Atypical presentation of lipomatous hypertrophy of the interatrial septum: a case report

Dipika J. Gopal, Yuchi Han, Frank E. Silvestry, and Victor A. Ferrari

Department of Cardiology, Perelman Center for Advanced Medicine, East Pavilion, 2nd Floor, 3400 Civic Center Boulevard, University of Pennsylvania, Philadelphia, PA 19104, USA

Received 31 March 2019; first decision 23 April 2019; accepted 18 October 2019; online publish-ahead-of-print 11 November 2019

Background
Lipomatous hypertrophy of the interatrial septum (LHIAS) is a common finding on transthoracic echocardiogram (TTE). Occasionally, the appearance of LHIAS is atypical and multimodality imaging is helpful to make the diagnosis. We present a case of atypical LHIAS to highlight the potential aetiologies for an interatrial septal mass and review features on multimodality imaging that help decrease uncertainty and establish a diagnosis.

Case summary
A 64-year-old man with a history of hypertension, diabetes mellitus, and coronary artery disease with multiple percutaneous coronary interventions presented to the emergency room with chest pain. Transthoracic echocardiogram showed a homogenous echo-dense, intracardiac mass present within the interatrial septum. Computed tomography (CT) angiogram of the chest showed a homogenous mass similar in radiodensity to extracardiac and peri-cardial fat. Cardiac magnetic resonance (CMR) confirmed LHIAS by homogenous signal that was nulled on fat suppression images.

Discussion
This case highlights that while most LHIAS has the standard ‘dumbbell’ appearance on TTE, there are instances where it can appear more like an adherent mass prompting a wider differential. Unenhanced CT of the heart can be used to confirm LHIAS by the presence of low attenuation values for tissue. Alternatively, CMR can be used for tissue characterization and confirmation of LHIAS. Precontrast T2/T1-weighted CMR images with steady-state free precession show high signal intensity in the area of LHIAS and produce a black/hypointense boundary effect between fat and myocardium. A multimodality approach is crucial in arriving at the appropriate diagnosis using the tissue characterization capabilities of CT and CMR.

Keywords
Lipomatous hypertrophy of the interatrial septum • Multimodality imaging • Interatrial mass • Case report

Learning points
- Differential of interatrial masses commonly includes lipomatous hypertrophy of the interatrial septum, though it can present atypically.
- Multimodality imaging aids in the differential diagnosis of an interatrial mass. Computed tomography and cardiac magnetic resonance imaging provide advanced tissue characterization abilities that help cinch the diagnosis.

* Corresponding author. Tel: 215 615 4949, Fax: 215 349 8444, Email: dipika.gopal@pennmedicine.upenn.edu

Handling Editor: Riccardo Liga
Peer-reviewers: Hajnalka Vágo and Golnaz Houshmand
Compliance Editor: Anastasia Vamvakidou
Supplementary Material Editor: Peregrine Green
© The Author(s) 2019. Published by Oxford University Press on behalf of the European Society of Cardiology.
This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (http://creativecommons.org/licenses/by-nc/4.0/), which permits non-commercial re-use, distribution, and reproduction in any medium, provided the original work is properly cited. For commercial re-use, please contact journals.permissions@oup.com
Introduction

Lipomatous hypertrophy of the interatrial septum (LHIAS) is a common finding on transthoracic echocardiogram (TTE). Although TTE is typically sufficient for diagnosis of LHIAS through pattern recognition of the classic dumbbell-shaped morphology within the interatrial septum, occasionally the appearance of LHIAS is atypical and multimodality imaging is helpful to make the diagnosis. Computed tomography (CT) and cardiac magnetic resonance (CMR) imaging offer the additional benefit of tissue characterization. We present a case of atypical LHIAS to highlight the potential aetiologies for an interatrial septal mass and review features on multimodality imaging that help decrease uncertainty and establish a diagnosis.

