

The Role of Contrast Echocardiography in 2025



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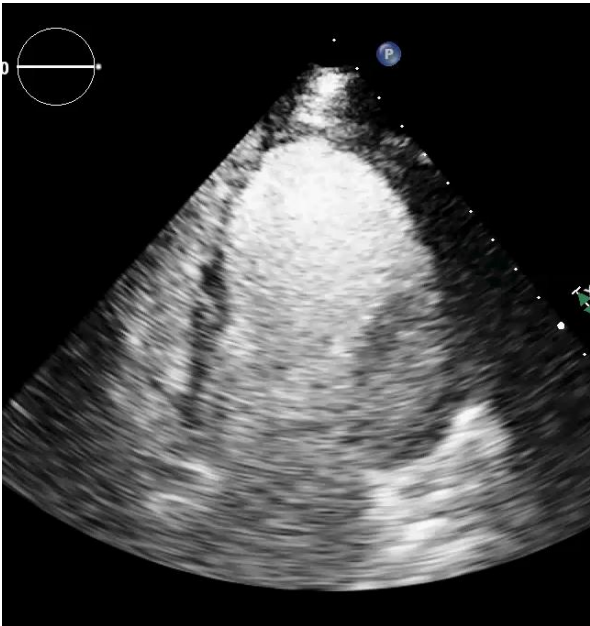
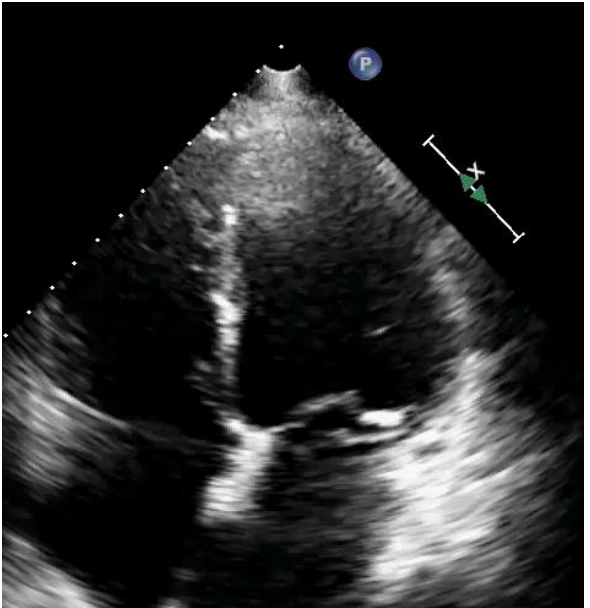
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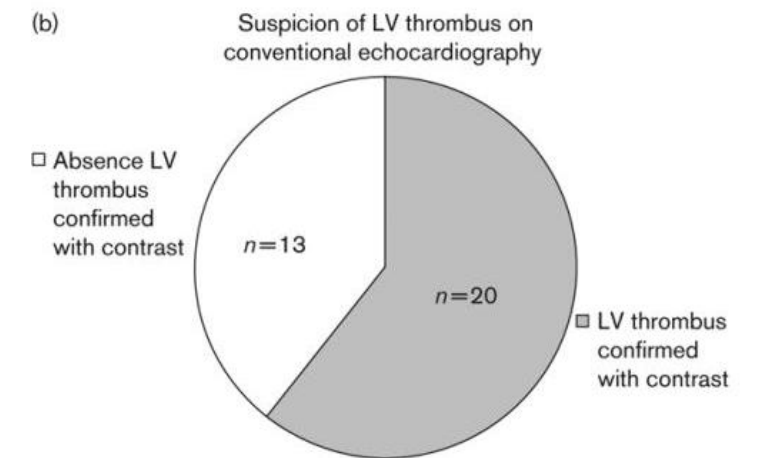
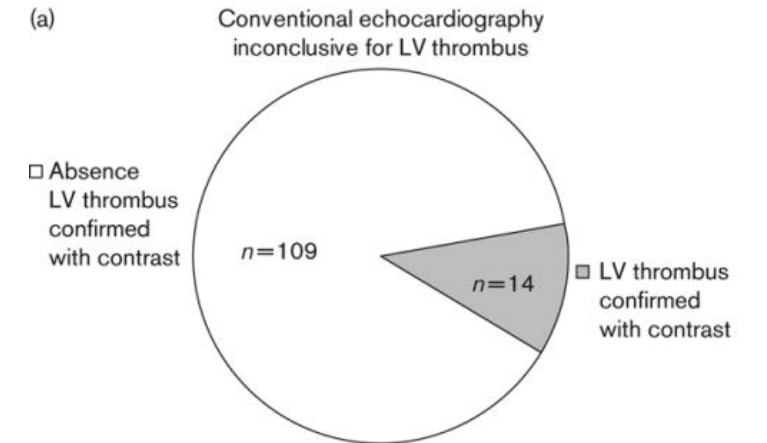
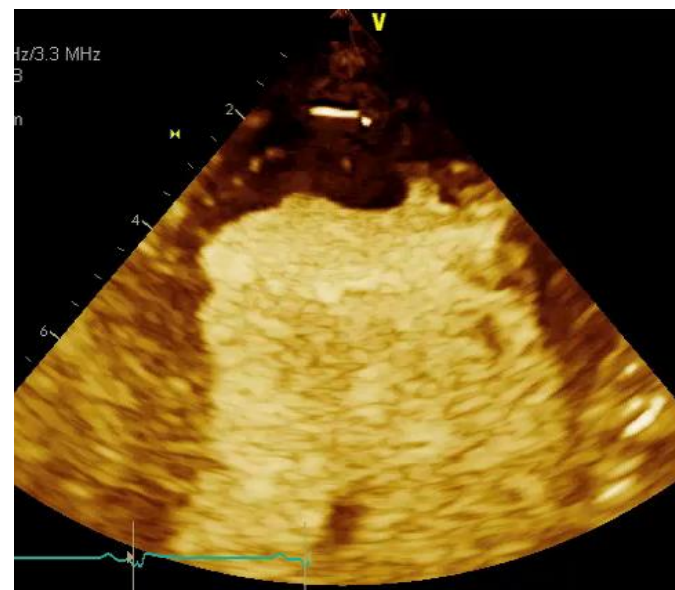
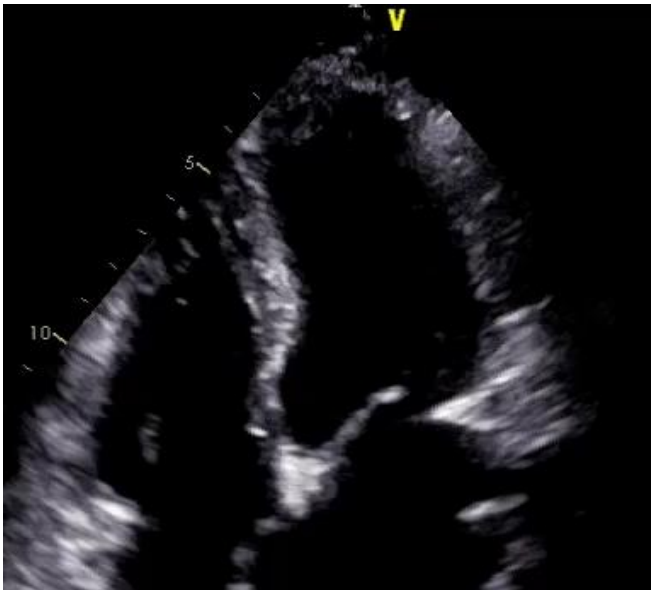
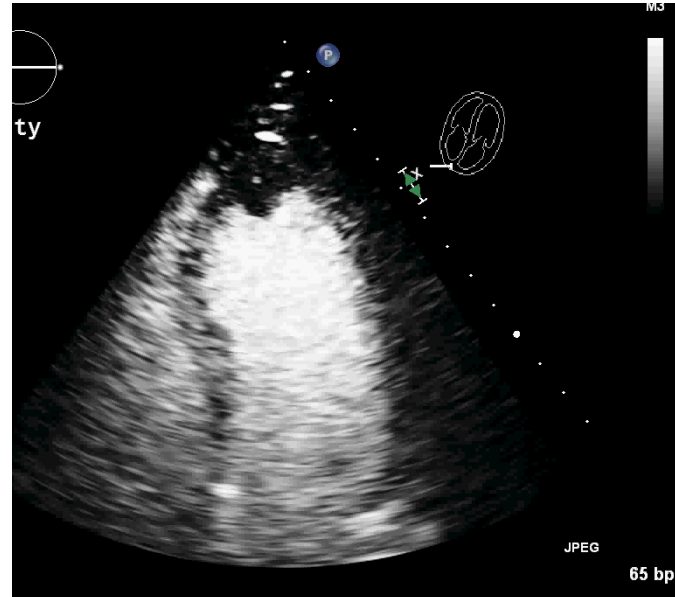
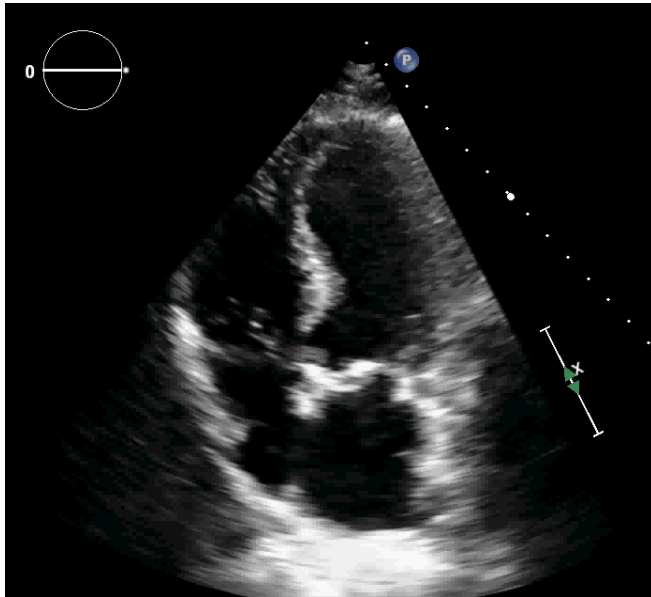
Contrast Echocardiography: Recommendations for Use

<u>Clinical Indication for Echo</u>		<u>Quality of Non-contrast Echo</u>			
		poor	fair	good	
Chest pain, resting ischemia	→				 <i>high benefit</i>
LV Thrombus	→				
Stress echo	→				
LVEF for ICD, CRT, or valve intervention	→				
Dyspnea	→				 <i>Low benefit</i>
Hypotension	→				
Aortic dissection	→				
Atrial fibrillation	→				
Valve quantification	→				
Pericardial disease	→				

