Troponin Elevation in Young People

Regional Heart and Vascular Symposium 2019
Kimberly Hayden PA-C

Objectives

1. Identify possible etiologies of troponin elevation in younger people.
2. Identify common modalities used to make diagnoses.

Case #1

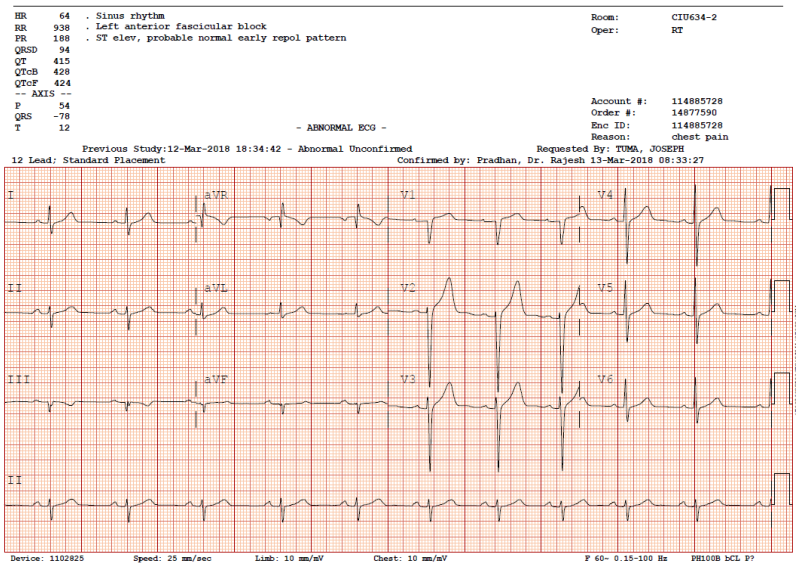
Patient was a 29-year-old male who presented to his local emergency department after a 12 to 14-hour history of ongoing chest pain which started after an intense game of basketball. At the outlying facility he was noted to have a troponin elevation of 16.0 with subtle anterior ST and T wave changes. He was transferred to Rapid City and continued to have persistent chest discomfort.

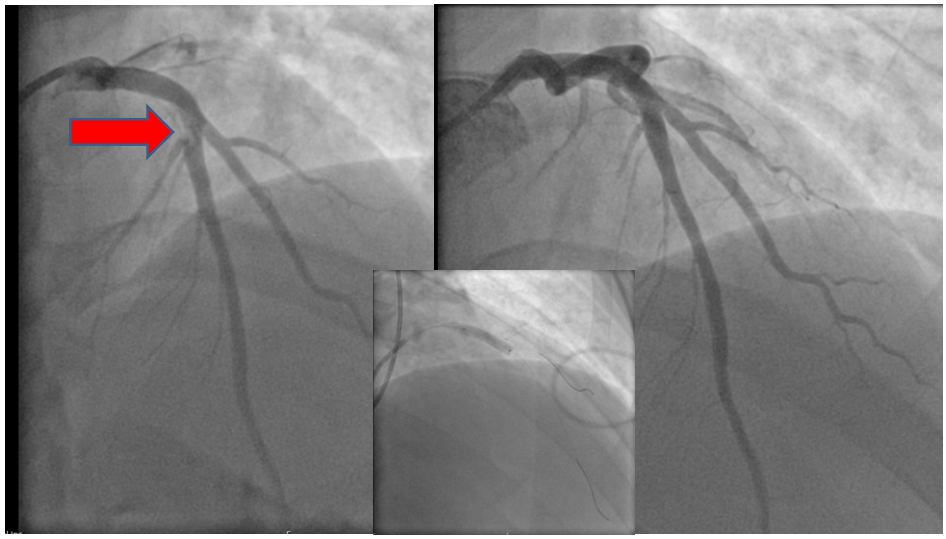
Troponin I Blood, Venous

Status: **Final result** Visible to patient: **Yes (MyChart)**

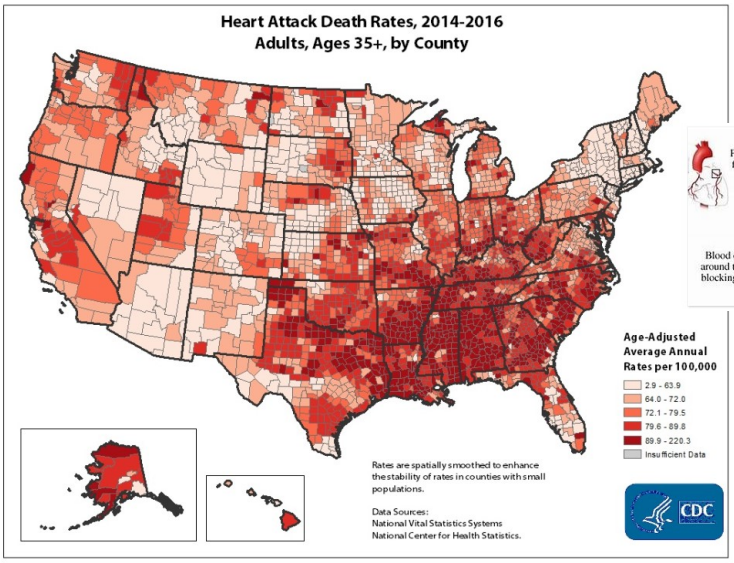
Newer results are available. Click to view them now.

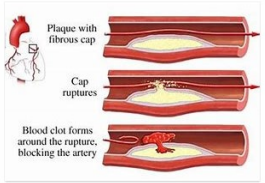
	Ref Range & Units	1yr ago
Troponin I	<0.030 ng/mL	11.035 ↑
Resulting Agency		RCH





Left Anterior Descending: Left anterior descending arises from the left main and courses along the anterior interventricular groove. A hazy, thrombotic 70% stenosis is noted in the proximal LAD just at the takeoff of a large first diagonal and a moderate sized septal penetrator. This has a characteristic appearance of ruptured plaque with overlying thrombus. Flow is TIMI grade III. The remainder the vessel is very large and otherwise normal. The diagonal branches are all normal.





alamy.com

Most common cause of ACS.