Timeline

| Time   | Event                                                                 |
|--------|----------------------------------------------------------------------|
| Hospital Day 1 |
| 0100   | Patient arrived in emergency department                                 |
| 0700   | Patient was seen by general cardiology consult                          |
| 0700   | Transthoracic echocardiogram (TTE) completed                            |
| 1130   | Computed tomography (CT) angiography of the heart completed            |
| 1600   | Cardiac magnetic resonance (CMR) imaging performed                     |
| Hospital Day 2 |
| 1200   | Patient discharged                                                     |

Case presentation

A 64-year-old man with a history of hypertension, diabetes mellitus, and coronary artery disease with multiple percutaneous coronary interventions (PCI) of the left anterior descending artery and left circumflex arteries, most recently 2 weeks prior, presented to the emergency room with chest pain. On the day of admission, he noted the sudden onset of precordial chest pain associated with dyspnoea while ambulating consistent with his prior angina. This pain was initially relieved by nitroglycerine spray, but due to continued pain he presented to the emergency room. On arrival, his vital signs were notable for heart rate of 75 beats per minute, blood pressure of 167/72 mmHg, respiratory rate of 20 breaths per minute, and oxygen saturation of 98% on ambient air. His body mass index was 35 kg/m². Physical examination was notable for regular rate and rhythm, clear lung sounds, and a jugular venous pressure of 9 cmH₂O. Serial cardiac enzymes were normal (troponin T 0.02 ng/mL, normal 0–0.03 ng/mL), and an electrocardiogram showed sinus rhythm with right bundle branch block and lateral t-wave inversions, unchanged compared to prior. His medication list prior to hospitalization included aspirin 81 mg daily, clopidogrel 75 mg daily, atorvastatin 40 mg daily, metoprolol tartrate 25 mg twice daily, amlodipine 10 mg daily, ranolazine 500 mg twice daily, and furosemide 20 mg daily. A TTE was performed for further evaluation of his chest pain and to assess for regional wall motion abnormalities. The study showed a homogenous echo-dense, intracardiac mass present within or attached to the interatrial septum (Figure 1) measuring 4 cm × 4 cm. The mass was noted within the superior aspect of the interatrial septum and extended superiorly and posterior to the aortic root. Movement of the mass was synchronous with the atrial walls (Figure 1). The right and left atrial and left ventricular size were normal with normal left ventricular wall thickness and function. Pulmonary artery pressure was unable to be measured due to the absence of tricuspid regurgitation. Although images from a prior TTE were not available, a report of a TTE performed 1 year prior made no mention of an interatrial mass.

The differential diagnosis for this mass includes an atrial myxoma, iatrogenic haematoma, invasive or metastatic tumour, lipoma, liposarcoma, and LHIAS. While the most common cause of interatrial septal thickening is LHIAS, an extensive differential diagnosis was considered because of the absence of the typical symmetrical ‘dumbbell’ shape. In the setting of a clinical history of severe chest pain after a PCI, we were concerned about a complication of the procedure including vascular trauma and haematoma. To further localize the mass and evaluate for tumour and iatrogenic haematoma, a CT angiogram of the chest was performed. There was no evidence of aortic dissection or haematoma and no extension of the mass outside of the cardiac structures. The homogenous mass seen on echocardiogram was similar in radiodensity to extracardiac and pericardial fat with Hounsfield units (HU) within the fat range (-64 HU). The mass extended from the interatrial septum to the posterior left and right atria and spared the fossa ovalis.

The CMR showed a homogenous mass that was nulled on fat suppression images consistent with fat. Although the attenuation on CT was similar to fat, the mass was not completely visualized. For further evaluation of the mass and chest pain, the patient was referred for CMR imaging without the stress protocol. Cardiac magnetic resonance imaging was performed on a 1.5-T scanner and confirmed LHIAS by homogenous signal that was nulled on fat suppression images (Figure 2, Supplementary material online, Video S1). Contrast imaging using CT demonstrated no enhancement to suggest vascularity to the mass and a normal pericardium.

Although the attenuation on CT was similar to fat, the mass was not completely visualized. For further evaluation of the mass and chest pain, the patient was referred for CMR imaging without the stress protocol. Cardiac magnetic resonance imaging was performed on a 1.5-T scanner and confirmed LHIAS by homogenous signal that was nulled on fat suppression images (Figure 3, Supplementary material online, Video S1). Although T1 weighted spin echo with and without fat suppression is more widely used in this situation, we used gradient echo technique here due to the benefit of shorter imaging times.

Cardiac magnetic resonance and TTE demonstrated normal ventricular function. Ultimately, the patient’s chest pain was determined to be of non-cardiac origin and he was discharged from the hospital in stable condition with recommendations for repeat imaging with...
TTE and/or CMR every 6 months to 1 year to monitor for interval progression.