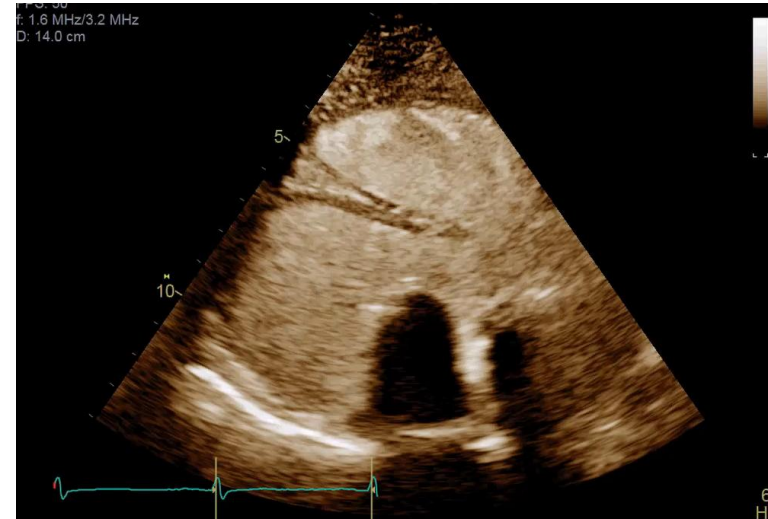
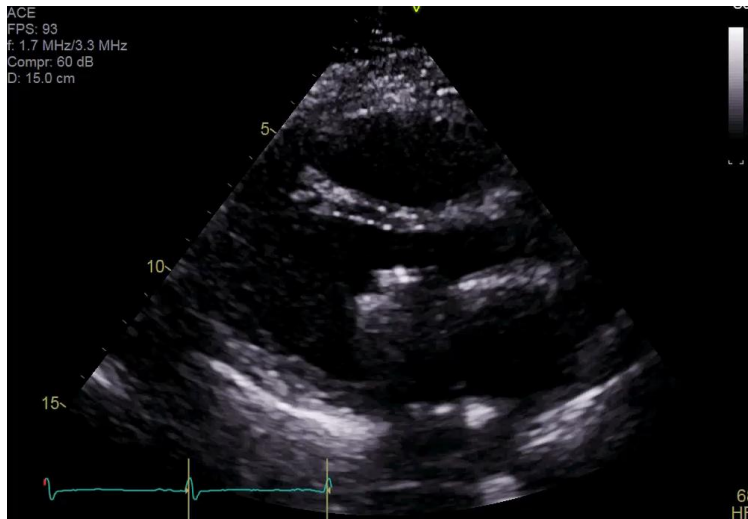
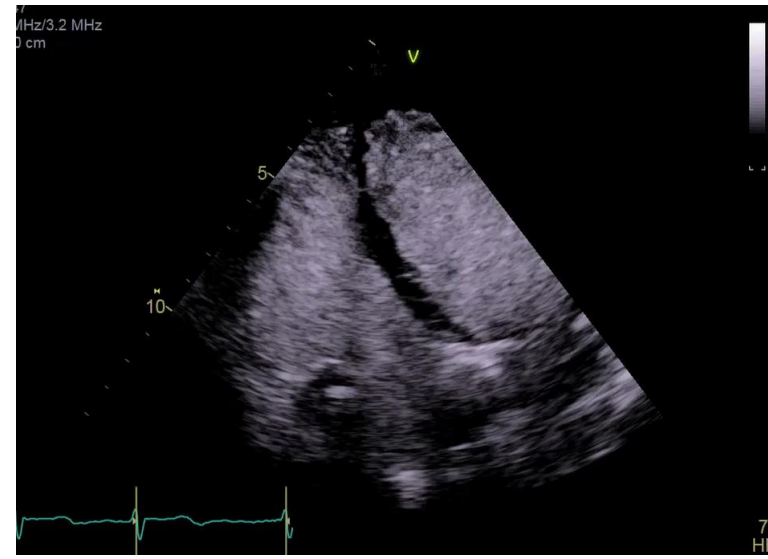
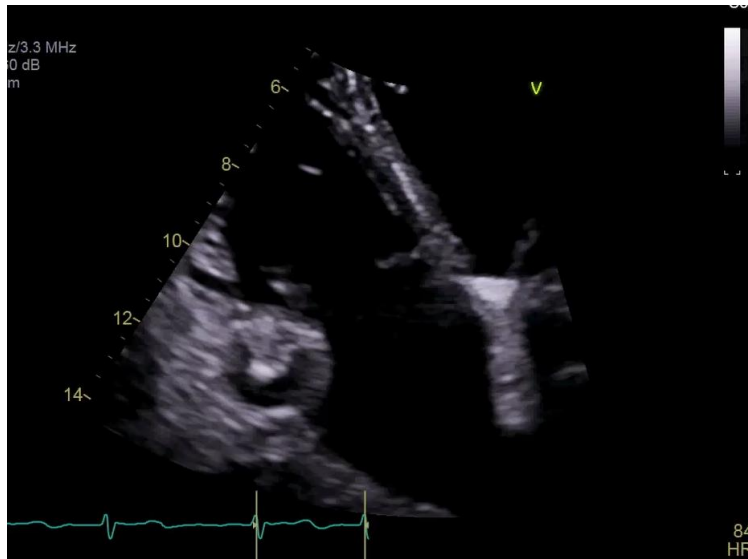
Lindner JR.
From Otto C,
Textbook of Clinical
Echocardiography



Detection of LV Thrombus



Niche Applications



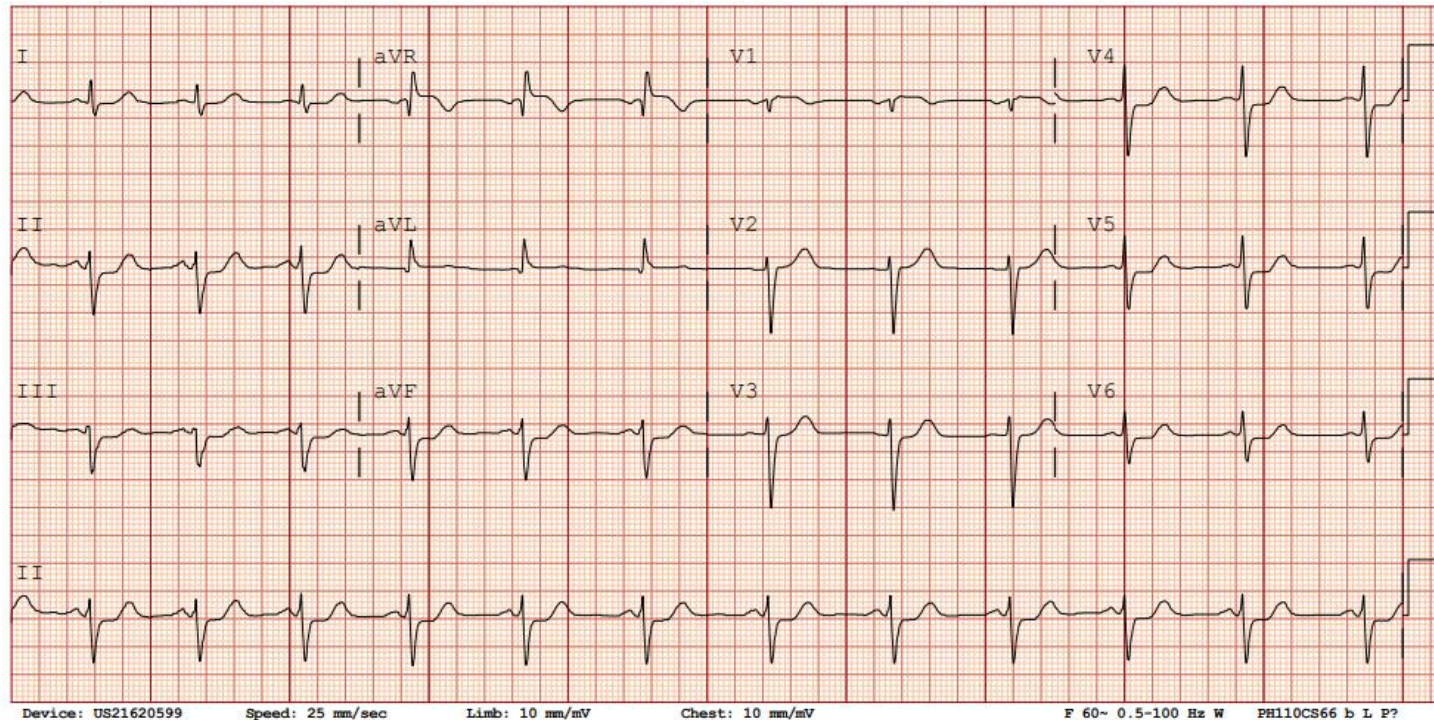
Precision Medicine and MCE Perfusion Imaging

- Bedside or ED diagnosis of ischemia
- Stress imaging in patients with LBBB or in those with pre-existing wall motion abnormalities
- Evaluation of microvascular dysfunction or transplant vasculopathy
- Donor heart for OHTx with WMA
- Masses: Tumor vs Thrombus vs other
- Thrombotic microangiopathies

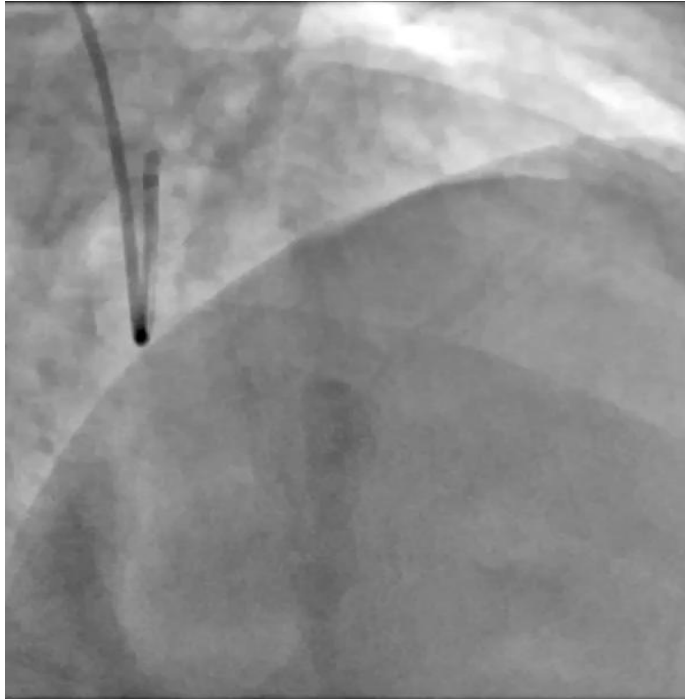
CLINICAL SCENARIOS

Case Presentation: No Reflow?

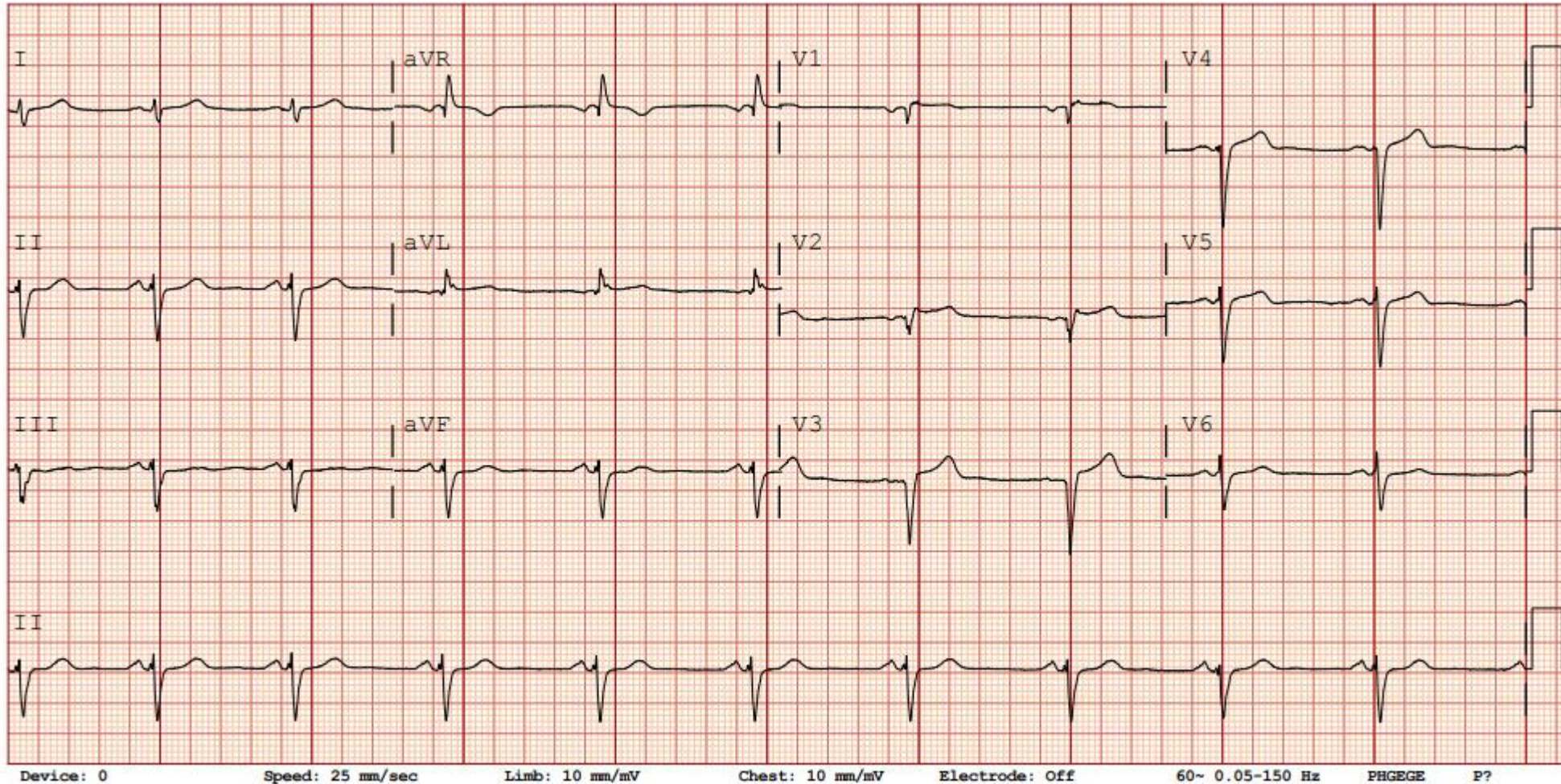
- 53 y.o. male with hypertension and untreated hyperlipidemia
- Presents to ED with waxing and waning “ripping” chest, jaw, back, and epigastric pain
- hs-Troponin 10 mg/dL → 55 mg/dL; ECG abnormal (below)
- CT-PA ordered by ED staff negative for TAA or dissection, but extensive CAC seen
- Angio recommended but consent delayed for hours until his wife (a lawyer) could be present



