



POCUS Conference

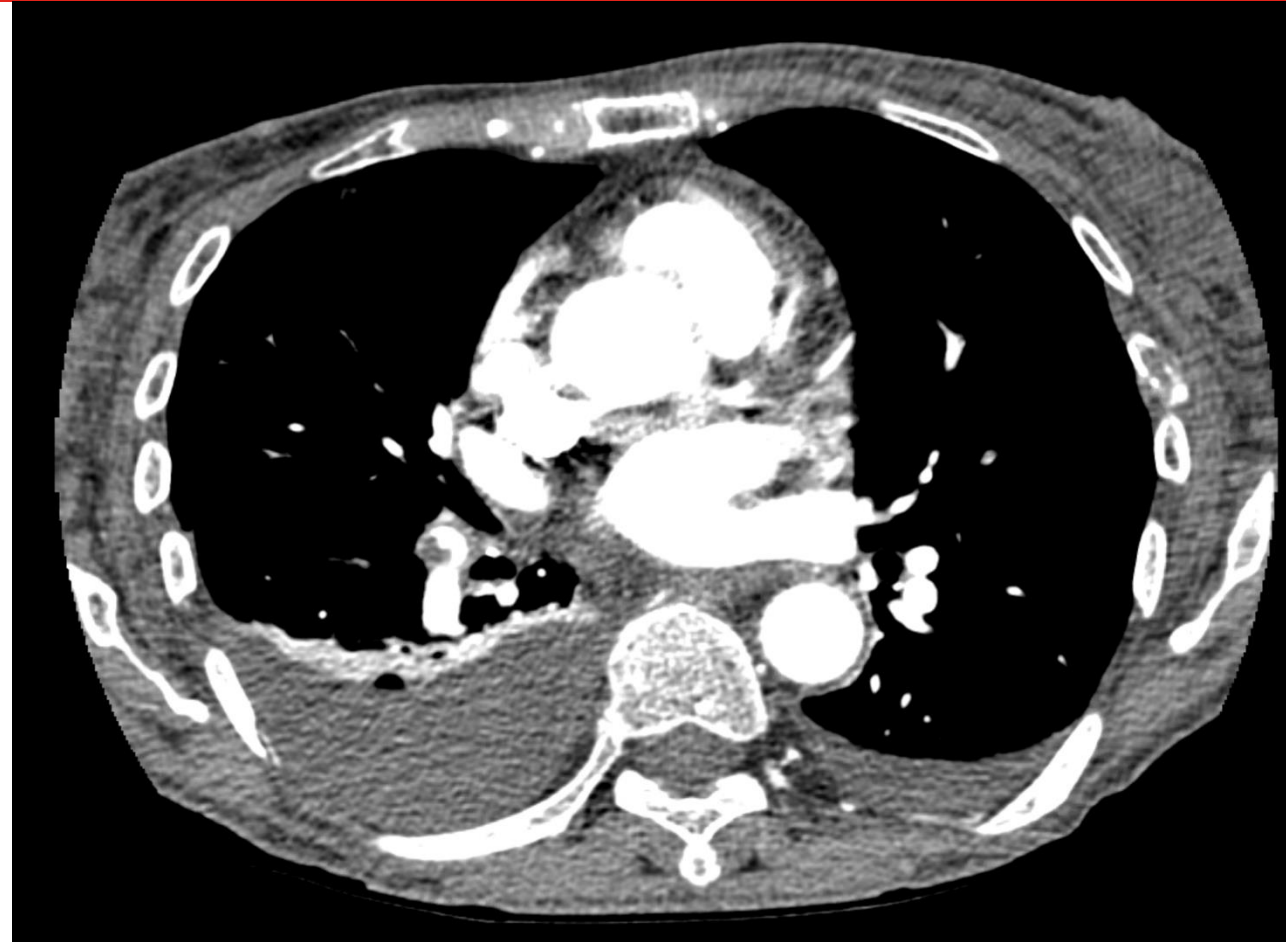
January 17, 2019

Mark Sonnick, PGY-2 Medicine

AMAZING
THINGS
ARE
HAPPENING
HERE

Clinical Scenario

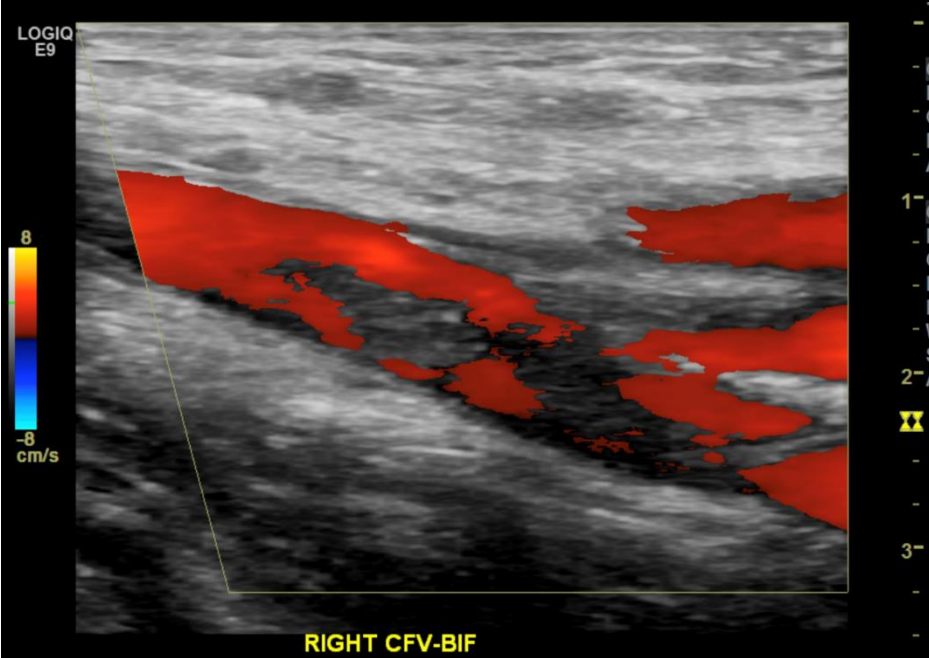
- 75 year old lady
- Concurrent cancers
 - Breast mass → adenocarcinoma
 - Cecal mass → adenocarcinoma (felt synchronous primary)
- Hydronephrosis 2/2 uterine leiomyomata, s/p PCN bilaterally
 - Recent admit PCN dysfunction, VRE bacteriuria
 - Found with RLE DVT, PE, on Eliquis
- Re-presents to ED with FTT, bloody PCN output



