AMSER Case of the Month August 2021

61 y.o. F w/ subacute onset of heart failure

Raymond Sun, MS3
Elizabeth Lee, M.D.
University of Michigan Medical School
Department of Cardiothoracic Radiology

MICHIGAN MEDICINE
UNIVERSITY OF MICHIGAN

AMSER

Patient Presentation

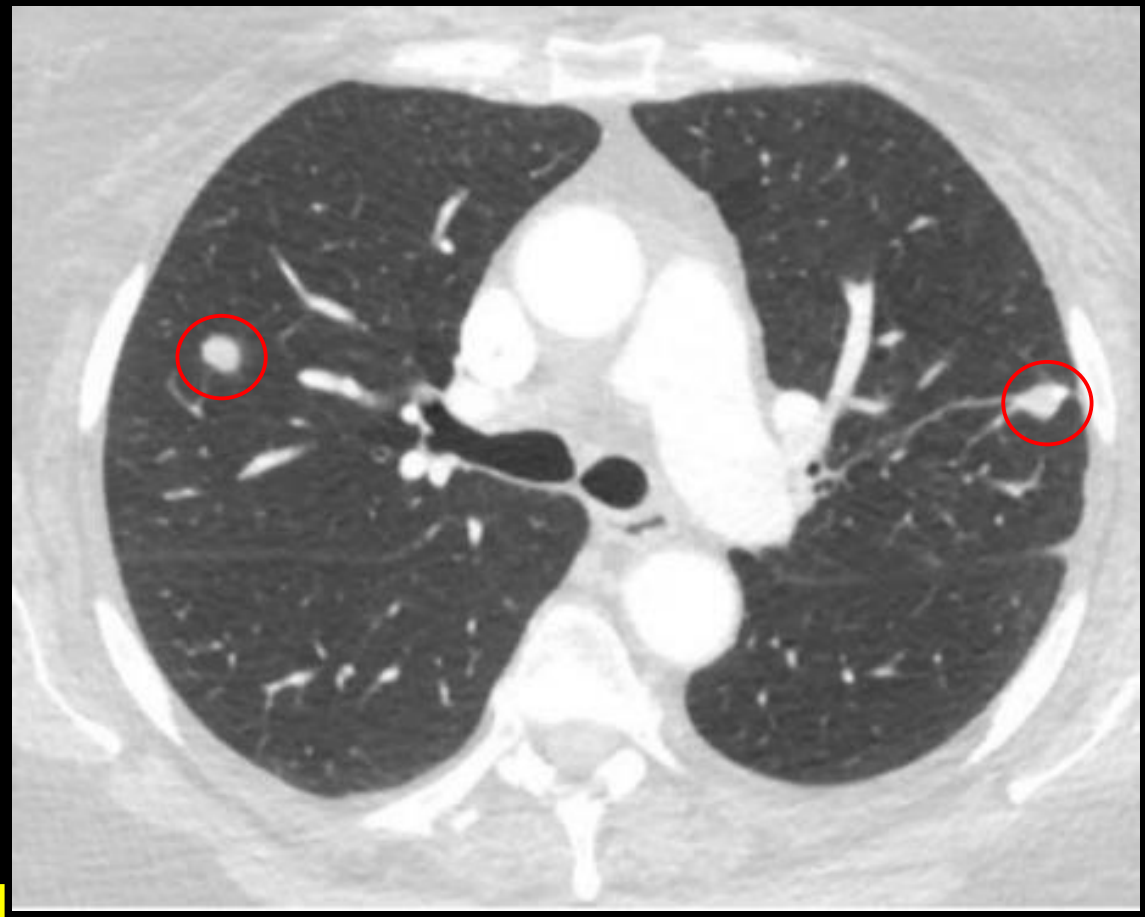
Oncologic History

2015: Diagnosed with left shoulder **high grade leiomyosarcoma** which was resected

2017: Metastatic disease to the lungs treated with radiotherapy and surgical resections