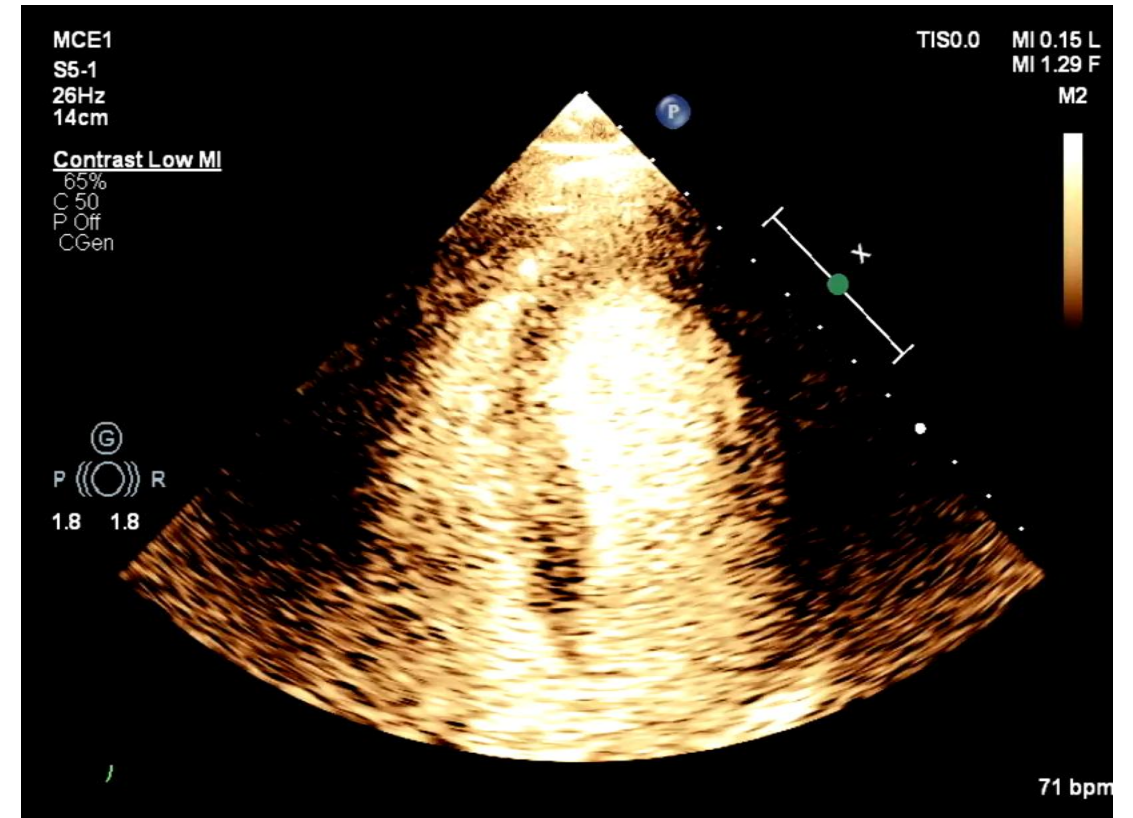
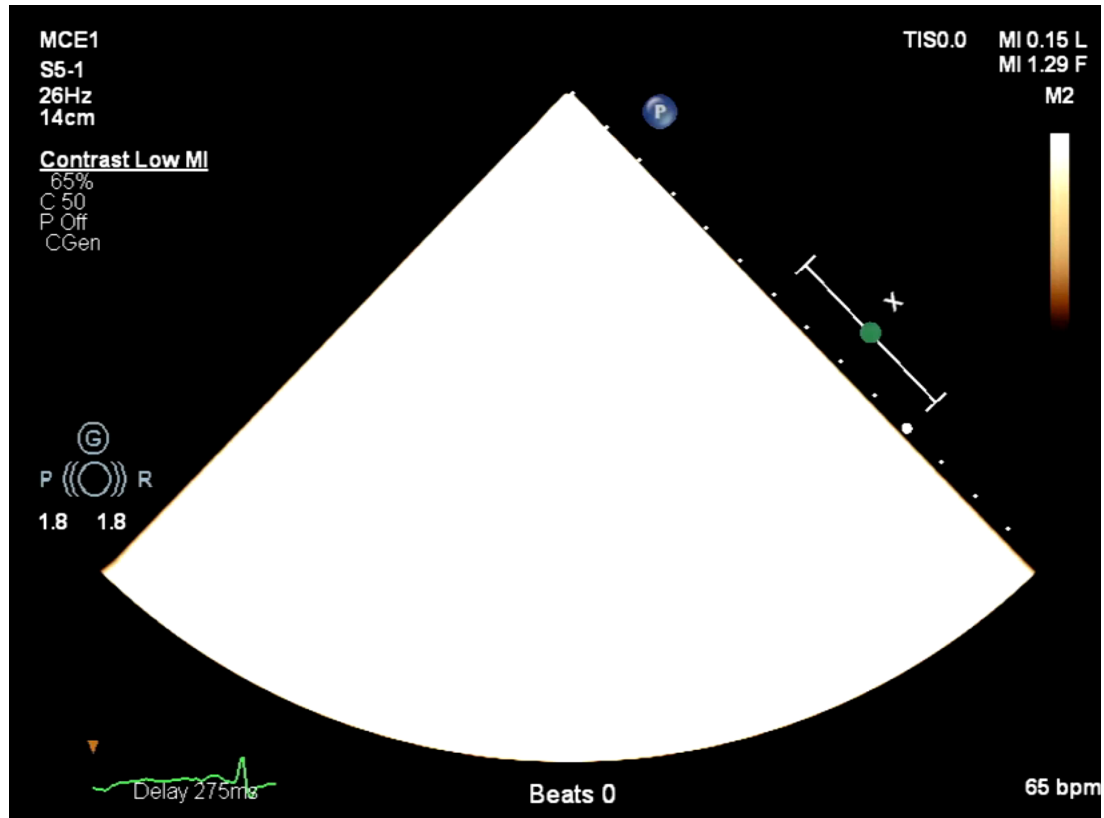
- Angiography and LAD PCI performed 8 hours after presentation



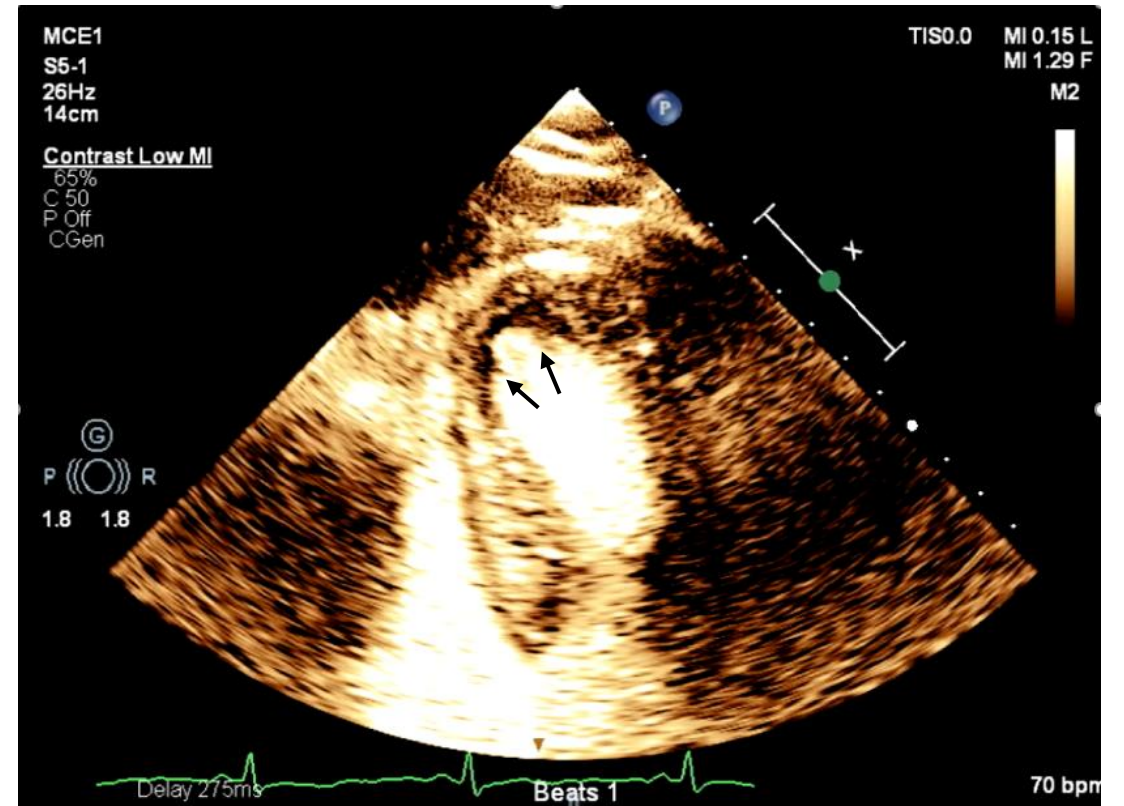
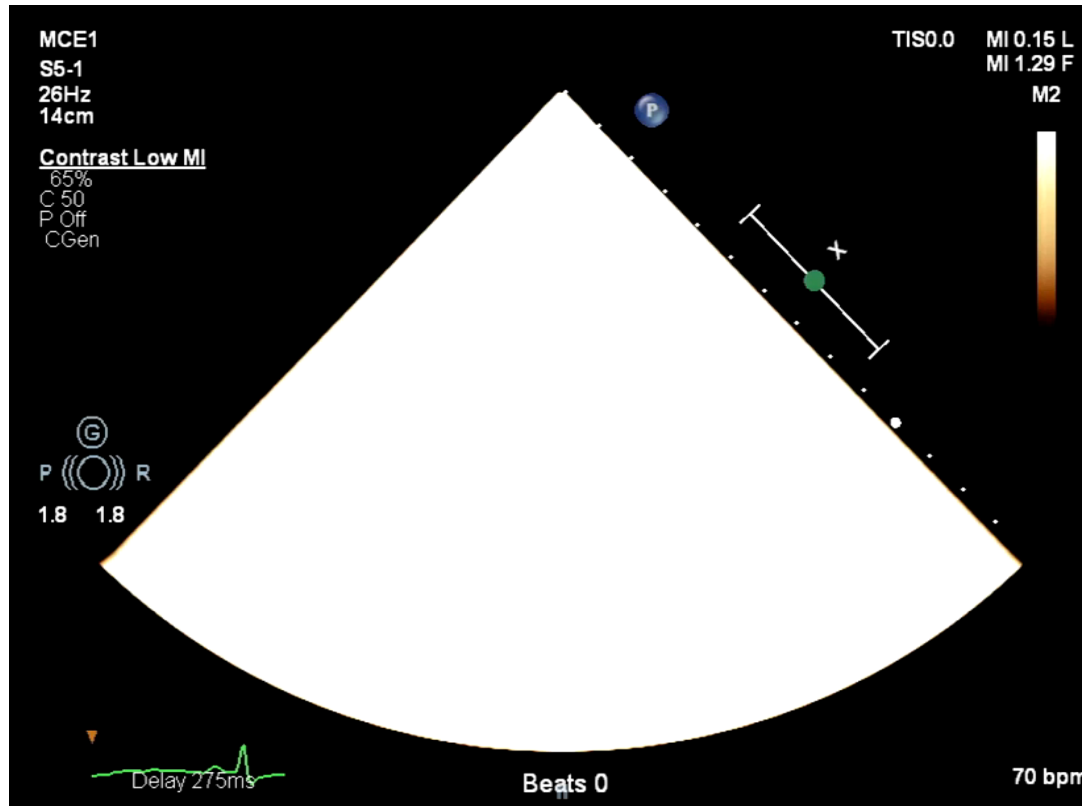
- Night after PCI, developed CP which spontaneously resolved