Reminder: Approximately 15% risk of death

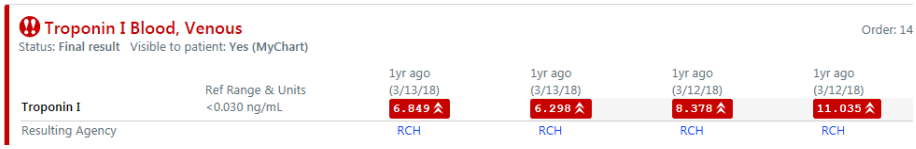
Coronary heart disease accounts for 370,000 deaths annually
Annually 735,000 Americans have a heart attack.
525,000 are first heart attacks
210,000 will have their second or more heart attack.

In the United States someone has a heart attack every 40 seconds. Every minute more than 1 person will die from a heart disease related event.

Accelerated atherosclerosis: An autopsy study of 760 victims of accidents, suicides, or homicides of patients aged 15 to 34 years noted advanced coronary atheroma in 2% of males aged 15–19, and 20% of males age 30–34. There was no incidence of coronary atheromas in females age 15–19, but it was present in 8% of women aged 30–34.

Mc Gill HC, McMahan CA, Zieske AW, et al. Association of coronary heart disease risk factors with microscopic qualities of coronary atherosclerosis in youth. Circulation2000;102:375.Google Scholar

Patient was discharged home on dual antiplatelet therapy with aspirin and Effient. He was initiated on atorvastatin as well as carvedilol. He has done well since.

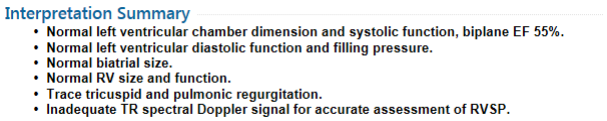


Troponin I Blood, Venous

Order: 14

Status: Final result Visible to patient: Yes (MyChart)

	Ref Range & Units	1yr ago (3/13/18)	1yr ago (3/13/18)	1yr ago (3/12/18)	1yr ago (3/12/18)
Troponin I	<0.030 ng/mL	6.849 ^^	6.298 ^^	8.378 ^^	11.035 ^^
Resulting Agency		RCH	RCH	RCH	RCH

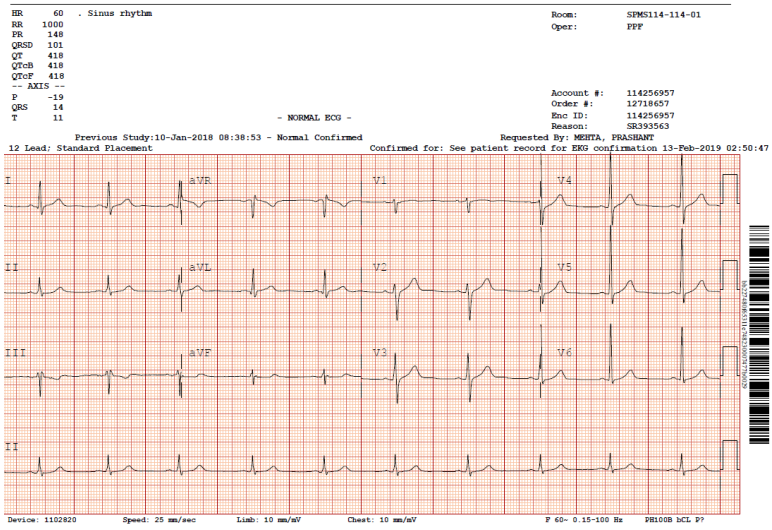


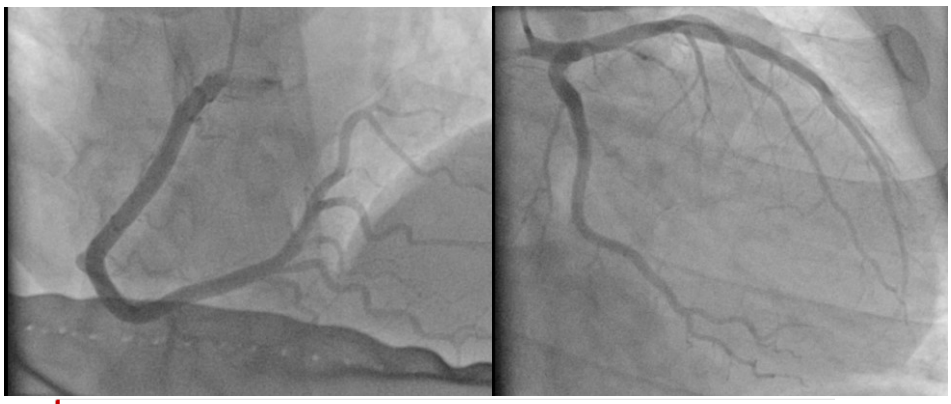
Interpretation Summary

- Normal left ventricular chamber dimension and systolic function, biplane EF 55%.
- Normal left ventricular diastolic function and filling pressure.
- Normal biatrial size.
- Normal RV size and function.
- Trace tricuspid and pulmonic regurgitation.
- Inadequate TR spectral Doppler signal for accurate assessment of RVSP.