2020: Due to progression of disease chemotherapy with doxorubicin and ifosfamide initiated

5/2020: Presents with new **swelling, DOE, and heart racing**



Axial CT chest w/ contrast showing bilateral pulmonary nodules (circles) due to metastatic disease

AMSER

Pertinent Labs and Studies

Labs:

- Lipid panel: mildly elevated triglycerides
- Normal comprehensive metabolic panel
- Complete blood count was stable
- **Normal brain natriuretic peptide (BNP)**

EKG:

- Left bundle branch block (LBBB)

Echocardiography:

-Prior to starting doxorubicin, globally hypokinetic left ventricle, **Ejection fraction (EF) 44%**,

-3 months later on doxorubicin, repeat **EF decreased to 31%**

What Imaging Should We Order?

Ordered next for evaluation for ischemic disease as other highly rated exams had been performed

American College of Radiology
ACR Appropriateness Criteria®
Dyspnea–Suspected Cardiac Origin

Variant 1: **Dyspnea due to heart failure. Ischemia not excluded.**

Radiologic Procedure	Rating	Comments	RRL*
X-ray chest	9		☢
US echocardiography transthoracic resting	9		O
US echocardiography transthoracic stress	9		O
SPECT or SPECT/CT MPI rest and stress	9		☢☢☢☢
Rb-82 PET/CT heart	8		☢☢☢
MRI heart function and morphology without and with IV contrast	8		O
MRI heart with function and vasodilator stress perfusion without and with IV contrast	8		O
CTA coronary arteries with IV contrast	8		☢☢☢
Arteriography coronary with ventriculography	8		☢☢☢
MRI heart with function and inotropic stress without and with IV contrast	7		O
US echocardiography transesophageal	5		O
MRI heart function and morphology without IV contrast	5	This procedure may be appropriate but there was disagreement among panel members on the appropriateness rating as defined by the panel's median rating.	O
MRI heart with function and inotropic stress without IV contrast	5	This procedure may be appropriate but there was disagreement among panel members on the appropriateness rating as defined by the panel's median rating.	O
CT heart function and morphology with IV contrast	5	This procedure may be appropriate but there was disagreement among panel members on the appropriateness rating as defined by the panel's median rating.	☢☢☢☢
CT coronary calcium	5		☢☢☢

Rating Scale: 1,2,3 Usually not appropriate; 4,5,6 May be appropriate; 7,8,9 Usually appropriate

*Relative Radiation Level

AMSER

Nuclear Medicine SPECT Stress Test Results

IMPRESSION:

(1) Large sized, moderate severity, apical, anterior, anteroseptal, and septal, partially reversible defect consistent with impaired perfusion reserve, ischemia and infarction in the territory typical of the proximal to distal LAD. Based on defect tracer uptake in the rest images, defect reversibility, and regional wall function in the defect area, this defect is mostly viable.