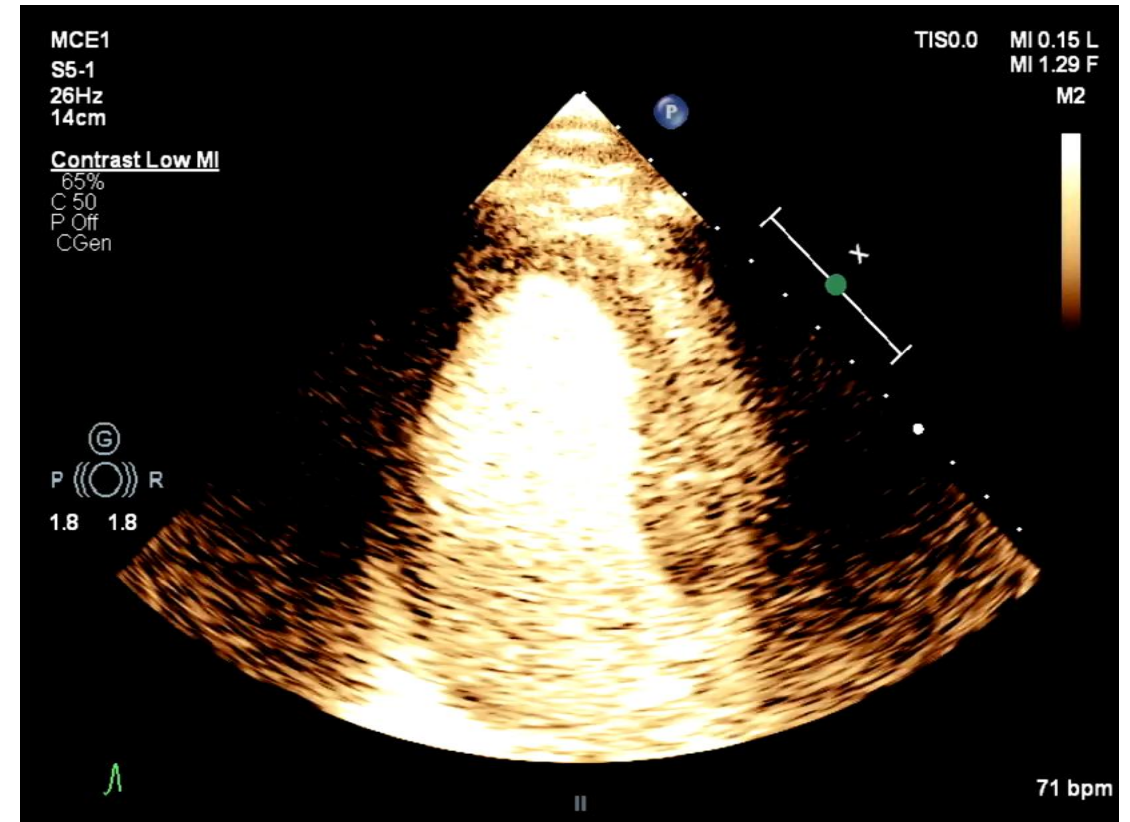
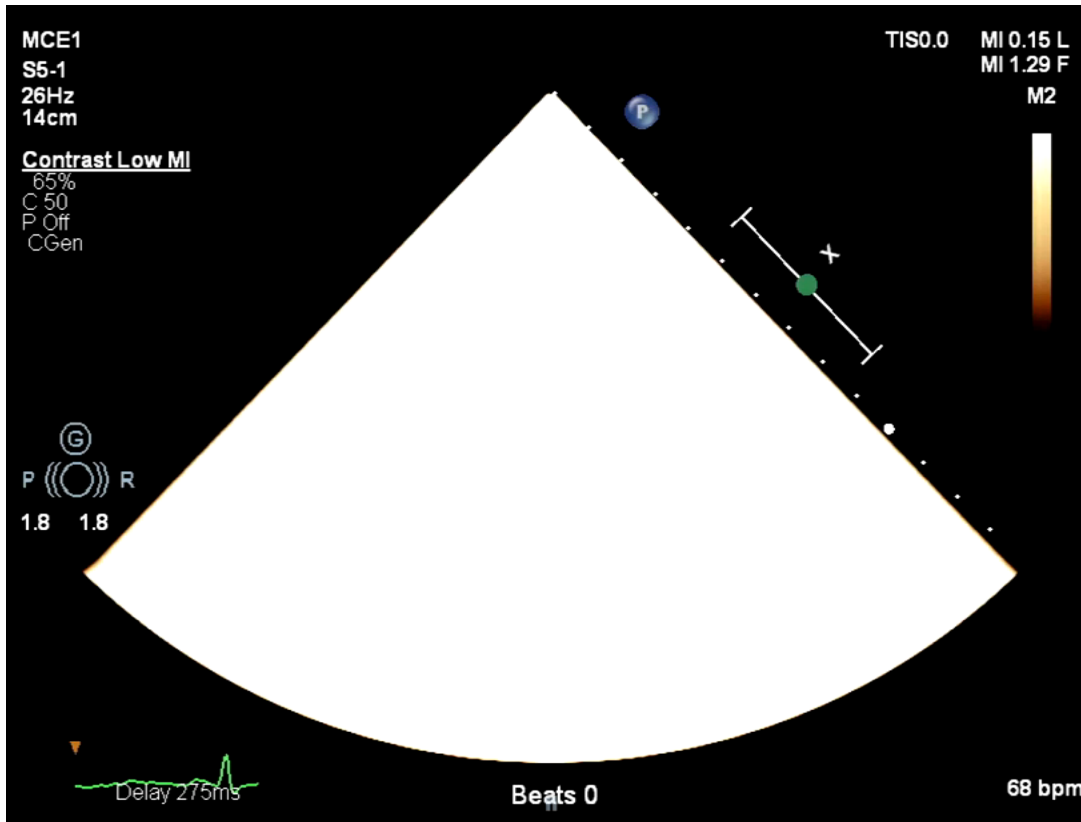
Apical 4 chamber MCE



Apical 5 chamber (ish) MCE



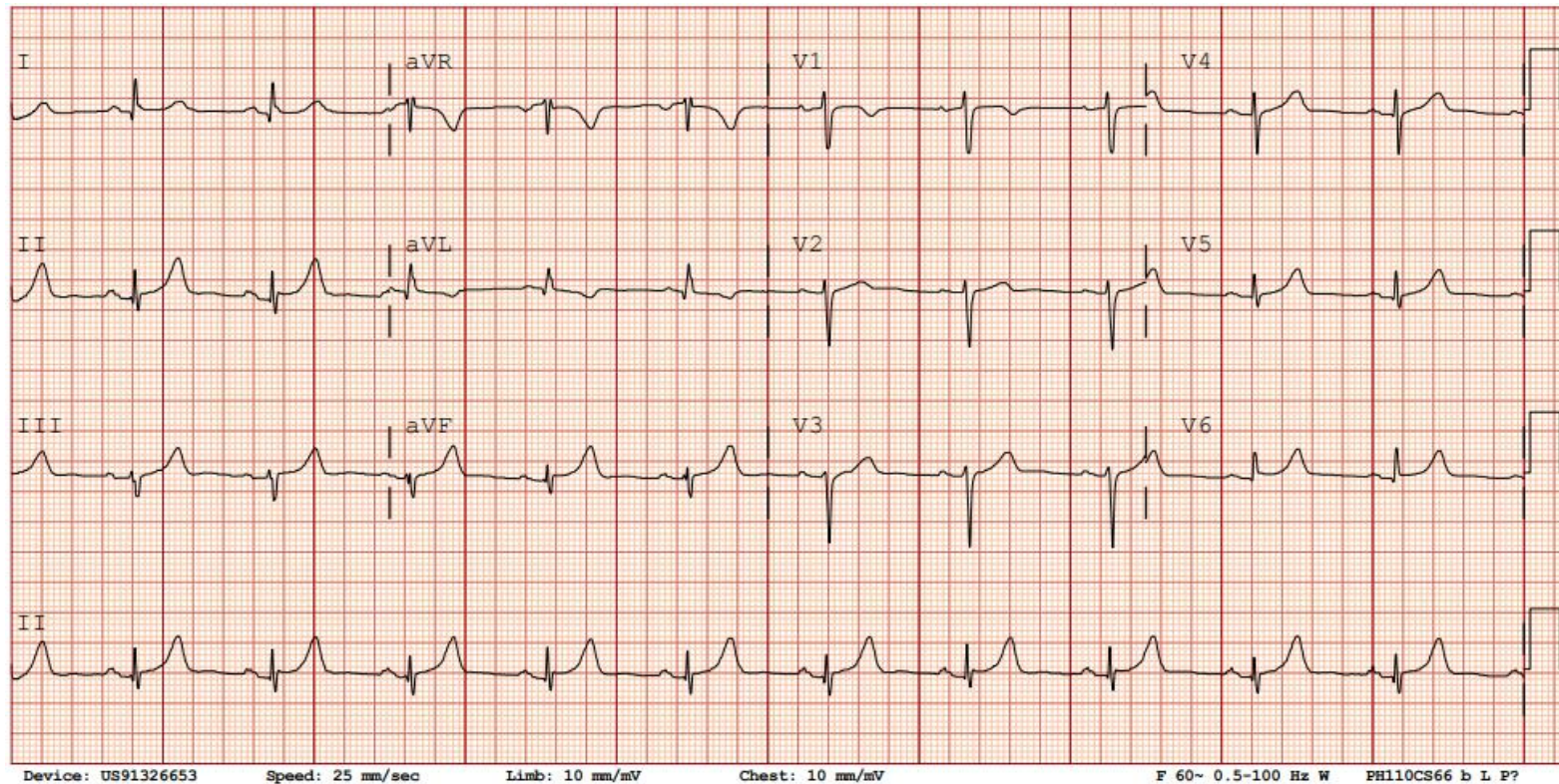
Apical 3 chamber MCE



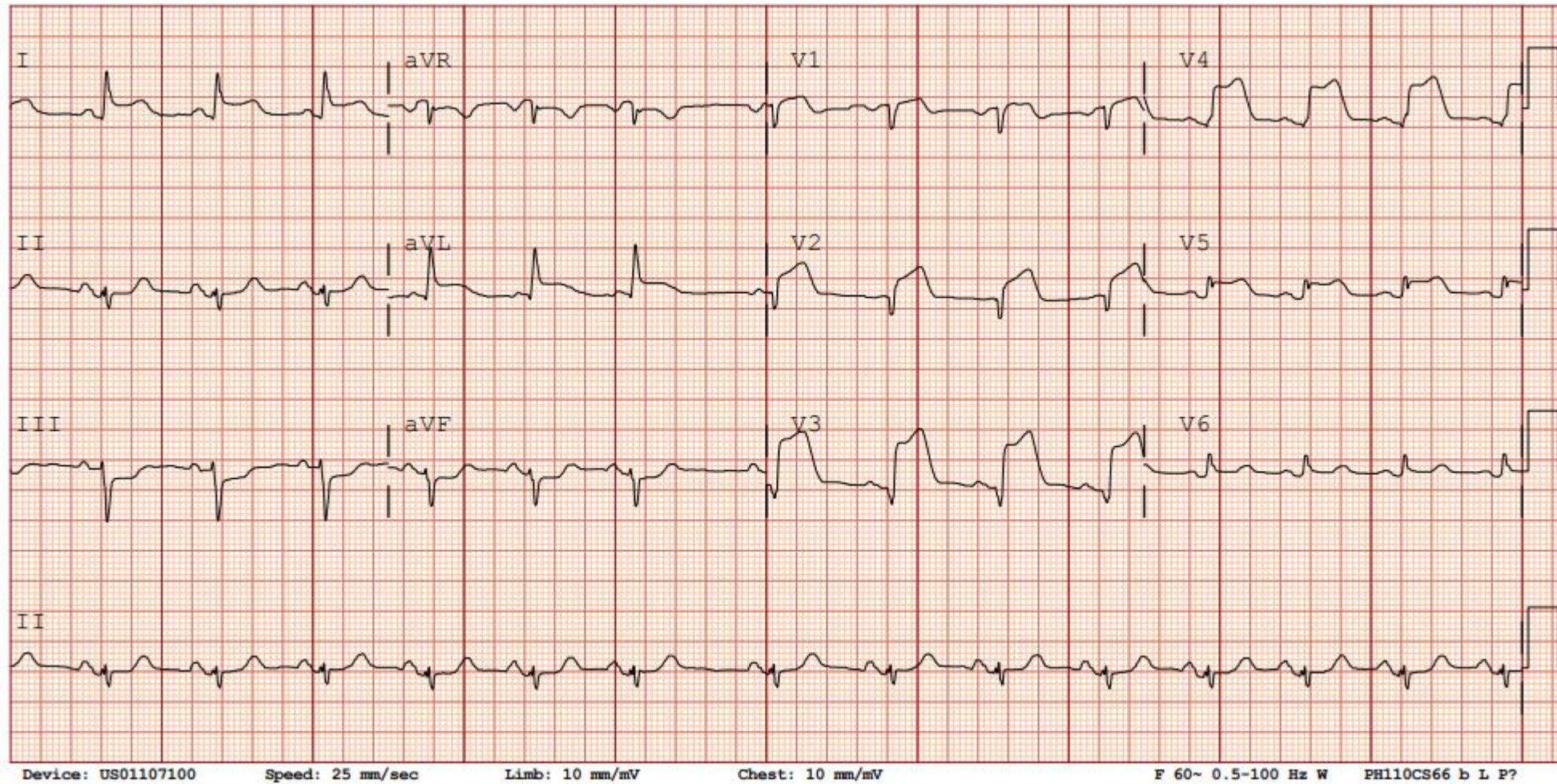
- Heparin and ntg restarted for 24 hrs with no recurrence; on GDMT and referred to cardiac rehab

Case Presentation: No Reflow?