Discussion

Lipomatous hypertrophy of the interatrial septum is a common finding seen on echocardiography with an incidence reported to be 1–8% of the general population. It is more commonly seen in women and in the elderly and is associated with obesity, steroid use, and emphysema. Histologic examination shows adipocyte hyperplasia and fat infiltration of the myocardial fibres differentiating it from a lipoma which has solely adipocytes. Lipomas account for ~10% of cardiac neoplasms and are discrete collections of adipocytes that are normally extramyocardial and present as a defined rounded mass. While similar in tissue characterization to lipomas, LHIAS on TTE respects the boundaries of the atrial septum and typically spares the fossa ovalis. On transoesophageal echocardiogram, LHIAS appears as an echo-dense, globular thickening of the interatrial septum best seen on the bicaval view. This case highlights that while most LHIAS has the standard ‘dumbbell’ appearance on TTE, there are instances where it can appear more like an adherent mass prompting a wider differential. Unenhanced CT of the heart can be used to confirm LHIAS by the presence of low attenuation values for tissue (-80 to -120 HU) in the area of the interatrial septum. Alternatively, CMR can be used for tissue characterization and confirmation of LHIAS. Precontrast T2/T1 weighted cine CMR images with steady-state free precession show high signal intensity in the area of LHIAS and produces a black/hypointense boundary effect between fat and myocardium. A fat suppression protocol can also be used to confirm LHIAS. In light of the atypical appearance of the echo-dense mass seen on TTE in this patient, a multimodality approach was used to narrow the differential diagnosis and arrive at the final determination of LHIAS. Lipomatous hypertrophy of the interatrial septum is a
benign condition in most cases. Rarely, if severe interatrial hypertrophy is present, patients may develop obstruction of right atrial filling, shortness of breath, and/or heart failure symptoms. Lipomatous hypertrophy of the interatrial septum may coexist with other intracardiac malignancies, which would dictate any necessary interventions.1

Conclusion
This case highlights the differential diagnosis of an interatrial septal mass. Lipomatous hypertrophy of the interatrial septum may have atypical appearances and present with a variety of morphologic features. A multimodality imaging approach in these cases is crucial in arriving at the appropriate diagnosis using the tissue characterization capabilities of CT and CMR.

Lead author biography
Dipika J. Gopal is a third-year cardiology fellow at the University of Pennsylvania in Philadelphia, Pennsylvania, with an interest in Preventive Cardiology and non-invasive imaging. She also has a passion for medical education and plans to pursue a career as a physician-educator.

Supplementary material
Supplementary material is available at European Heart Journal - Case Reports online.

Acknowledgements
The authors thank Tiffany Chen, Jennifer Lewey, and Neel Chokshi for their contribution to the clinical case and manuscript.

Slide sets: A fully edited slide set detailing this case and suitable for local presentation is available online as Supplementary data.

Consent: We were unable to contact the patient at the time of publication of this case report. All identified information has been removed. We received permission from our local Institutional Review Board for the publication of this case report.

Conflict of interest: none declared.

References
1. Kleiman AM, Harding LM, Bechtel AJ. Concomitant lipomatous hypertrophy and left atrial mass distinguishing benign from malignant. Echocardiography 2018;35:534–536.
2. Cannavale G, Francione M, Galea N, Vullo F, Molisso A, Carbone I, Catalano C. Fatty images of the heart: spectrum of normal and pathological findings by computed tomography and cardiac magnetic resonance imaging. Biomed Res Int 2018;2018:1.
3. Kimura F, Matsuo Y, Nakajima T, Nishikawa T, Kawamura S, Sannohe S, Hagiwara N, Sakai F. Myocardial fat at cardiac imaging: how can we differentiate pathologic from physiologic fatty infiltration? Radiographics 2010;30:1587–1602.
4. Langer FW, Rafael G, Alves T, Santos D, Jesus C, Haygert P, Maria S. Lipomatous hypertrophy of the interatrial septum. Radiol Bras 2018;51:130–132.
5. Maleszewski JJ, Bois MC, Bois JP, Young PM, Stulak JM, Klarich KW. Neoplasia and the heart: pathological review of effects with clinical and radiological correlation. J Am Coll Cardiol 2018;72:202–227.

Figure 3 Cardiac magnetic resonance imaging showing lipomatous hypertrophy of the interatrial septum as evidenced by loss of signal on T-1 weighted gradient echo technique fat saturation images (A) compared to non-fat saturation images (B) and no abnormal enhancement on perfusion imaging (C). (A) Fat saturation pre-contrast four-chamber view of interatrial septum. (B) Non-fat saturation four-chamber view of interatrial septum. (C) Perfusion imaging four-chamber view of interatrial septum.