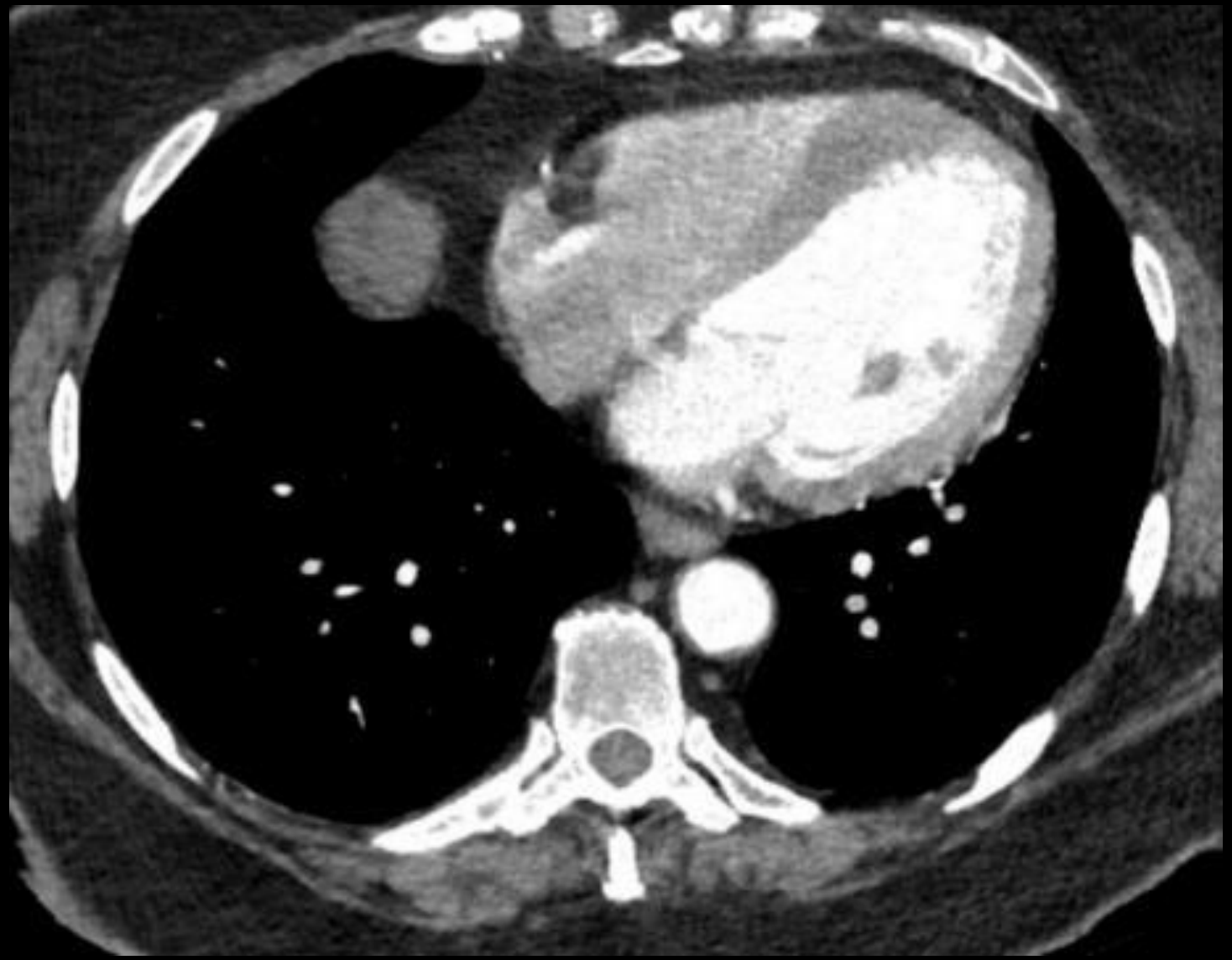
↓

Left heart catheterization negative for coronary artery disease.