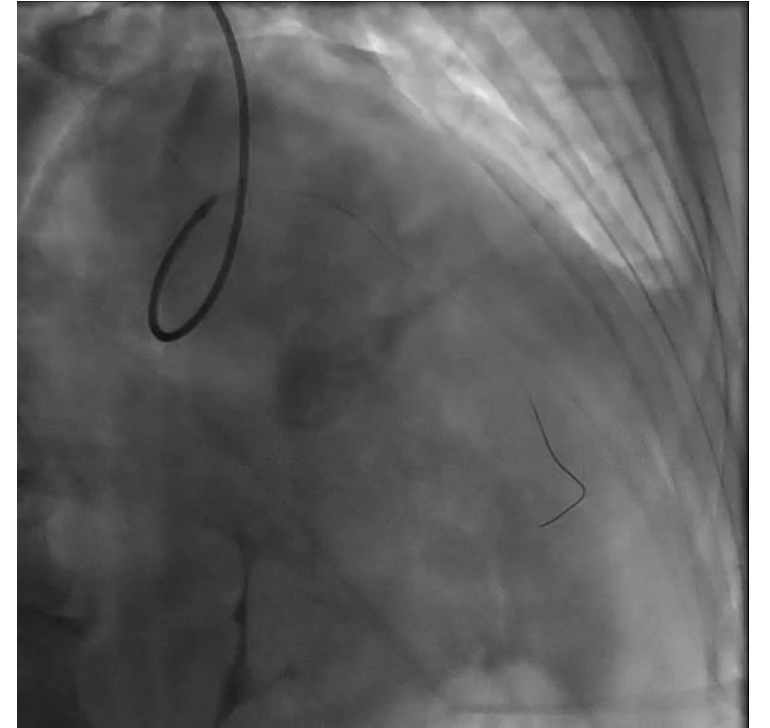
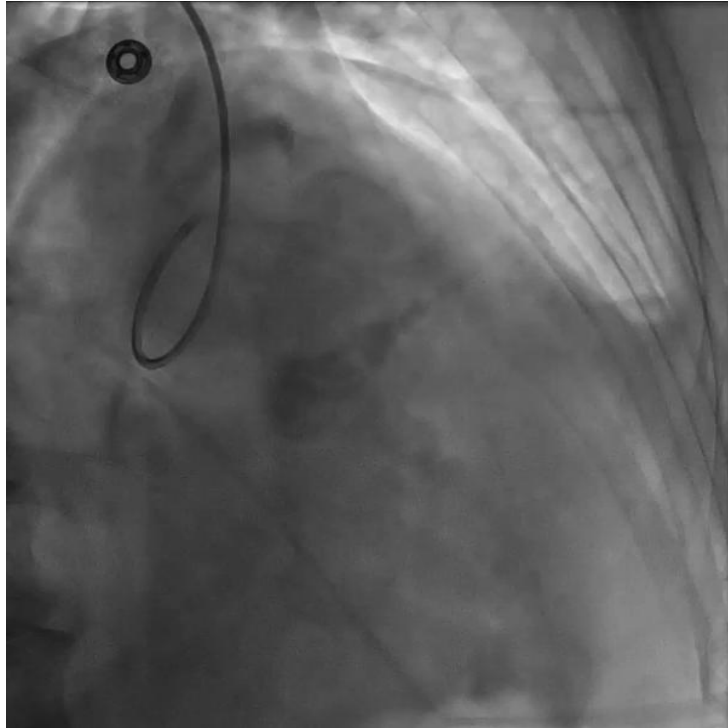
- 61 y.o. female with WPW, s/p ablation, and migraine headaches admitted with 3 days of intermittent chest pain, culminating in one severe CP episode with spontaneous resolution in ED
- Hs-Troponin 195 mg/dL
- Started on therapy for ACS with planned angiography the next day



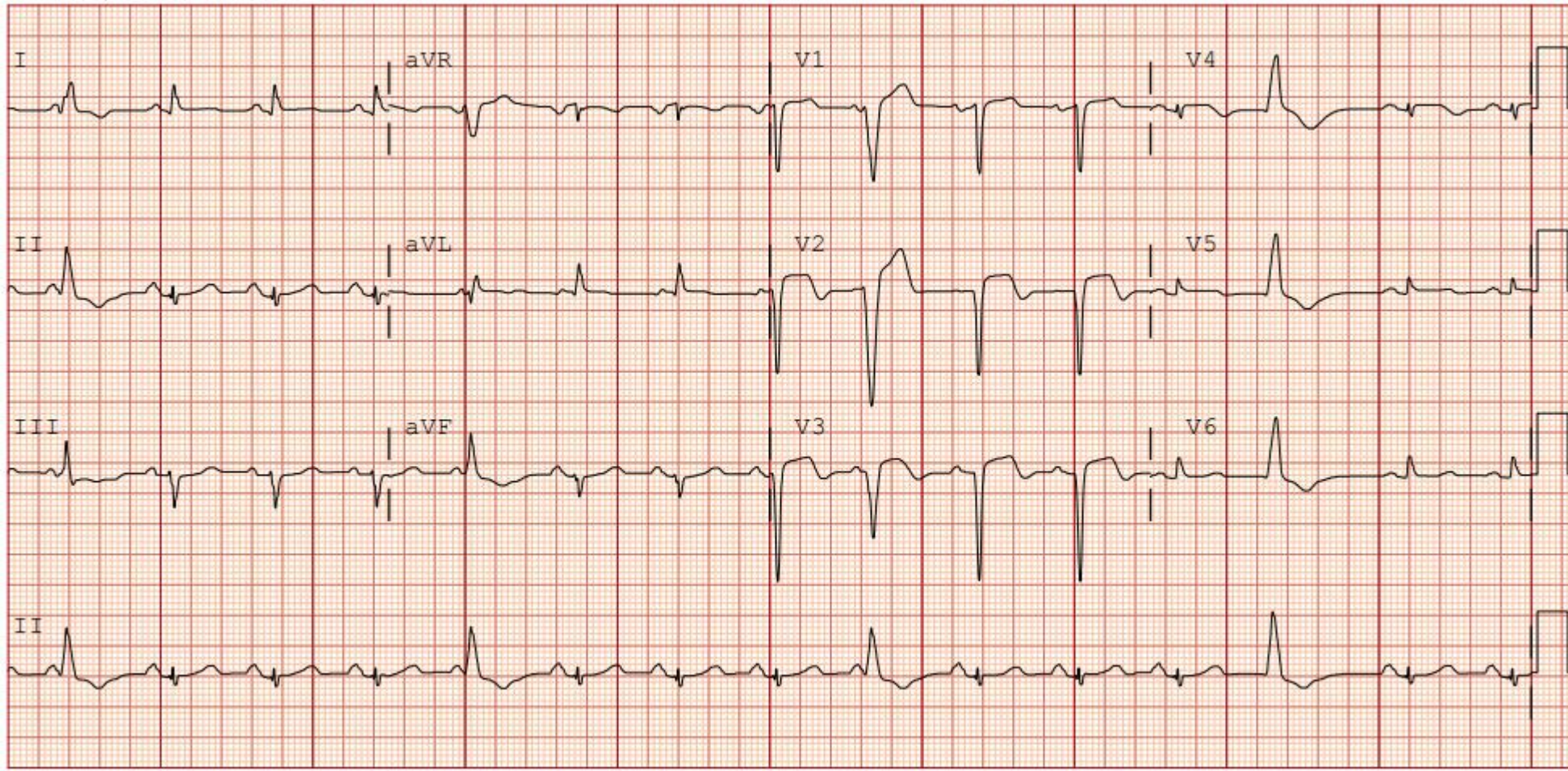
- Acute increase in chest pain in the hospital



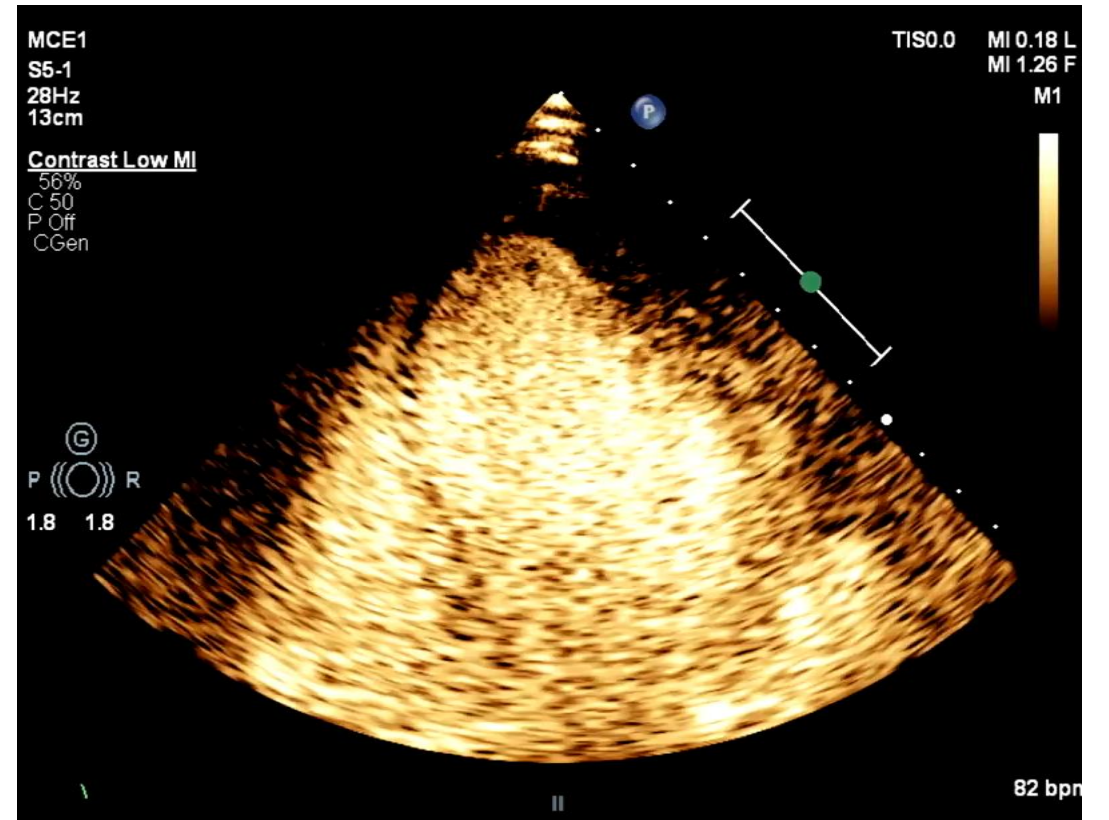
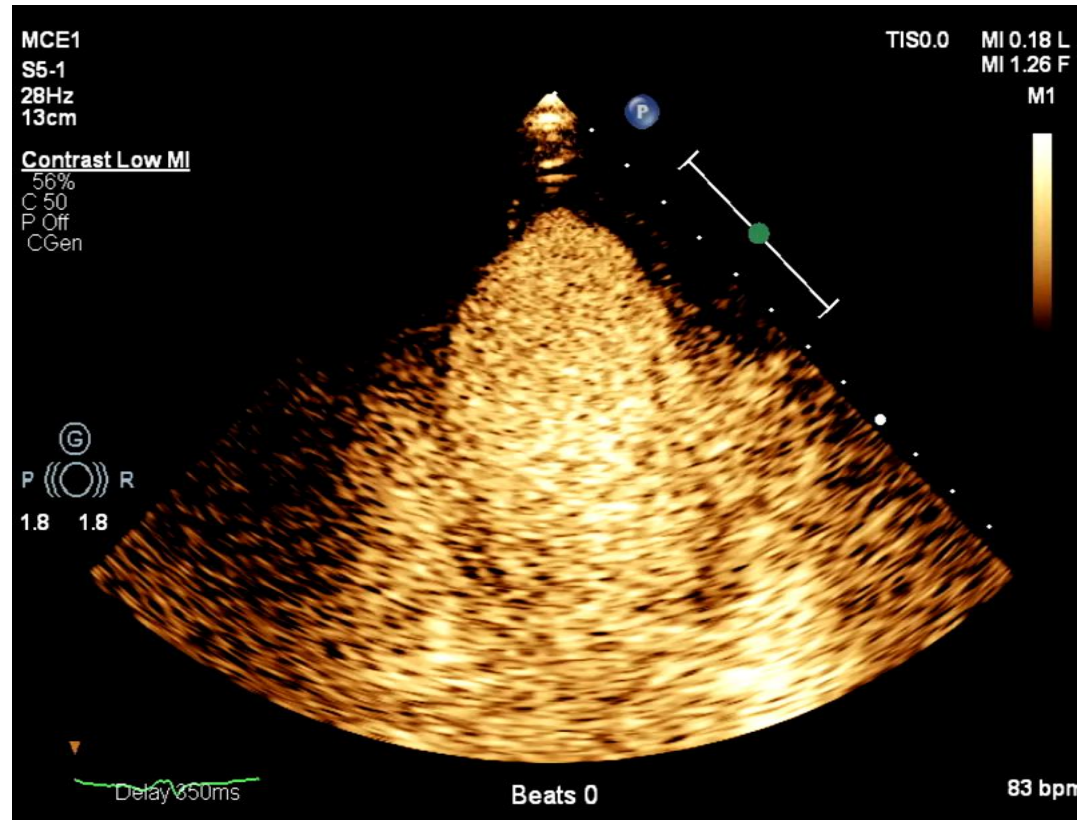
- Urgent angiography and LAD PCI performed