Case #2

Patient was a 32-year-old male who presented to an urgent care after he developed severe burning pain in his right chest which radiated down his right arm and into his neck and jaw on both sides. Earlier in the morning he had been exercising per his usual CrossFit training that he does on a daily basis. His initial troponin at the urgent care was 0.248 and he was instructed to present to the emergency department. His troponin at the outlying emergency department was 1.5. He was then transferred to Rapid City Hospital for further evaluation. His pain lasted for over 2 hours until he was given sublingual nitroglycerin in the ambulance on transfer to Rapid City. History includes a family history of premature CAD. He was noted to have an LDL cholesterol of 147. No other cardiac risk factors.





Troponin I Blood, Venous

Status: **Final result** Visible to patient: **No (Inaccessible in MyChart)**

Order: 1

	Ref Range & Units	1yr ago (1/11/18)	1yr ago (1/11/18)	1yr ago (1/10/18)	1yr ago (1/10/18)	1yr ago (1/10/18)
Troponin I	<0.030 ng/mL	1.520 ↑↑	2.186 ↑↑	2.603 ↑↑	1.517 ↑↑	0.248 ↑
Resulting Agency		RCH	RCH	RCH	SPH LAB	SPH LAB

Patient was initiated on diltiazem for probable coronary vasospasm.

Case #3

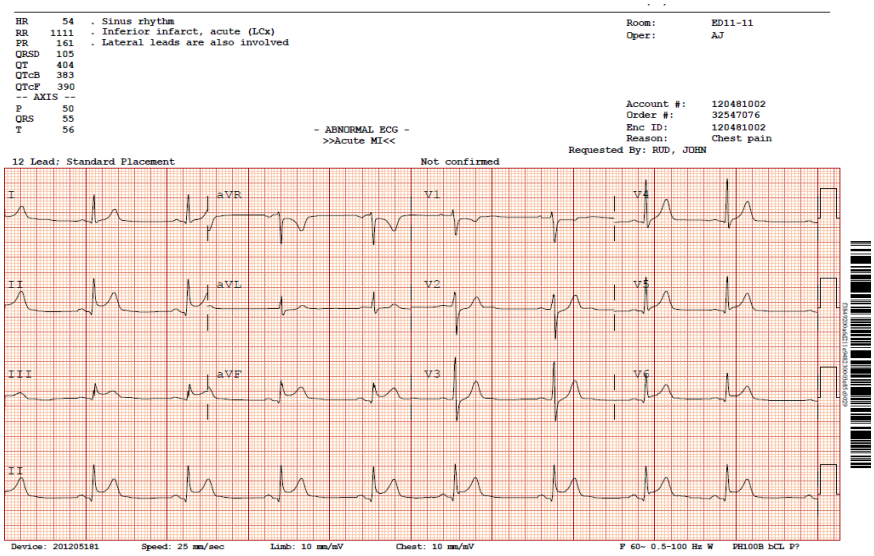
Patient is a 32-year-old male who presented with chest pain. He woke up from sleep and was experiencing substernal severe crushing chest pain with diaphoresis. He had some radiation to the left arm. His coronary risk factors include ongoing tobacco use and a family history of early coronary artery disease. His father had passed away from a myocardial infarction at the age of 38. He has otherwise been in his normal state of health with the exception of a febrile illness 10 to 14 days prior.

Troponin I Blood, Venous

Status: **Final result** Visible to patient: **Yes (MyChart)**

Newer results are available. Click to view them now.

	Ref Range & Units	1mo ago
Troponin I	<0.030 ng/mL	2.108 ^^
Resulting Agency		RCH



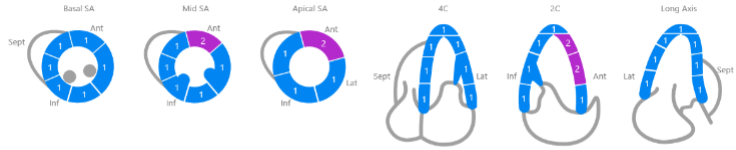
Echocardiogram

Interpretation Summary

- Normal left ventricular cavity size and wall thickness.
- Mild global and regional wall motion abnormalities as outlined below, EF 43%.
- Normal left ventricular diastolic function.
- Normal atrial dimensions bilaterally.
- Right ventricular systolic function is mildly hypokinetic.
- Normal valvular morphologies and function.
- There is no evidence of pulmonary hypertension. Estimated RVSP 26 mmHg.

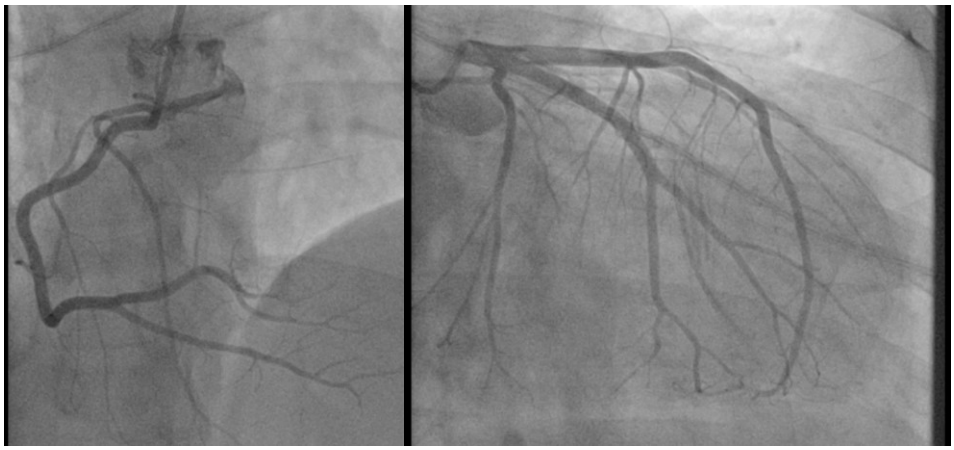
Wall Scoring

Baseline Score Index: **1.12**

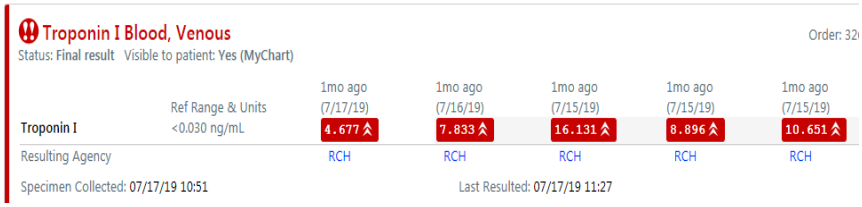


The following segments are hypokinetic: mid anterior and apical anterior.
All other segments are normal.
Mild global and regional wall motion abnormalities as outlined.