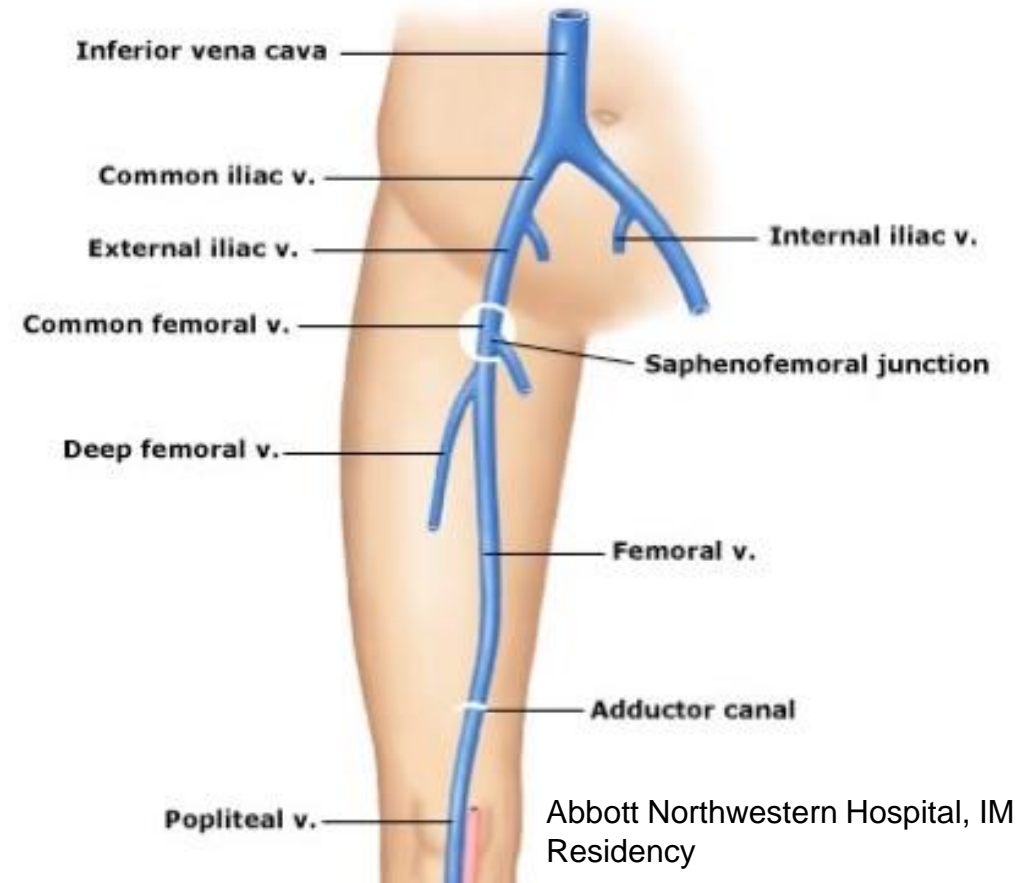
CTPE from prior hospitalization



RIGHT CFV-BIF



RIGHT CFV-BIF



Abbott Northwestern Hospital, IM Residency

US LE dopplers on presentation (HD 1)

“Let’s practice our POCUS skills on this patient.”

▪ Hospital Day 7

- Blood cx on admission +VRE
- IVC filter placed on HD 5 given significant LE clot burden and lack of anticoagulation
- Melena
 - Hb trend: 8.3 (HD 4) - 1 unit in setting of bleed - 9.4 → 8.2 → 10.1 → 9.0 (HD 6)
- Worsening thrombocytopenia, Plt ct:
 - 135 --> 124 --> 59* --> 41* --> 35
 - Fibrinogen 121

▪ Exam

- 37.6 | 106 | 122/72 | RR 20
- SpO2 90% on NC 3L/min → 96% NRB 15L/min
- Groaning, tachypneic
- Tachycardic, RV heave
- Purpura fulminans; no edema

<https://derangedphysiology.com/main/required-reading/infectious-diseases-antibiotics-and-sepsis/Chapter%203.7.2.1/differential-diagnosis-purpura-fulminans>



Our POCUS on HD 7

RLE

RLE

Me:

“I have to go to clinic.”

Dr. B:

“OK. Let’s quickly do some cardiac views just for practice.”

Cardiac

Cardiac

Cardiac

Cardiac

Cardiac

DDX for RV Mass

- Congenital
 - Moderator Band
- Inflammatory
 - Thrombus
 - Metastasis
- Infectious
 - Vegetation
- Iatrogenic
 - PPM leads
 - Catheters

Masses, tumors, and source of embolus. In Armstrong WF, Ryan T. Feigenbaum's echocardiography. 7th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2010. 701–733.

Jammal M, Milano P, Cardenas R, Mailhot T, Mandavia D, Perera P. The diagnosis of right heart thrombus by focused cardiac ultrasound in a critically ill patient in compensated shock. *Crit Ultrasound J*. 2015;7:6. Published 2015 May 13. doi:10.1186/s13089-015-0023-7

The European Cooperative Study on the clinical significance of right heart thrombi. European Working Group on Echocardiography. *Eur Heart J*. 1989 Dec; 10(12):1046-59.