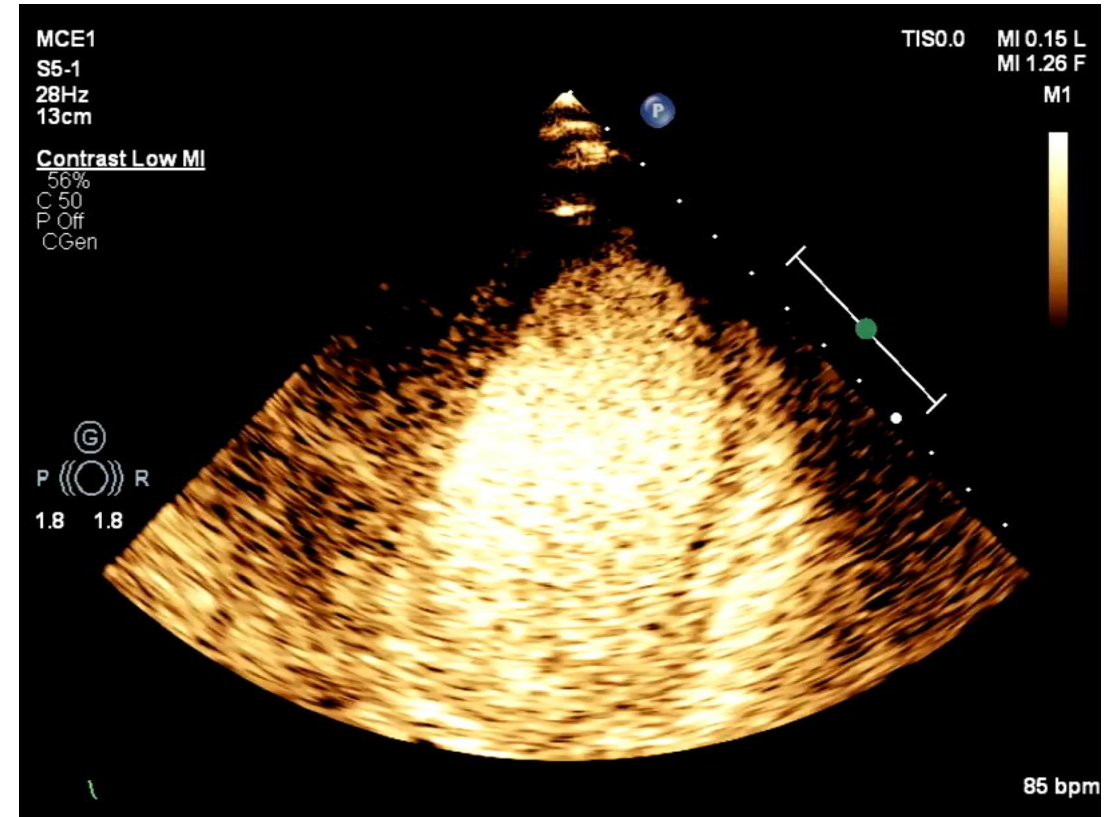
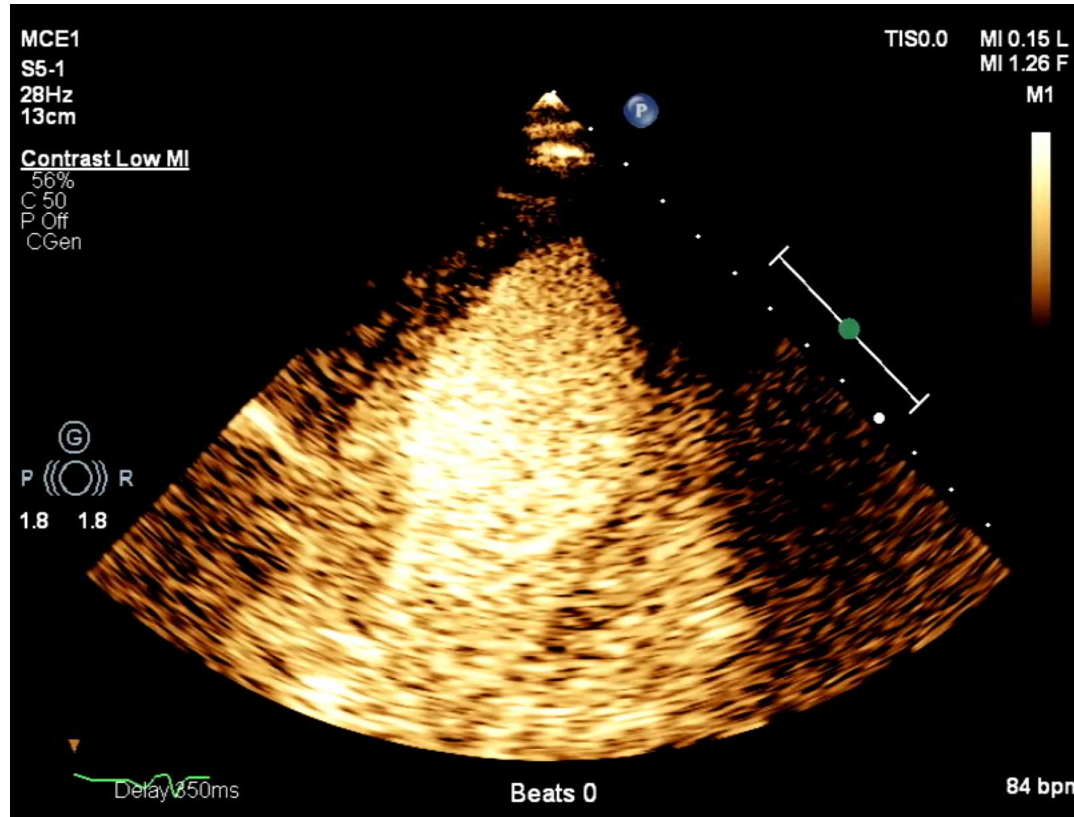
- Post-PCI severe nausea, vomiting, vague chest discomfort different than initial CP



Apical 4-chamber MCE

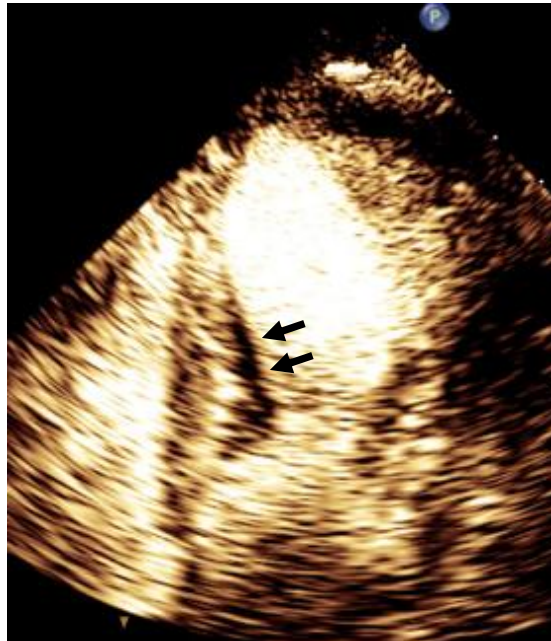
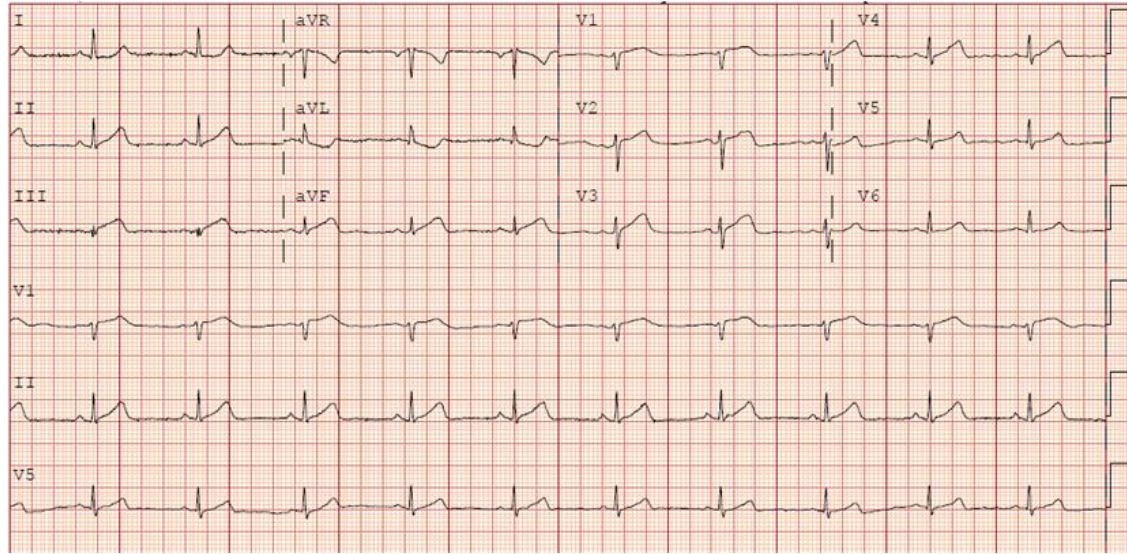


Apical 2-chamber MCE



- Heparin and ntg restarted with continued symptoms; eventually resolved after days
- Plans for f/u with heart failure team with GDMT for HFrEF; repeat echo in 4 weeks for development of aneurysm and apical thrombus

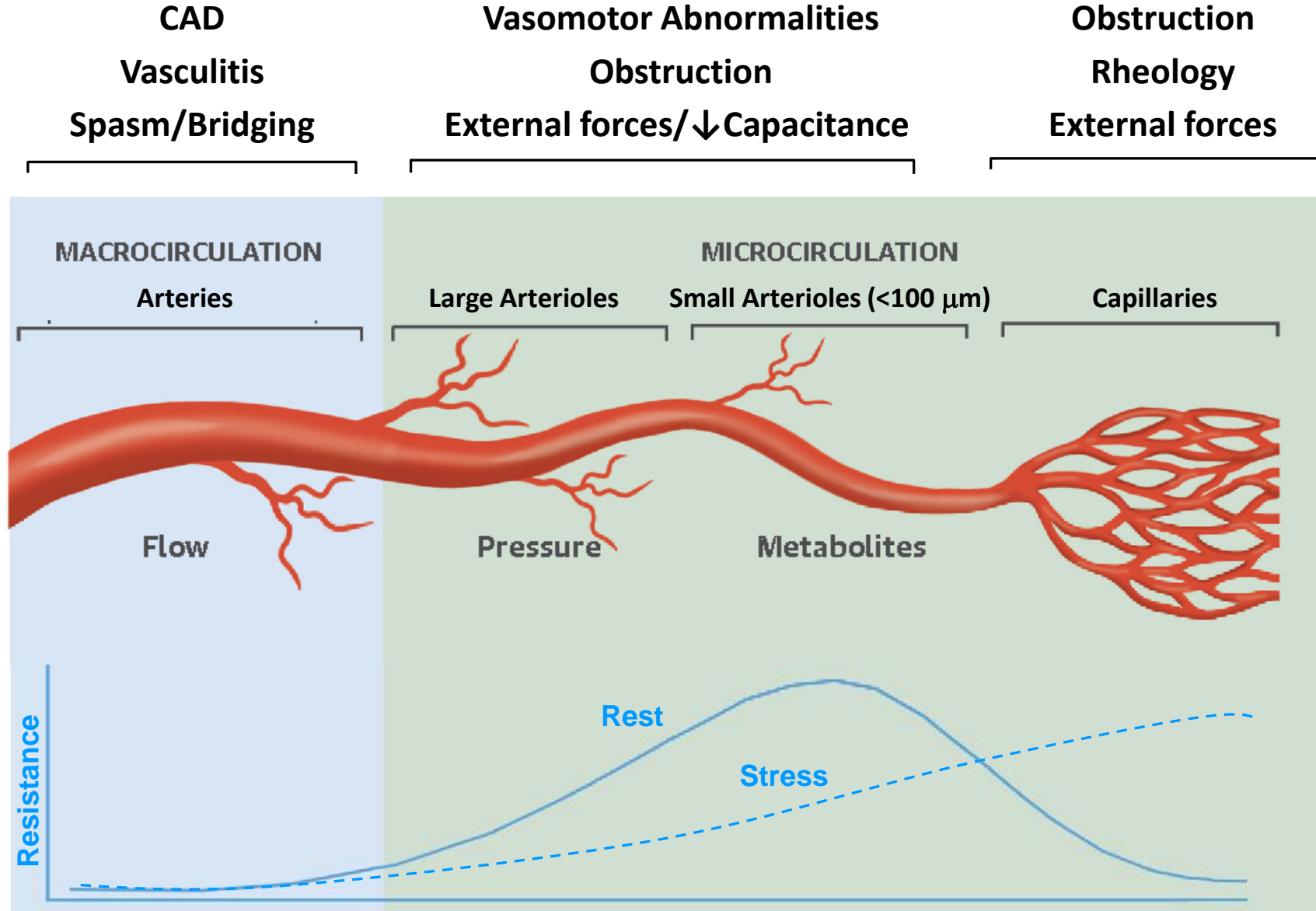
Patient 3: COVID-19 and “STEMI”