1 Hyperkinesis 1 Normal 2 Hypokinesis 3 Akinesis 4 Dyskinesis



Follow-up echocardiogram 1 month later demonstrated a normal ejection fraction with no regional wall motion abnormalities. The patient was discharged with a diagnosis of acute myocarditis likely related to the febrile illness he had experienced 1 to 2 weeks prior.



Troponin I Blood, Venous

Order: 32

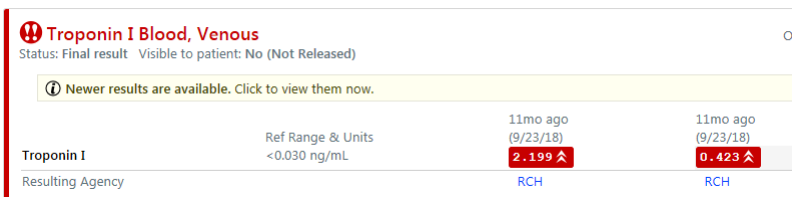
Status: Final result Visible to patient: Yes (MyChart)

	Ref Range & Units	1mo ago (7/17/19)	1mo ago (7/16/19)	1mo ago (7/15/19)	1mo ago (7/15/19)	1mo ago (7/15/19)
Troponin I	<0.030 ng/mL	4.677 ↑↑	7.833 ↑↑	16.131 ↑↑	8.896 ↑↑	10.651 ↑↑
Resulting Agency		RCH	RCH	RCH	RCH	RCH

Specimen Collected: 07/17/19 10:51 Last Resulted: 07/17/19 11:27

Case #4

Patient is a 22-year-old female with no known cardiac history. She presented with chest discomfort she describes as "squeezing" with radiation into her left side. She had recent IV meth use and previous substance abuse in the past with both heroin and methamphetamines. She also recently had a child.

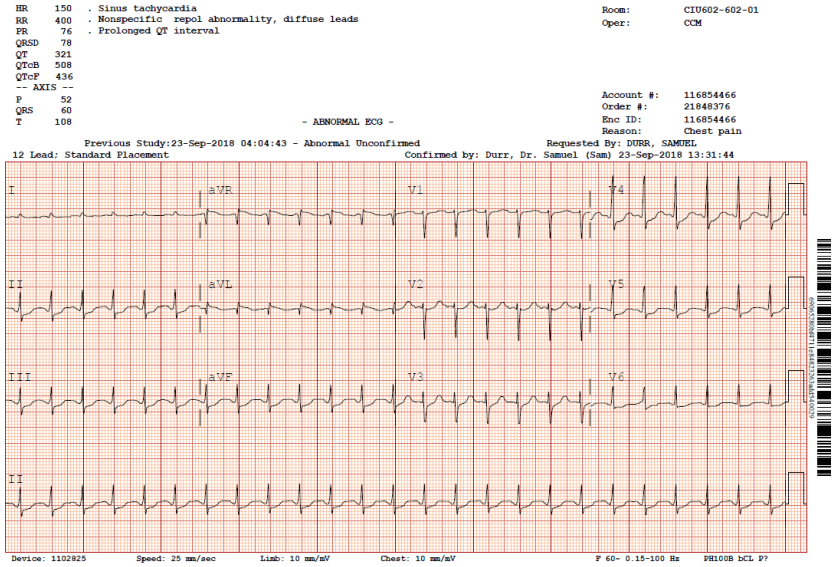


Troponin I Blood, Venous

Status: Final result Visible to patient: No (Not Released)

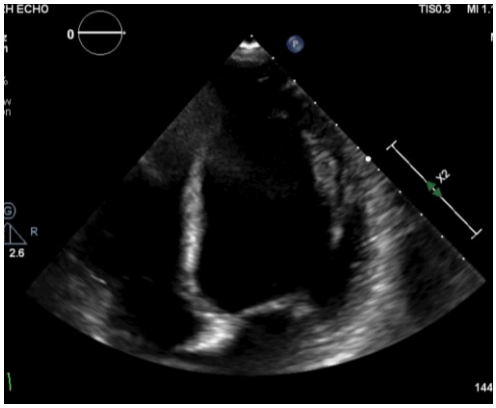
ⓘ Newer results are available. Click to view them now.