From Dr. Paul's TTE Report

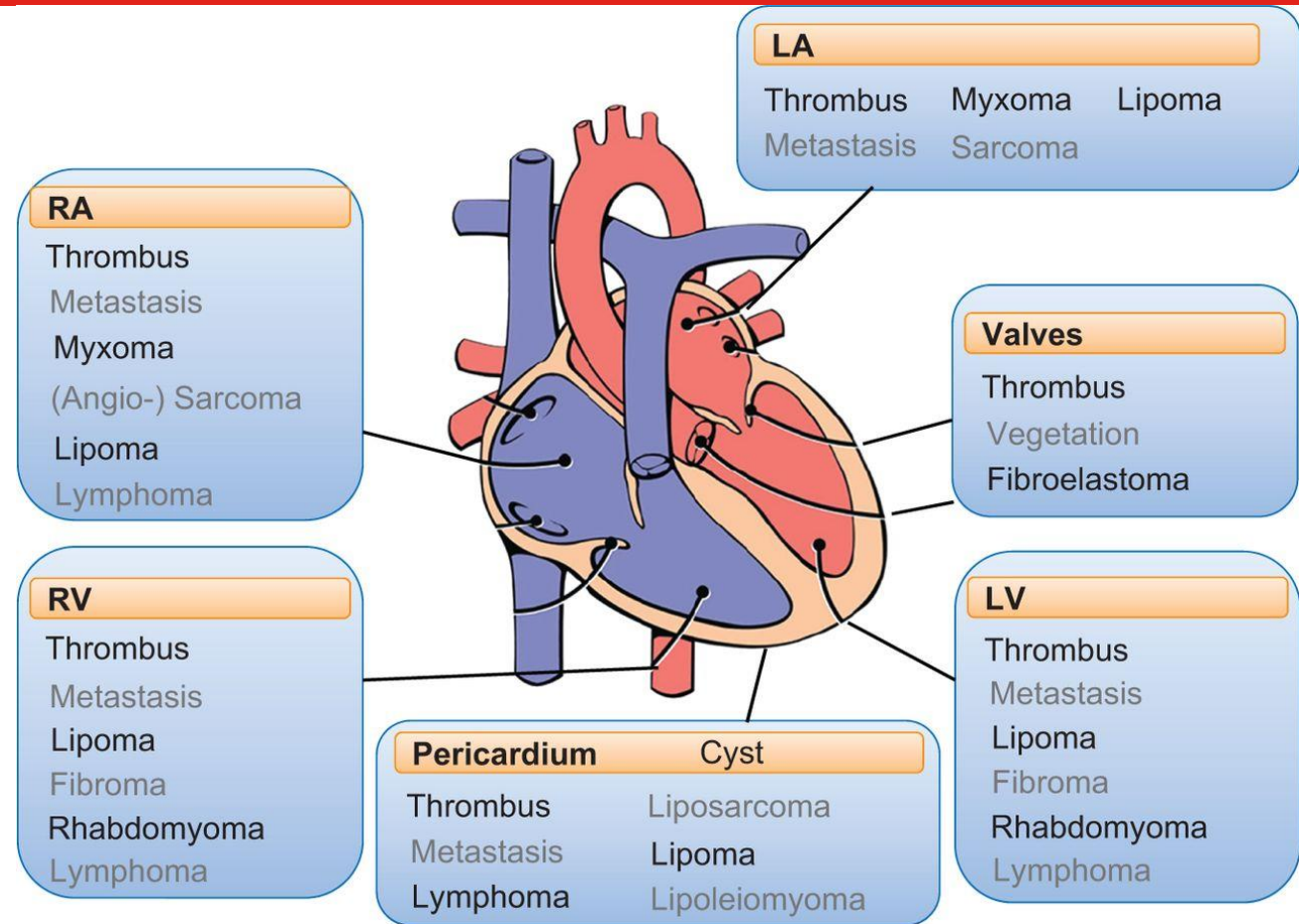
- There is an **irregularly shaped, tissue-density mass** located in the right ventricle, concerning for possible thrombus versus atypical moderator band. Clinical correlation recommended. The right atrium is normal. The tricuspid and pulmonic valves are normal. The inferior vena cava is normal in size **(1.5-2.5 cm) with normal respiratory variability** consistent with right atrial pressures of 5-10 mmHg.
- Pulsed wave, continuous wave and color Doppler revealed:. There is no aortic regurgitation. There is trace mitral regurgitation. **There is 3+(moderately severe) tricuspid regurgitation.** There is severe pulmonary hypertension.

Clinical Question:

Is it possible to tell between clot in transit and metastasis based on ultrasonographic characteristics?

Characteristics of an Echocardiographic Mass

- Favors Tumor
 - Pedunculated
 - Highly mobile
- Favors Thrombus
 - Decreased contractility nearby
 - Echo-lucent center (if recent)
 - Amorphous, adherent to endocardium



Masses, tumors, and source of embolus. In Armstrong WF, Ryan T. Feigenbaum's echocardiography. 7th ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2010. 711–740.

Dujardin KS, Click RL & Oh TK. The role of intraoperative transesophageal echocardiography in patients undergoing cardiac mass removal. *Journal of the American Society of Echocardiography* 13(12): 1080–1083

What do you think?

