong P, Backes M, Mahrholdt H. Chronic pericardial effusion in the setting of pericardial capillary haemangioma: a case report and review of the literature. Eur Heart J Case Rep 2018;2:yty024.
3. Johnson CM, Sheedy PF 2nd, Stanson AW, et al. Computed tomography and angiography of cavernous hemangiomas of the liver. Radiology 1981;138:115-21.
4. Klotz T, Montoriol PF, Da Ines D, et al. Hepatic haemangioma: common and uncommon imaging features. Diagn Interv Imaging 2013;94:849-59.
5. Semelka RC, Brown ED, Ascher SM, et al. Hepatic hemangiomas: a multi-institutional study of appearance on T2-weighted and serial gadolinium-enhanced gradient-echo MR images. Radiology 1994;192:401-6.
6. Bonnes J, Brink M, Nijveldt R. How to evaluate cardiac masses by cardiovascular magnetic resonance parametric mapping? Eur Heart J Cardiovasc Imaging 2023;24:1605-7.
7. Ben Youssef A, Zairi S, Ouerghi S, et al. Epicardial cavernous hemangioma: a two-case report. Tunis Med 2014;92:268-71.

Supplementary Material

To access the supplementary material accompanying this article, visit *CJC Open* at https://www.cjcopen.ca/ and at https://doi.org/10.1016/j.cjco.2024.05.009.