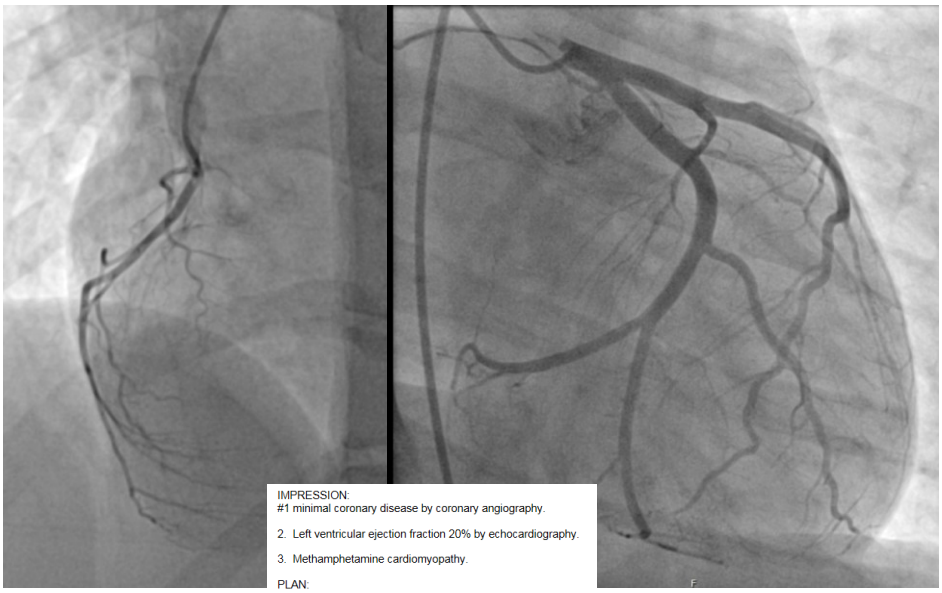
	Ref Range & Units	11mo ago (9/23/18)	11mo ago (9/23/18)
Troponin I	<0.030 ng/mL	2.199 ↑↑	0.423 ↑↑
Resulting Agency		RCH	RCH



Interpretation Summary

- Severe left ventricular systolic dysfunction. Impairment left ventricular systolic function is global. Left ejection fraction is reduced to 22%.
- Normal left ventricular cavity size and wall thickness.
- Unable to assess left ventricular diastolic function.
- Right ventricular systolic function is hypokinetic.
- The left atrium is moderately dilated. 44 cc/m².
- The right atrium is normal in size.
- Moderately elevated central venous pressure and IVC diameter is <21 mm (6-10 mmHg).
- No pericardial effusion.
- Mild to moderate regurgitation of the mitral valve is noted. ER was 21 regurgitant volume 21
- The degree of mitral valve regurgitation is more moderate than mild. Mitral valve regurgitation secondary mitral valve regurgitation.
- The left ventricle is enlarged.





The patient's hospital course was complicated by hypotension. She required pressor support. She stabilized and was initiated on appropriate CHF medications.

Troponin I Blood, Venous Order: 2206

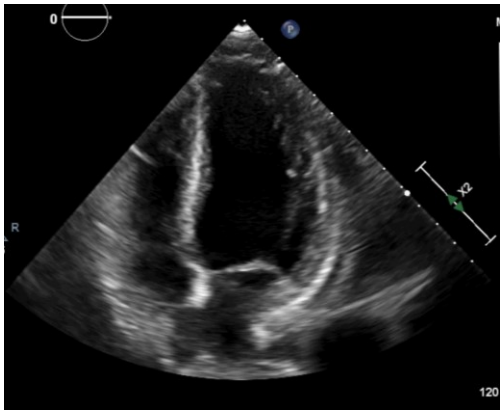
Status: **Final result** Visible to patient: **No (Not Released)**

Newer results are available. Click to view them now.

	Ref Range & Units	11mo ago (9/29/18)	11mo ago (9/24/18)	11mo ago (9/23/18)	11mo ago (9/23/18)	11mo ago (9/23/18)
Troponin I	<0.030 ng/mL	0.048 ^	2.525 ^^	3.197 ^^	2.199 ^^	0.423 ^^
Resulting Agency		RCH	RCH	RCH	RCH	RCH

Interpretation Summary

- Normal left ventricular systolic function.
- Normal left ventricular cavity size and wall thickness.
- Normal left ventricular diastolic function.
- The left atrium is normal in size.
- The right atrium is normal in size.
- Normal central venous pressure (0-5 mmHg).
- No pericardial effusion.
- Normal left ventricular filling pressure.
- The left ventricular wall motion is normal.



Patient's heart function has recovered. She continues to struggle with substance abuse. She was counseled on pregnancy risks going forward.

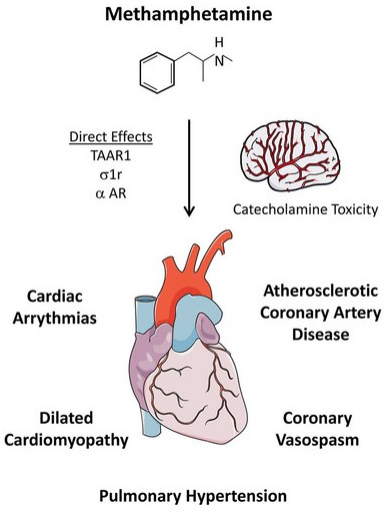
Methamphetamines cause blood vessel constriction and spasm which can cause dangerous spikes in blood pressure. It also can affect conduction leading to potentially fatal heart arrhythmias.

Cardiovascular disease represents a significant leading cause of death among methamphetamine users following only accidental overdose.

Hospitalizations related to amphetamines has increased by more than 270% between 2018 2015.

Methamphetamines from a cardiovascular disease through catecholamine toxicity or direct effects on cardiac and vascular tissue.