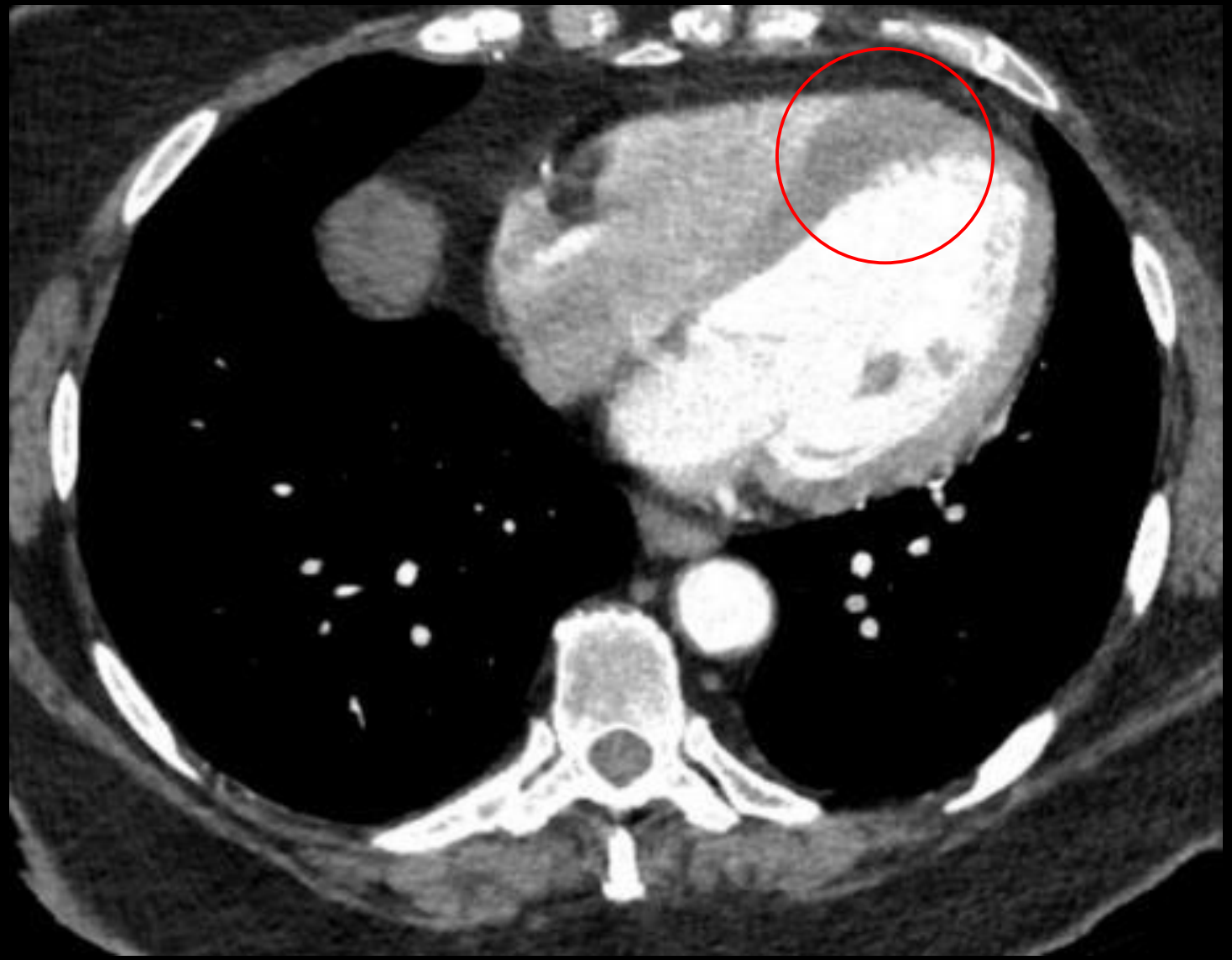
↓

Presentation felt 2/2 **doxorubicin cardiotoxicity** with stress test abnormality from LBBB

Doxorubicin was stopped. A follow up chest CT with contrast was performed.