Studies that answer this question use contrast

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doi:10.1016/j.jacc.2003.09.065

Cardiac Imaging

Differential Diagnosis of Cardiac Masses Using Contrast Echocardiographic Perfusion Imaging

James N. Kirkpatrick, MD, Tiffany Wong, MD, James E. Bednarz, BS, RDCS,
Kirk T. Spencer, MD, FACC, Lissa Sugeng, MD, R. Parker Ward, MD, FACC,
Jeanne M. DeCara, MD, FACC, Lynn Weinert, BS, Thomas Krausz, MD, FRCPATH,
Roberto M. Lang, MD, FACC
Chicago, Illinois

Population

- Group at U Chicago
- 16 patients total, ages 19 to 84
- Mass sites: 2 LA, 6 LV, 3 RA, 1 RV, 3 pericardium, 1 in PA

Intervention/Comparison

16 patients with
echocardiographic
mass

Definity or
Optison contrast
Power Echo

Primary reader qualitatively
determines mass as
“enhancing,” “partially
enhancing,” or not, records
this; quantitative
measurements performed
comparing mass to
myocardium

Images shown to three
blinded expert observers,
kappa statistic calculated
on whether they agreed
with original reader re:
enhancement

Images shown to three
blinded, inexperienced
observers: Malignant
tumor, stromal tumor, or
thrombus. Wilcoxon
signed-rank test

Outcome

- Incremental benefit calculated by Wilcoxon signed-rank test; variability by Kappa
- Definitive pathologic dx in all cases except where object resolved with AC (2 out of 16 cases)

Results

- 7 visually enhancing masses
 - Quant pixel intensity **higher** than myocardium
 - All were malignant tumors

Table 1. Contrast Perfusion and Pathologic Diagnosis of Cardiac Masses

Patient Number	Location of Mass	Mean Pixel Intensity (dB) of Mass	Mean Pixel Intensity (dB) of Myocardium	Pathology
1	Pulmonary artery, extension from mediastinal mass encasing great vessels	11	8.2	Anaplastic large-cell lymphoma
2	RA, originating in SVC	15	11	Follicular thyroid carcinoma
3	RV apex	3.7	1	Malignant peripheral nerve sheath tumor
4	LV apex	25	19	Hemangioma
5	Pleura and pericardium near apical-lateral LV	15	6.5	Lung adenocarcinoma
6	Apical pericardium	30	16	Poorly differentiated adenocarcinoma, unknown primary
7	Apical pericardium	18	15	Well-differentiated adenocarcinoma of the lung
8	LA, attached to fossa ovalis	10	16	Myxoma
9	LA side of interatrial septum	7.7	7.8	Myxoma
10	RA free wall near IVC	5.5	6.5	Resolution demonstrated on echocardiogram after 2 months of anticoagulation
11	RA free wall	4.8	8.1	Thrombus (resected for anticoagulation contraindication)
12	LV apex, pedunculated	0.1	6.5	Thrombus (resected for anticoagulation contraindication)
13	LV apex	0.2	17	Thrombus on autopsy
14	LV apex	7.1	29	Resolution demonstrated on follow-up echocardiogram
15	LV apex	4.1	13	Thrombus (resected during coronary artery bypass)
16	LV apex	20	29	Mural thrombus on autopsy

IVC = inferior vena cava; LA = left atrial; LV = left ventricle/ventricular; RA = right atrial; SVC = superior vena cava.

Kirkpatrick JN, Wong T, Bednarz JE, et al. Differential diagnosis of cardiac masses using contrast echocardiographic perfusion imaging. *J Am Coll Cardiol.* 2004 Apr 21;43(8):1412-9.

Results

- 2 masses with partial enhancement
 - Quant pixel intensity **lower** than myocardium
 - Both were myxomas

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Results

- 7 masses not enhancing
 - Quant pixel intensity **lower** than myocardium
 - All were either confirmed or supposed thrombi