Remodeling of cardiac tissue can follow methamphetamine use leading to dilated cardiomyopathy and increased susceptibility to arrhythmias.



https://www.ahajournals.org/doi/10.1161/ATVBAHA.119.312461

Case #5

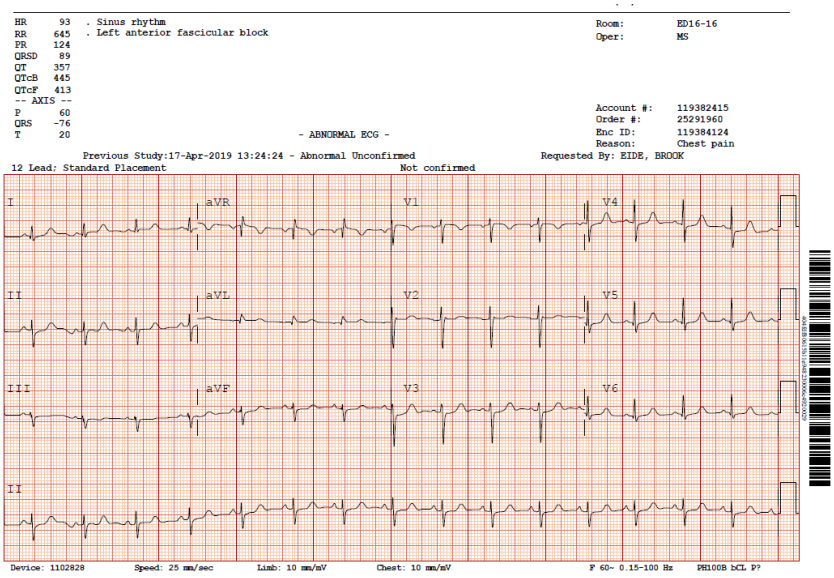
Patient is a 36-year-old female who presents with chest palpitations and chest tightness. She is 4 months postpartum. She has a long-standing history of palpitations and episodes of tachycardia. However, she has been feeling more palpitations and had EMS come to her house to do an EKG. She went to her primary care provider who checked lab work this morning and after an elevated troponin instructed her to go to the emergency department. On Monday she woke up from sleep with chest discomfort that she describes as a 6–7/10 with radiation to her back, neck, left arm. She took ibuprofen and went back to sleep. Since that time she has had some tingling in her left finger and some slight nausea and dizziness. She was feeling better later Monday and decided to go for a run. She went for 1 mile at a 10-12-minute pace. Afterwards she felt lightheaded and continued to have some chest tightness. On Tuesday she woke up from sleep with 7/10 chest tightness and pressure. In the emergency department she is describing a 3/10 chest tightness.

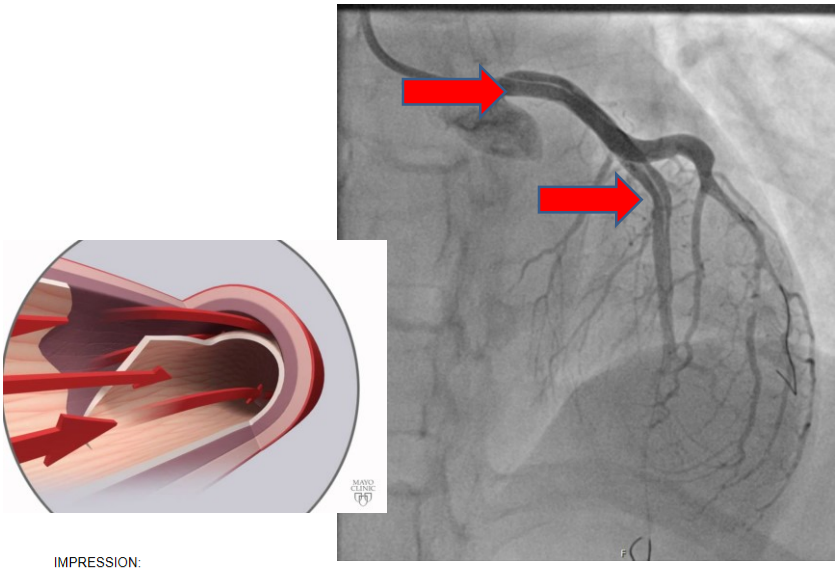
Troponin I Blood, Venous

Status: **Final result** Visible to patient: **No (Not Released)**

Newer results are available. Click to view them now.

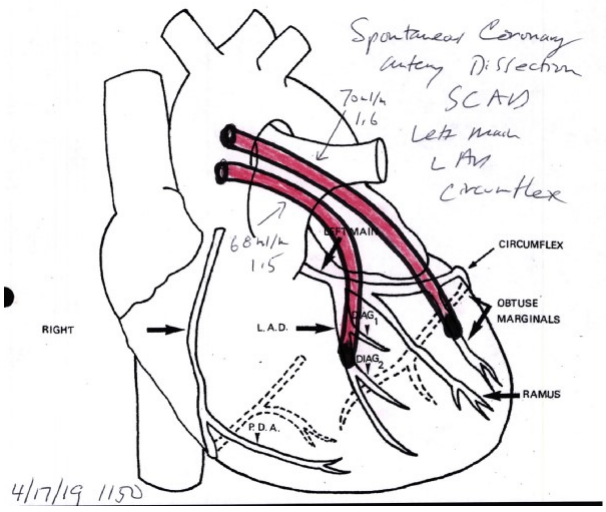
	Ref Range & Units	4mo ago (4/17/19)	4mo ago (4/17/19)
Troponin I	<0.030 ng/mL	3.574 ↑	1.033 ↑
Resulting Agency		RCH	RCH



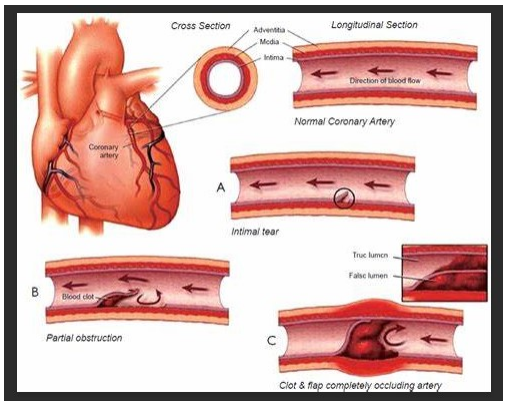


IMPRESSION:
1. Spontaneous coronary artery dissection involving the left main and the posterolateral marginal vessels, worsened with selective coronary angiograms from the catheters.
2. Based on intravascular ultrasound assessment it appears that the dissection is restricted to the left main and compromises a significant portion of the left main lumen.
3. Guiding catheter with wires in the true lumen of the LAD and the circumflex.