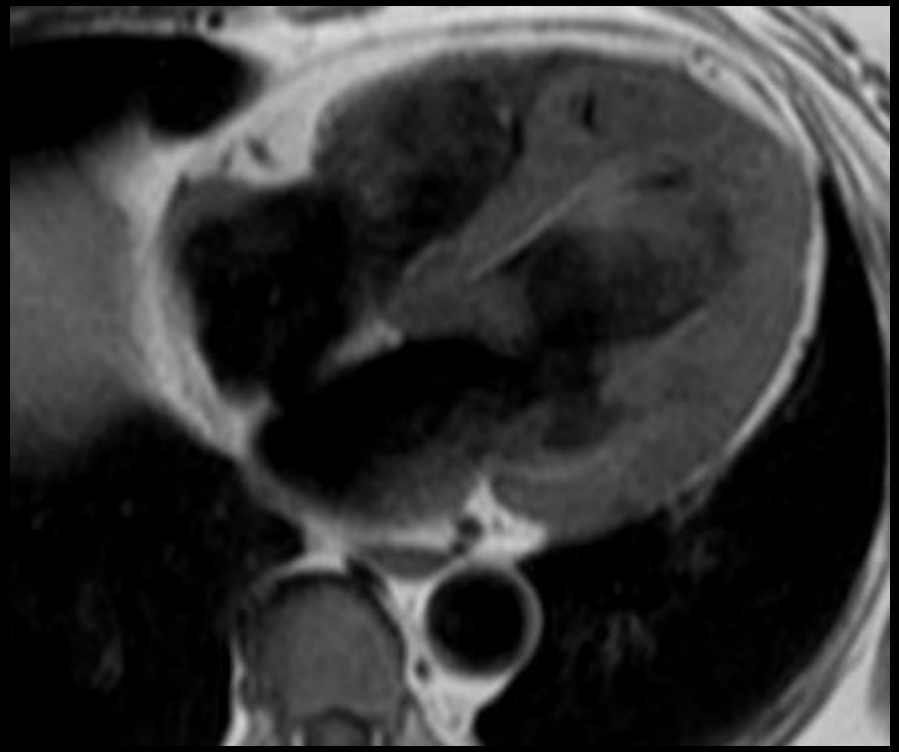


Findings: Focal thickening of the interventricular septum.



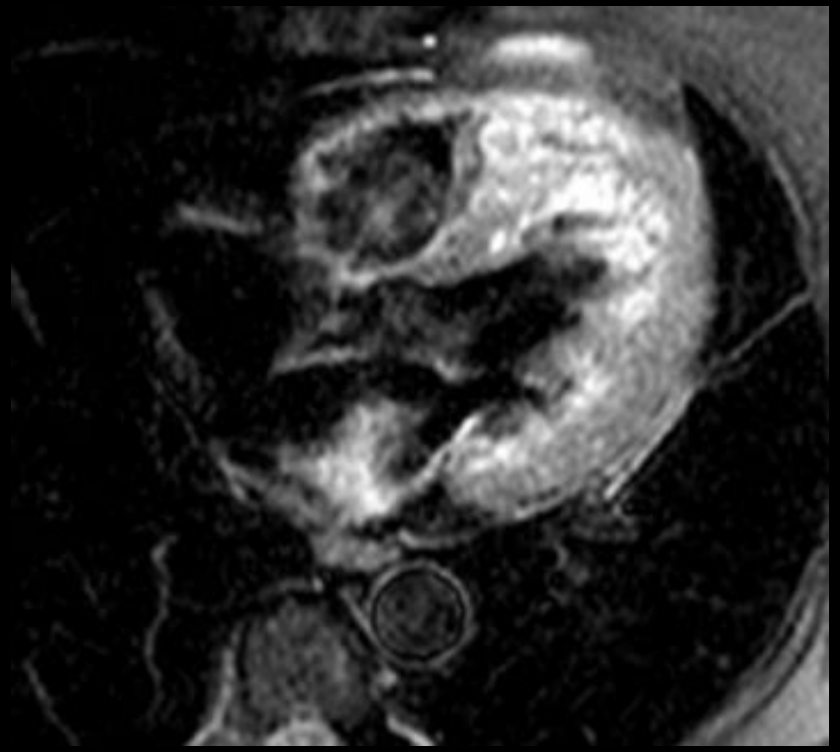
Cardiac MR completed to evaluate the CT abnormality:

4 Chamber



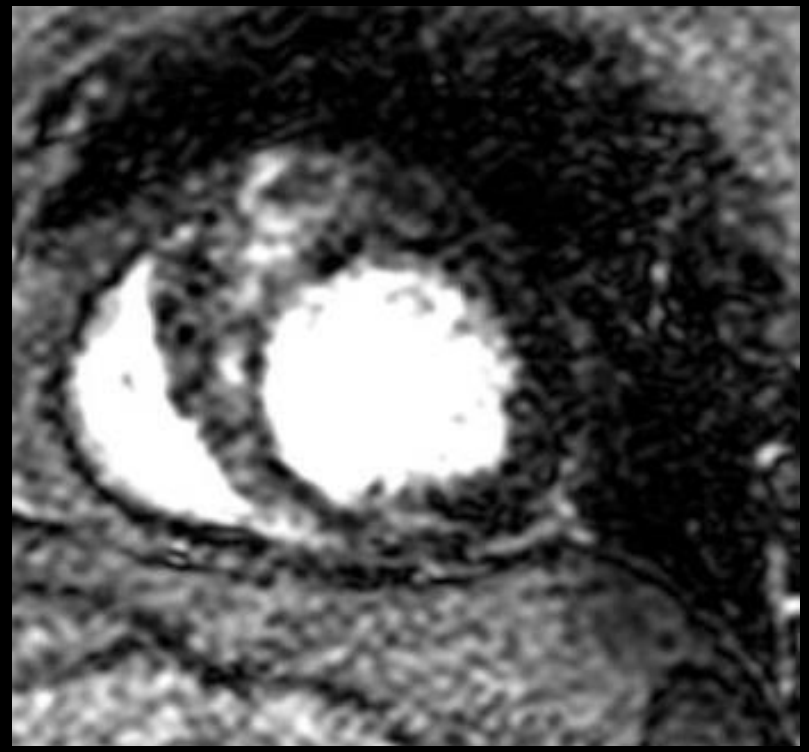
T1 weighted, Black blood

4 Chamber



T2 weighted, Black blood

Short axis

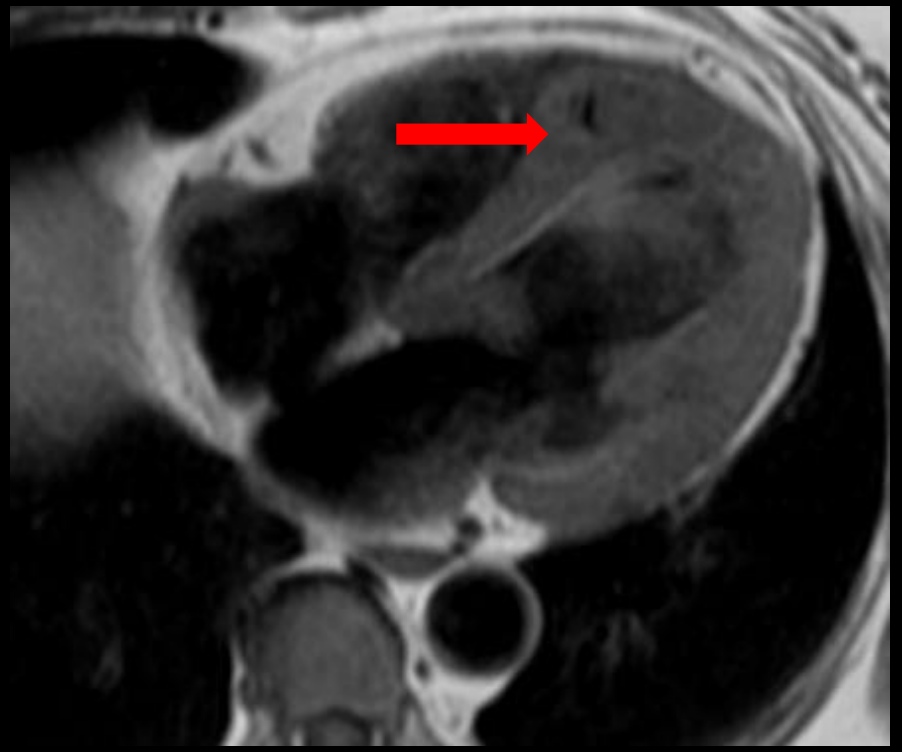


Delayed post contrast inversion recovery