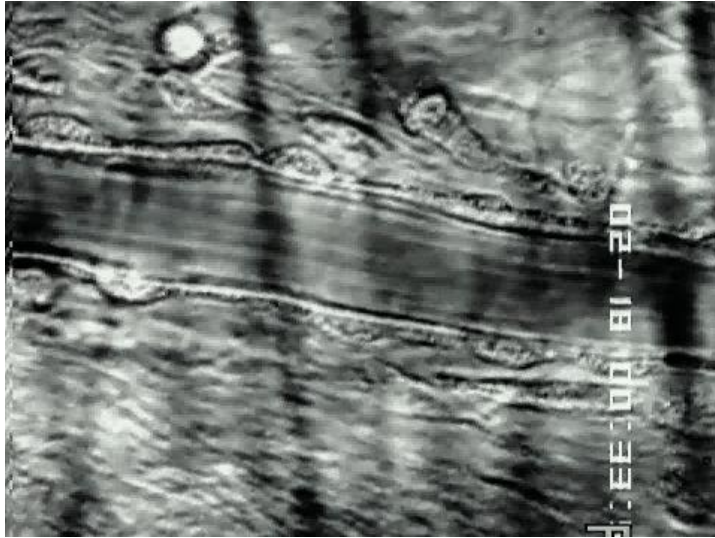
Lessons Learned

- Perfusion imaging is possible with POC echocardiography
- Assessment of myocardial perfusion enhances clinical care in a broad range of scenarios other than just diagnosis of CAD

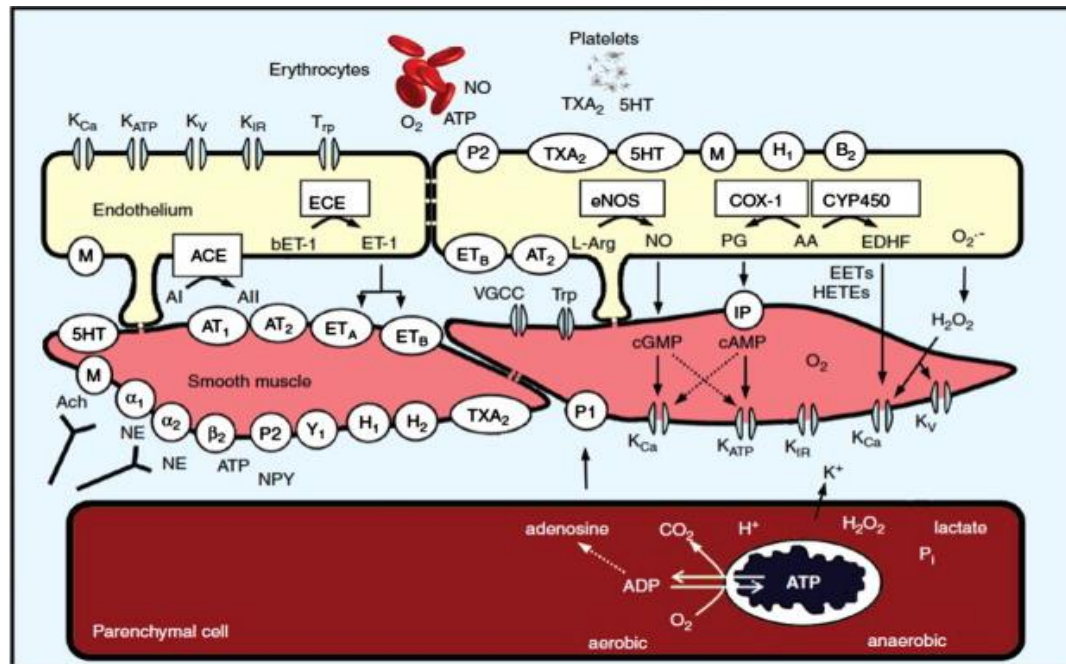
Spectrum of Microvascular Pathology



Regulation of Microvascular Tone

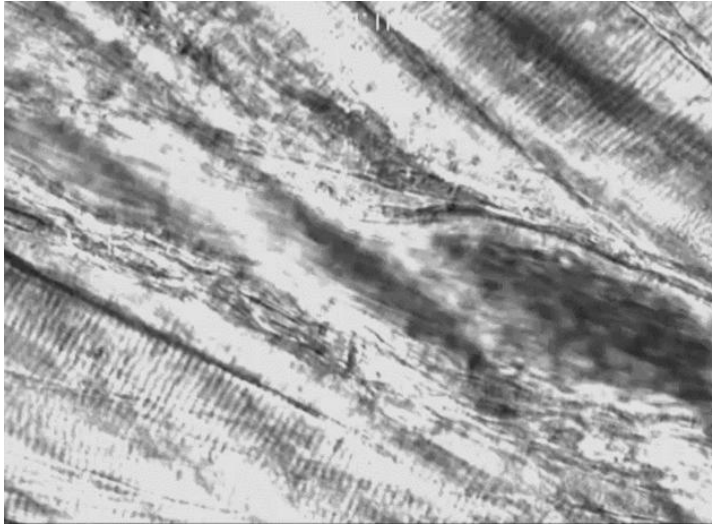


	<u>Vasodilation</u>	<u>Vasoconstriction</u>
EDVs	Nitric Oxide (NO)	Endothelin
	Adenosine	Angiotensin II
	EETs/HETEs	Thromboxane
	H ₂ O ₂	Epi/Norepi
	ATP	Dopamine
	Prostacyclin	ATP
	Bradykinin	Vasopressin
	K ⁺	Muscarinic agonists
	Histamine	ADMA
	VIP	
	Anandamide	
	Insulin, C-peptide	

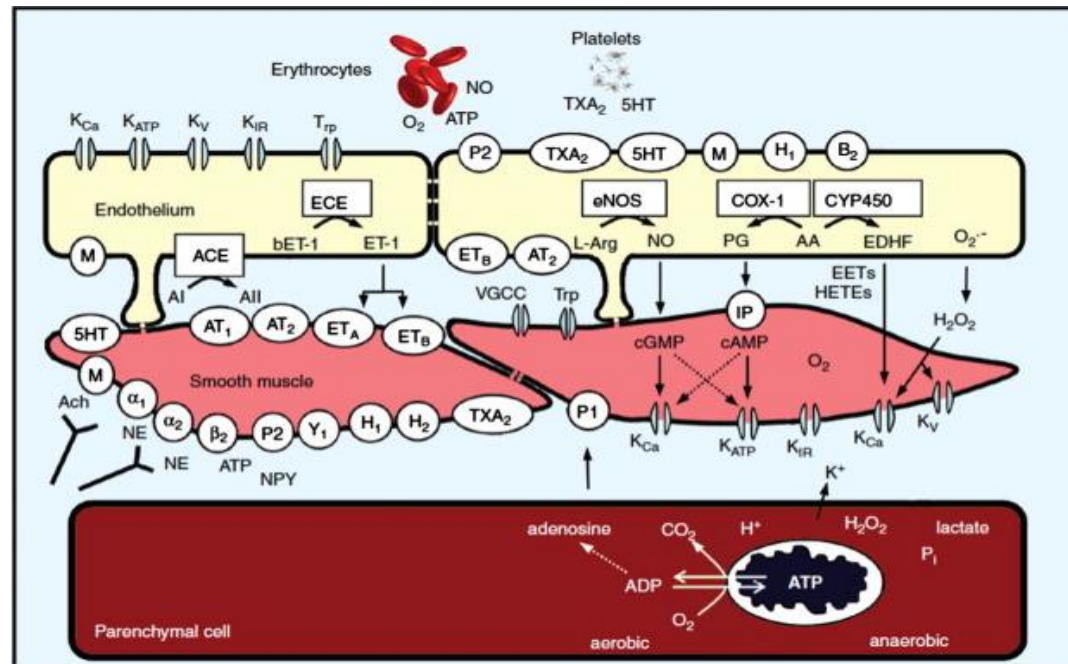


Laughlin MH, et al., Compr Physiol, 2012;2:321

Regulation of Microvascular Tone

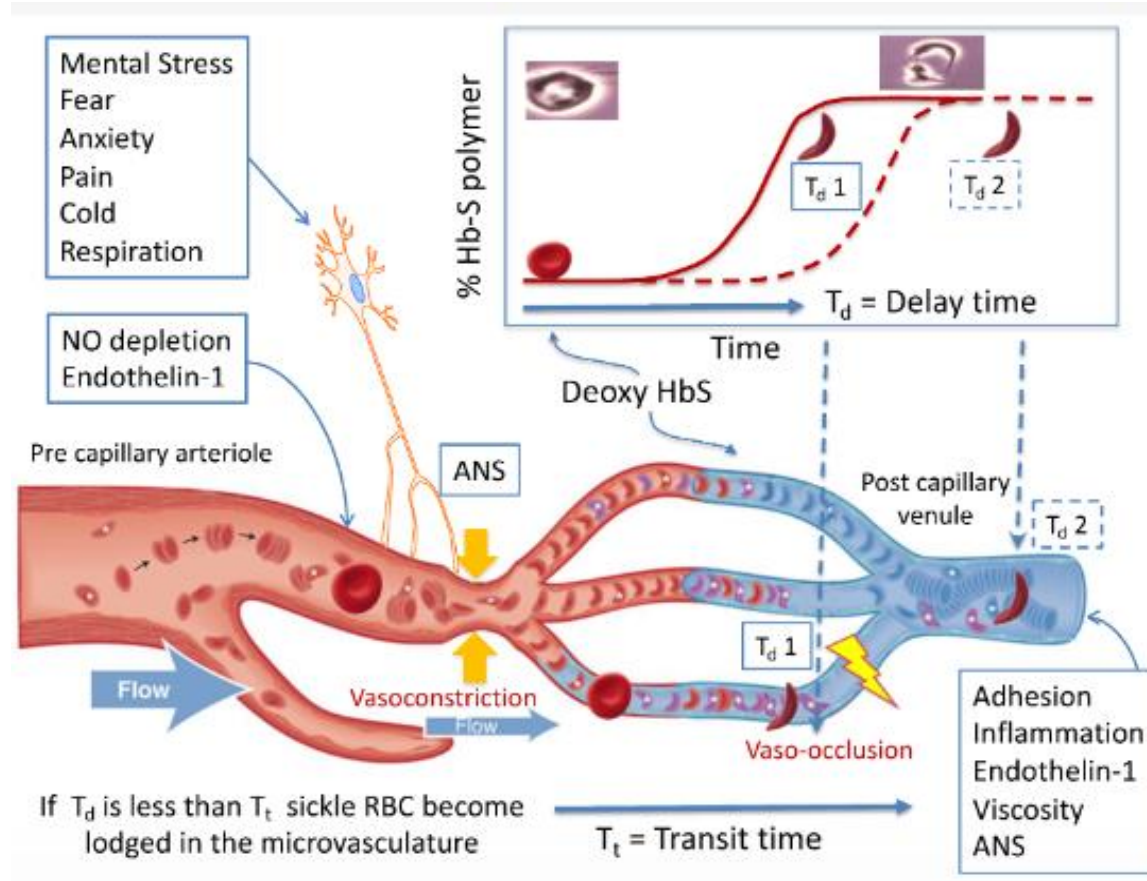


	<u>Vasodilation</u>	<u>Vasoconstriction</u>
EDVs	Nitric Oxide (NO)	Endothelin
	Adenosine	Angiotensin II
	EETs/HETEs	Thromboxane
	H ₂ O ₂	Epi/Norepi
	ATP	Dopamine
	Prostacyclin	ATP
	Bradykinin	Vasopressin
	K ⁺	Muscarinic agonists
	Histamine	ADMA
	VIP	
	Anandamide	
	Insulin, C-peptide	



Laughlin MH, et al., Compr Physiol, 2012;2:321

Spectrum of Microvascular Disease



Veluswamy S, et al., J Clin Med 2019;8:1690

Sickle Cell Dz, HUS, TTP, PNH

Obstructive

- Thrombotic angiopathy
- Inflamm./Thromboinflamm.