Table 1. Contrast Perfusion and Pathologic Diagnosis of Cardiac Masses

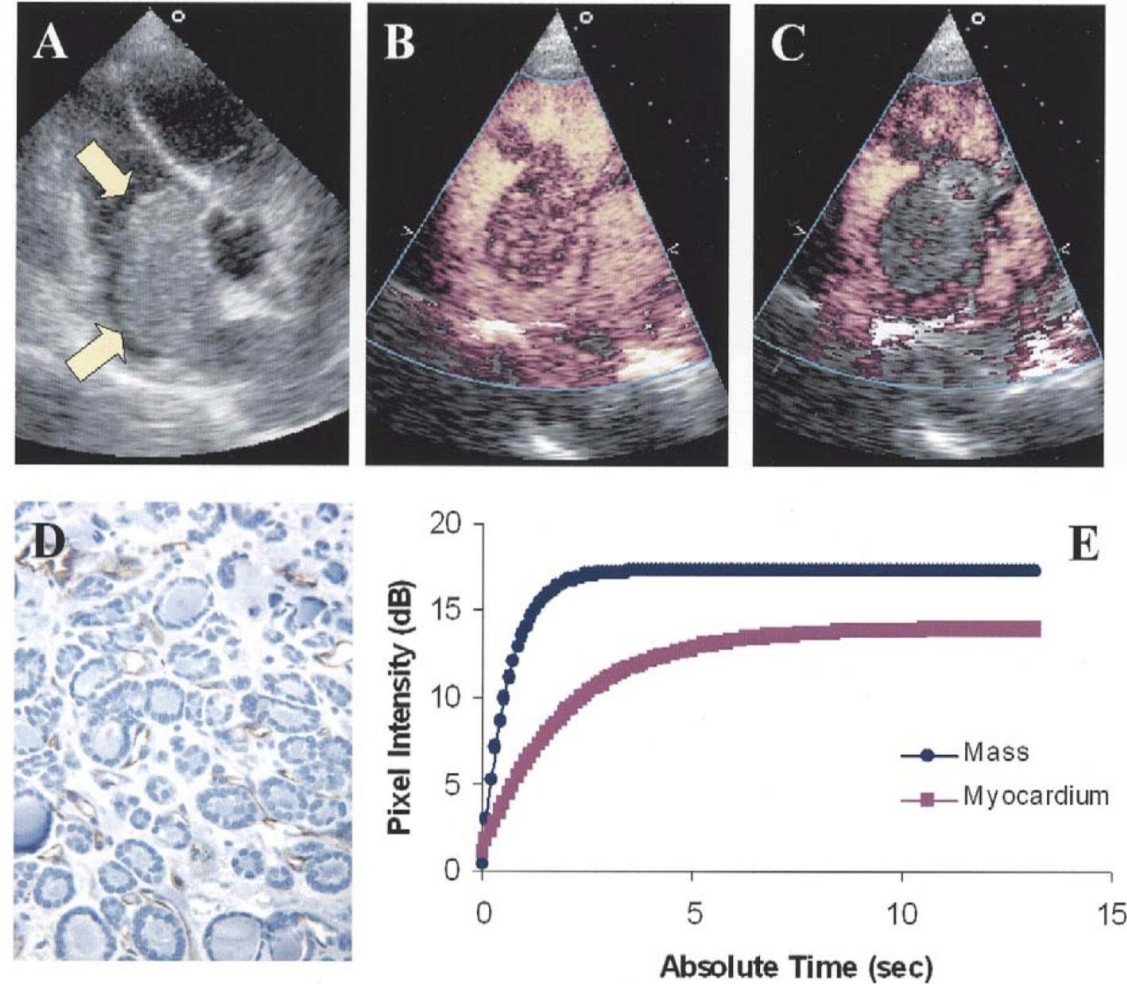
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What about those observers?

- Kappa ranged from 0.75 to 0.84 for agreement among the trained observers
- Wilcoxon test with $p = 0.06$ for benefit for the untrained observers



Kirkpatrick JN, Wong T, Bednarz JE, et al. Differential diagnosis of cardiac masses using contrast echocardiographic perfusion imaging. *J Am Coll Cardiol.* 2004 Apr 21;43(8):1412-9.

Figure 1. (A) A mass filling the right atrium (apical five-chamber view). (B) The mass hyper-enhanced with echocardiographic contrast, compared with the adjacent myocardium. (C) There was no enhancement of the mass or the adjacent myocardium after a high-mechanical index impulse destroyed contrast bubbles, ruling out “false-positive perfusion” of the mass. (D) The biopsy specimen diagnosis was follicular thyroid carcinoma. The blood vessels are stained with CD31 antibody. (E) Perfusion curves of video intensity over time demonstrated greater values for A and β for the mass than for the adjacent myocardium.

Back to our patient

- Critical Care Triage Consult
 - Impression: likely clot in transit
 - DNR DNI status following discussions with patient and caregivers
 - Thrombolysis deferred given active DIC which was attributed to malignancy
- SDU status maintained
 - Aggressive management of DIC with blood products
 - Heparin infusion started for presumed clot in transit
- Patient expired on HD 9

AMAZING
THINGS
ARE
HAPPENING
HERE

Thank You

Dr. Baduashvili

Dr. Mints

Dr. Wong