AMSER

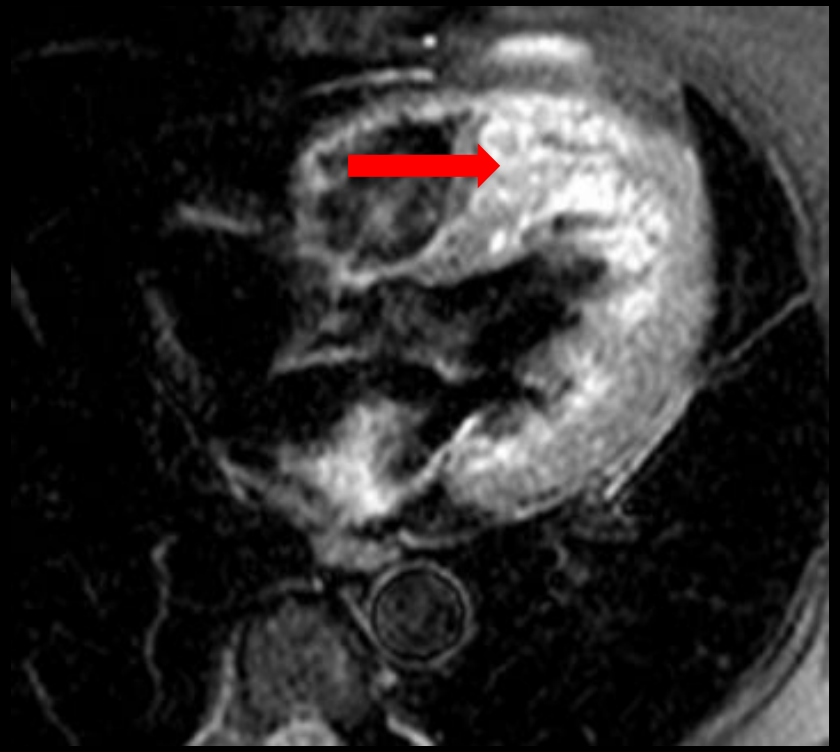
Findings:

4 Chamber T1 weighted



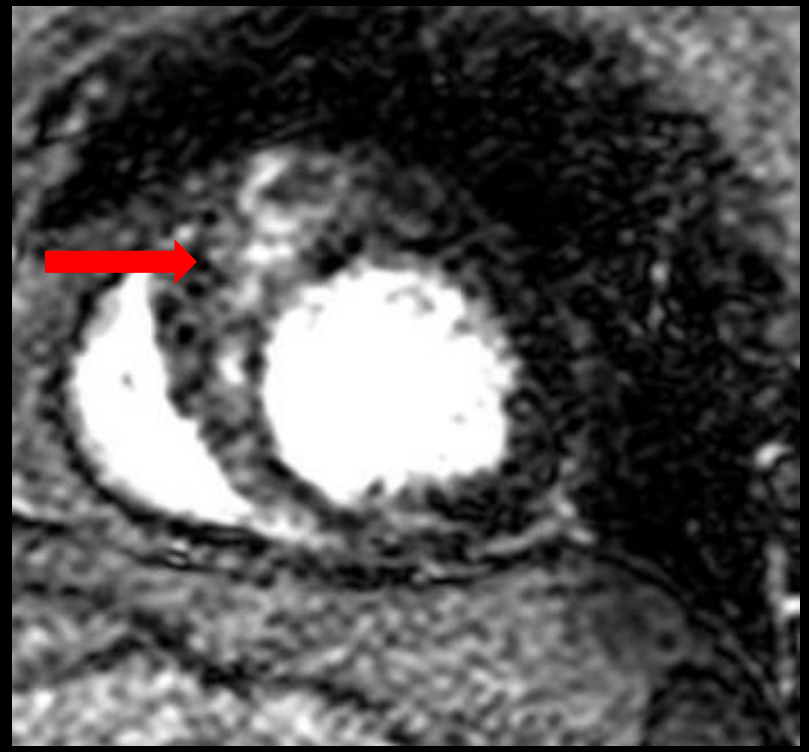
Mass (arrow) isointense to surrounding myocardium