Rheologic

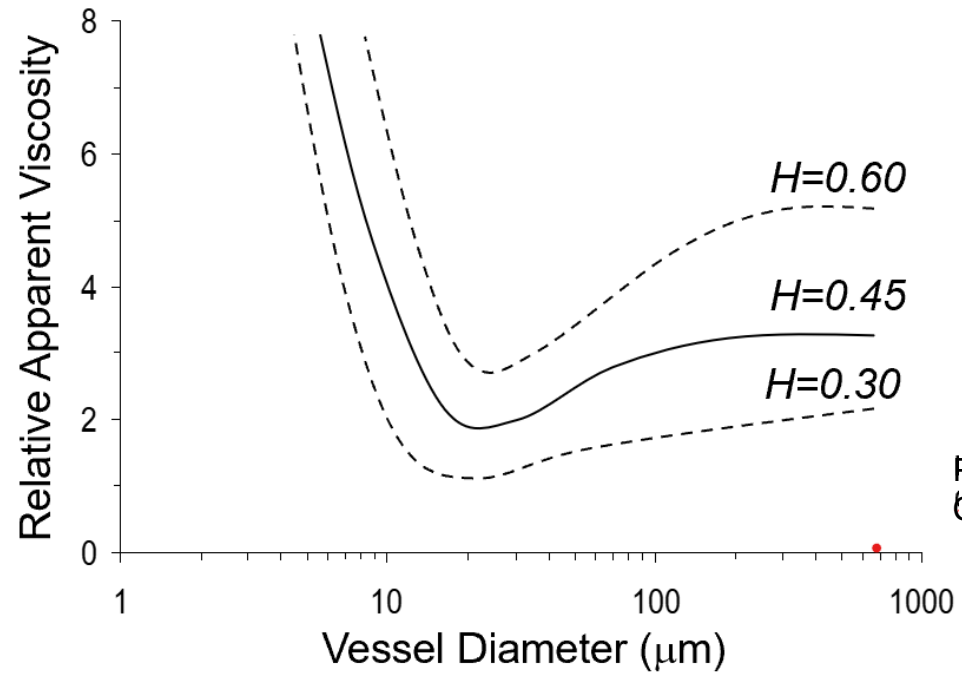
- ↓ RBC deformability
- RBC adhesiveness

Vasomotor

- ↓ Vasodilators
- ↑ Vasoconstrictors

Impaired microvascular
perfusion

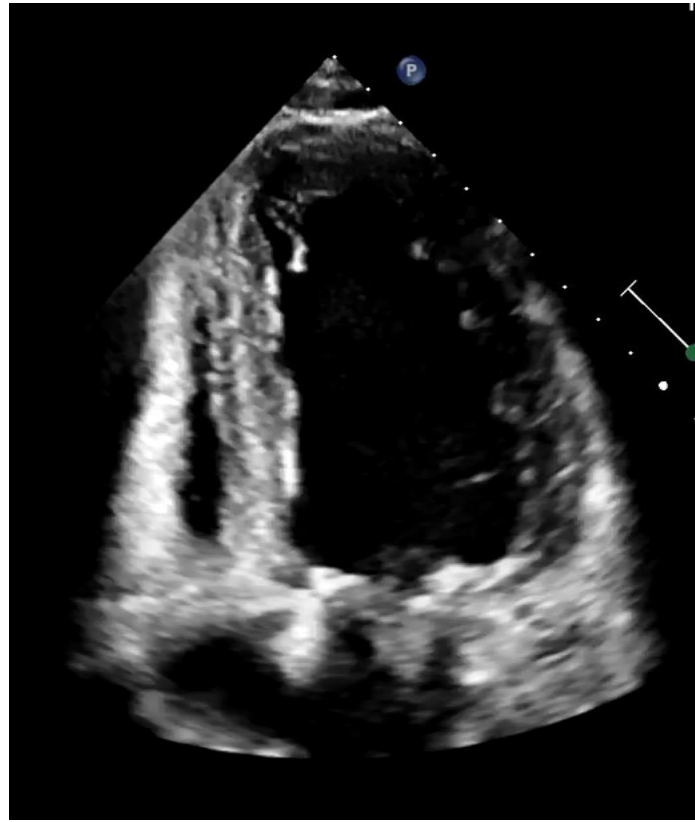
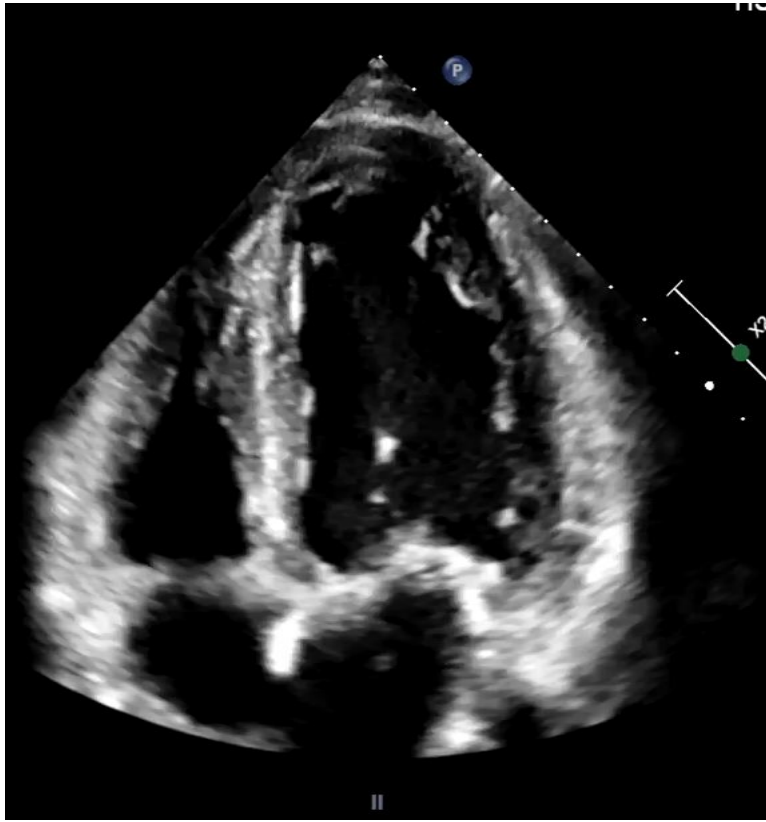
Resistance, Viscosity, and Non-Newtonian Fluids



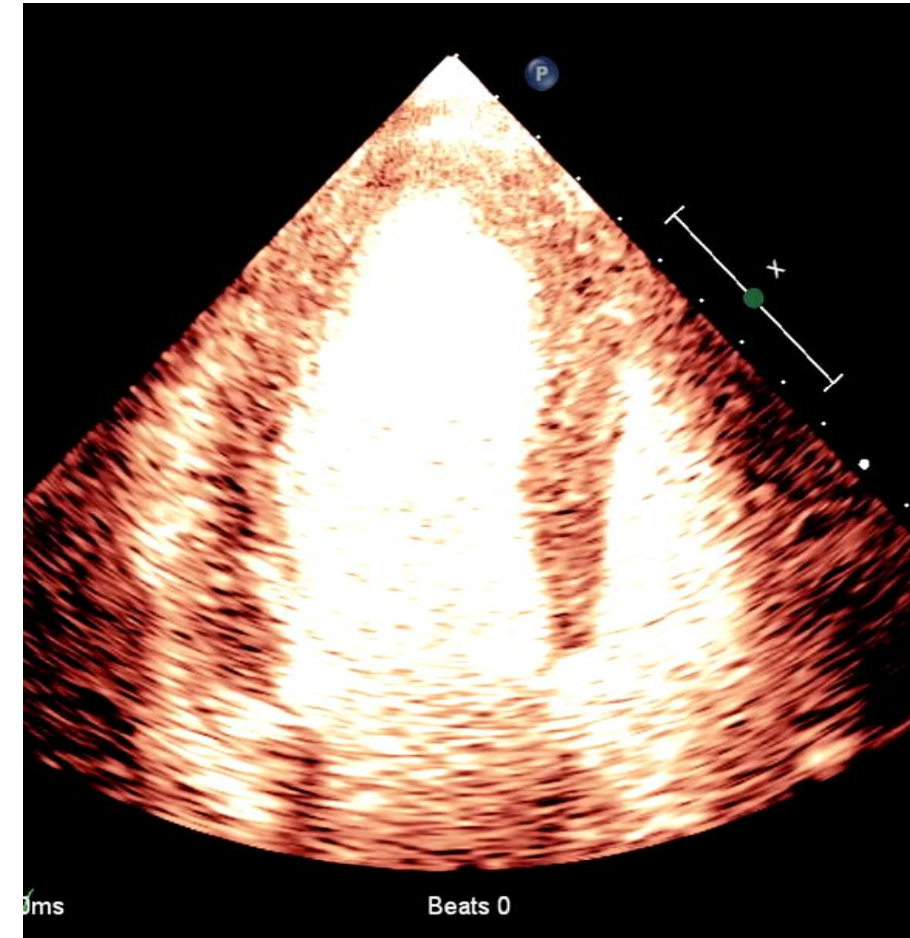
Pries A, et al.,
Cardiovasc Res 1996;32:654



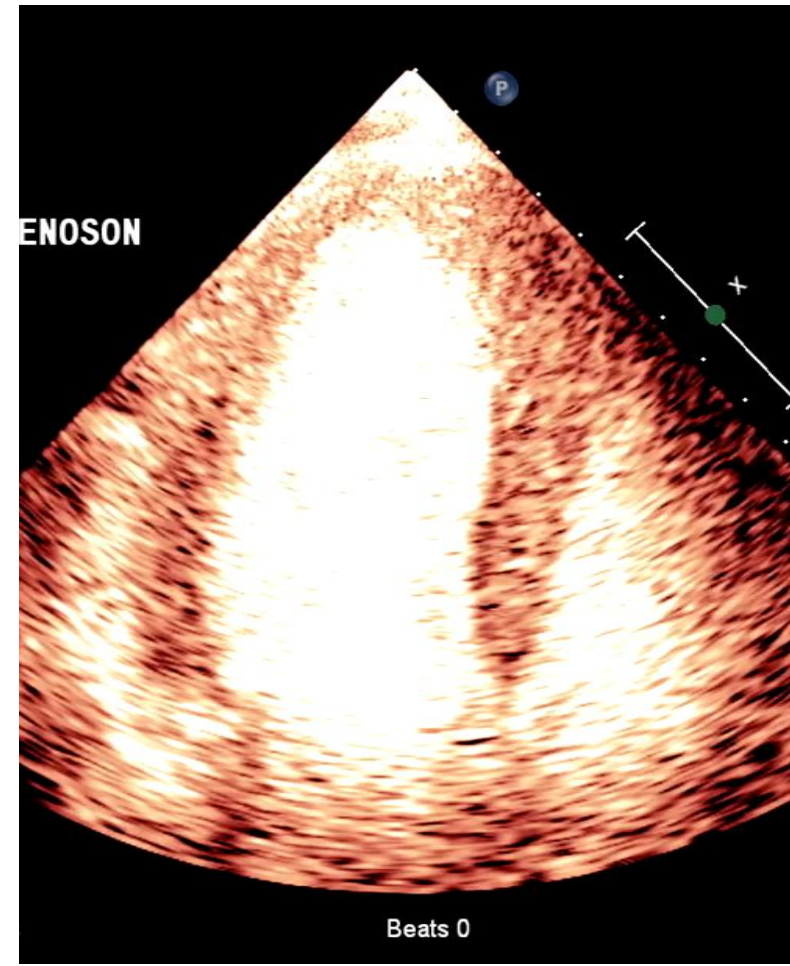
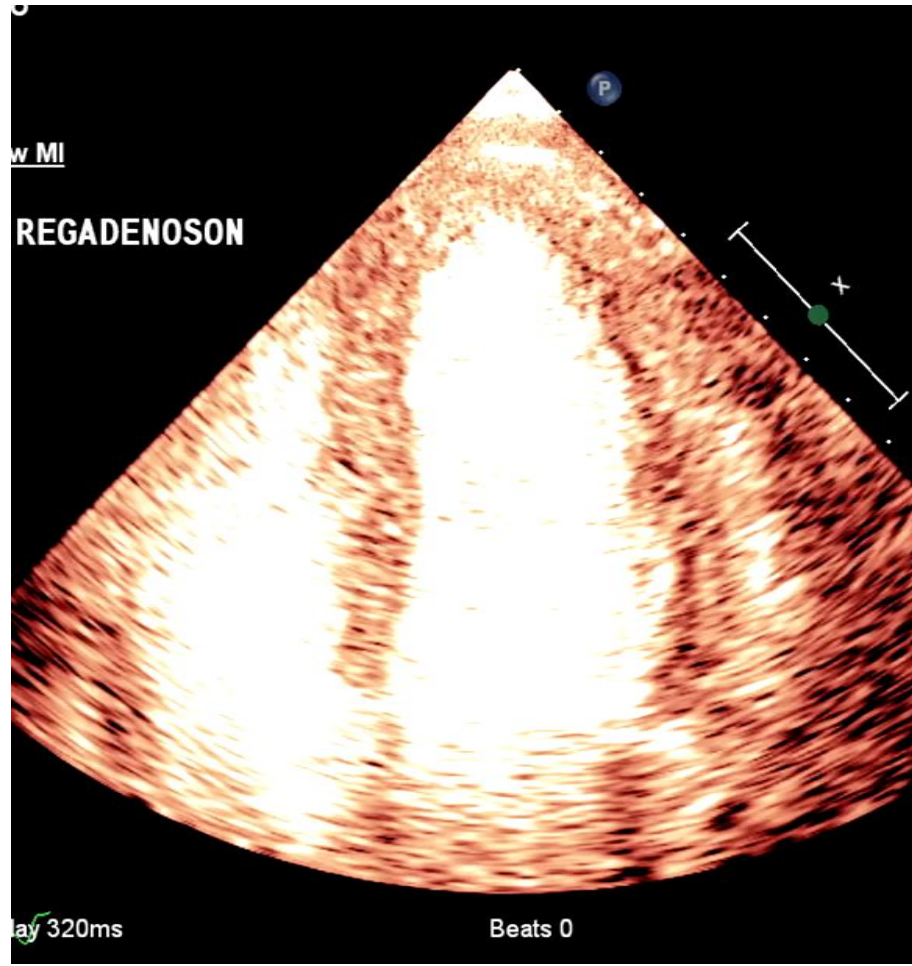
2D Echocardiography at Rest



MCE at Rest



MCE During Regadenoson Stress



Summary

- Contrast echocardiography is an essential component of a state-of-the-art echo lab and is vital for quality CV care
- MCE myocardial perfusion imaging is a clinical asset for rapid, bedside assessment of urgent diseases and assessment of the microcirculation
- MCE is particularly impactful for making individualized decisions in patients with a broad array of CV diseases