Plan: Emergent CABG.



Intraoperatively it was noted that she had what appeared to be an acute and chronic dissection involving the left main coronary artery extending into the circumflex and the LAD. The dissection flap was tacked down with suturing at the anastomosis of the bypass. Patient did well postoperatively. There is a possibility her graft will occluded due to competitive flow in the future. They are planning for a cardiac CTA for follow-up.



womensfitness.net

Spontaneous coronary artery dissection (SCAD):
A nontraumatic and non-iatrogenic separation of the coronary arterial wall and a rare cause of acute myocardial infarction.

Estimated to be at 0.1-4% of acute coronary syndrome cases.

Mechanism of action not fully understood.

More common in younger patients and in women.

In pregnant or early postpartum women, dissection may be a consequence of increased physiological hemodynamic stress or from hormonal effects weakening the coronary arterial wall.

Predisposing factors:
Fibromuscular dysplasia
Postpartum status
Multiparity (greater than 4 births)
Connective tissue disorders
Systemic inflammatory conditions
Hormonal therapy

In-hospital mortality: 4.2%
Recurrent SCAD rate 13-17%

UpToDate: https://www.uptodate.com/contents/spontaneous-coronary-artery-dissection?search=spontaneous%20coronary%20artery%20dissection&source=search_result&selectedTitle=1~8&usage_type=default&display_rank=1

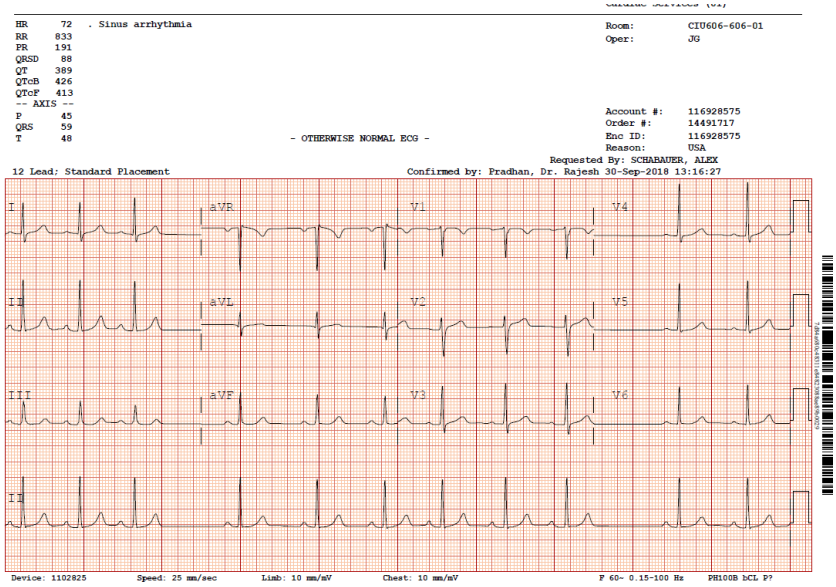
Case #7

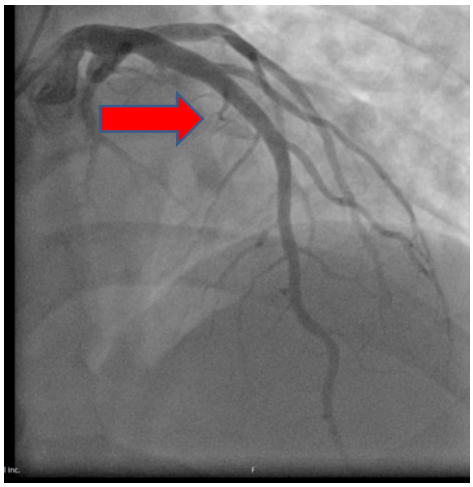
46-year-old male with no previous cardiac history. Presented with chest pain which was relieved by sublingual nitroglycerin at an outlying facility. Elevated troponin prompted transfer to Rapid City Hospital.

Troponin I Blood, Venous
Status: Final result Visible to patient: Yes (MyChart)

Newer results are available. Click to view them now.

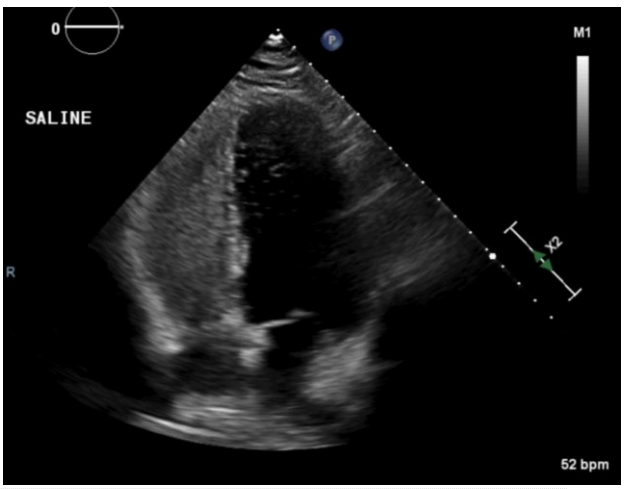
	Ref Range & Units	11mo ago
Troponin I	<0.030 ng/mL	1.927 ↑
Resulting Agency		RCH