4 Chamber T2 weighted STIR



Heterogeneous, hyperintense

Short axis delayed post contrast



Internal enhancement (arrow) of mass

Final Dx:

Metastatic leiomyosarcoma to the heart

Case Discussion

- **Metastatic disease is significantly more common than primary cardiac tumors (20-40x more frequent)**

- **Can affect *all* parts of the heart**
  - Sarcomas travel through the bloodstream leading to metastatic disease from the sarcoma to most commonly implant in the myocardium as in this case

- **Presentation depends of site of metastatasis**
  - Tumors in the ventricular walls can present like hypertrophic or restrictive cardiomyopathy
  - Tumors invading into the conduction pathway lead to arrhythmias

MR diagnosis of cardiac metastases:

- T1: variable appearance
- T2: typically hyperintense
- Post contrast: usually enhances

Does the cardiac metastasis or doxorubicin cardiomyopathy explain the patient's symptoms?

-EF improved from 31% → 37% after stopping doxorubicin, but she was on medical management that could have led to improvement

Doxorubicin cardiomyopathy:

Clinically: mimics heart failure, can present w/chest pain

Timing: usually acute (2-3d), or chronic (presenting years later)

Dosage: dose-dependent, 4% incidence at 500-550 mg/m^2 of total dose

Diagnosis: signs of overt heart failure, cardiomegaly, pulmonary venous congestion, **elevated BNP.**

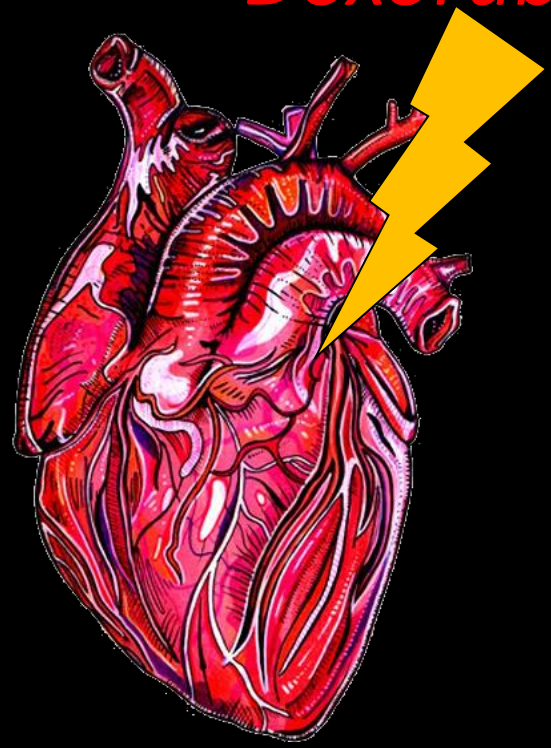
Our case:

Clinically: heart failure symptoms, no chest pain

Timing: 3 months

Dosage: had received 300 mg/m^2 total dose at time of hold

Diagnosis: signs of heart failure, no cardiomegaly or pulmonary venous congestion. **Normal labs**.



AMSER

References:

-Casavecchia G., et al. Cardiac Tumors. *J Cardiovasc Echogr*. 2020;30S45-S53.
-Chatterjee K., et al. Doxorubicin cardiomyopathy. *Cardiology*. 2010;115, 155–162.
-Chiles C., et al. Metastatic Involvement of the Heart and Pericardium: CT and MR Imaging. 2001;21:439-449.
-Goldberg A., et al. Tumors Metastatic to the Heart. Circulation. 2013;128:1790-1794.
-Pellikka P., et al. Variability in Ejection Fraction Measured By Echocardiography, Gated Single-Photon Emission Computed Tomography, and Cardiac Magnetic Resonance in Patients With Coronary Artery Disease and Left Ventricular Dysfunction. JAMA New Open. 2018;1:e181456.
-Vogel-Claussen J, Elshafee ASM, Kirsch J, et al. ACR appropriateness criteria dyspnea: suspected cardiac origin. J Am Coll Radiol 2017;14:S127-37

Thank you!