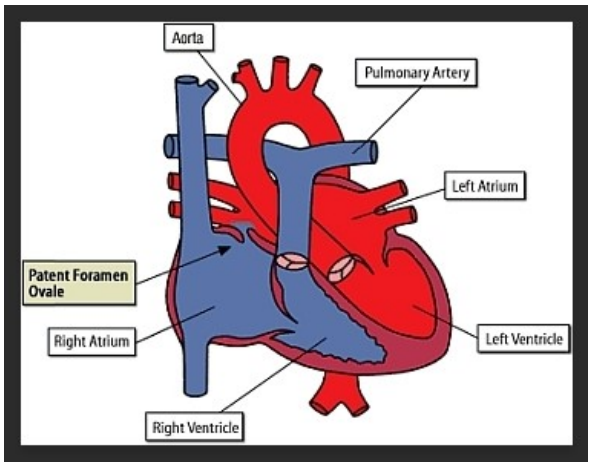
CONCLUSION:
1. Symptomatic vessel appears to be an occluded first septal branch proximally. Minor luminal irregularities to the LAD otherwise.
2. Large bore coronaries in general with normal appearance to the left main, ramus intermedius, circumflex and right coronary artery. Some vascular tortuosity is noted consistent with underlying hypertensive heart disease.
3. Preserved left ventricular function with evidence of a focal area of septal hypokinesis toward the base.

PLAN:
Proceed with Plavix loading and 24-48 hours of Integrilin loading. Continue to follow troponins. Check an echocardiogram. Findings are consistent with intermittent conduction abnormalities noted on the EKGs at the VA. Monitor on telemetry in the interim. Interestingly patient also became bradycardic with right coronary artery injections during this case.



Interpretation Summary

- Normal left ventricular size and systolic function. EF 65%. Mild LVH.
- Isolated basal septal hypokinesis as outlined below.
- Normal left ventricular diastolic function.
- Normal atrial dimensions bilaterally, normal RV size and function.
- Trace mitral valve regurgitation.
- Mild tricuspid regurgitation.
- There is no evidence of pulmonary hypertension. Estimated RVSP 30 mmHg.
- Borderline intra-atrial septal aneurysmal motion with mild right to left shunting with Valsalva, suggestive of small PFO.



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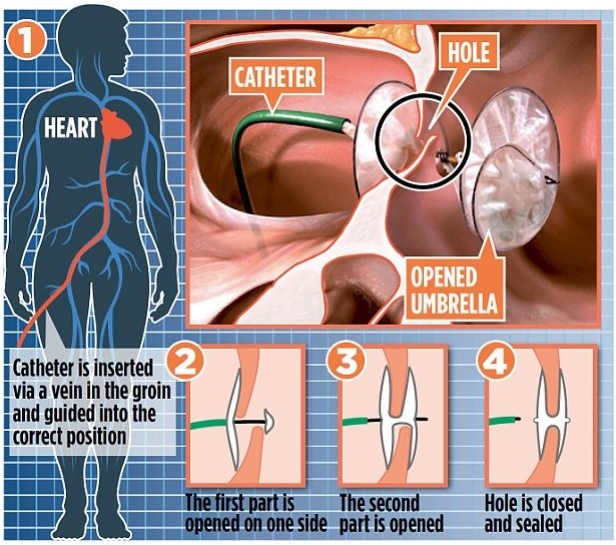
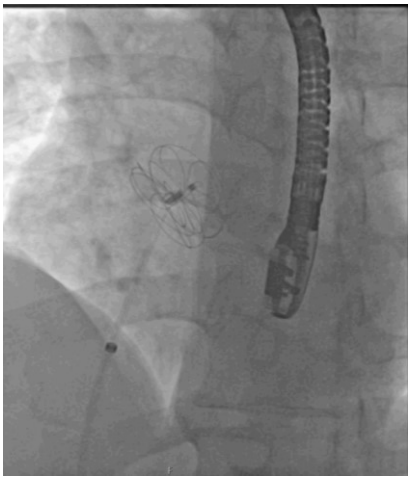
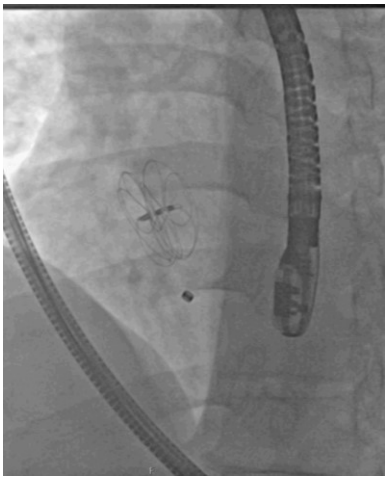
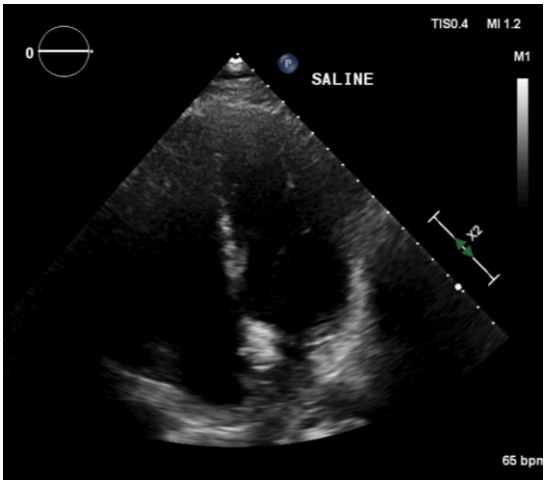




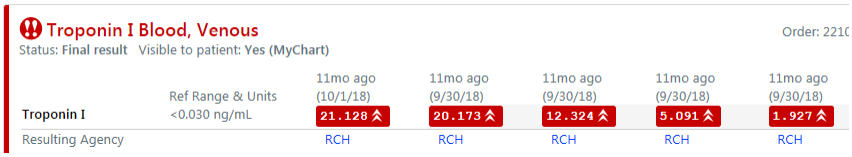


Interpretation Summary

1. Normal resting left ventricular systolic function
2. Successful PFO closure using a 30 mm Gore Cardioform device. Good placement of the device is noted post implant with no residual right to left shunting.
3. Structurally normal valves
4. No other intracardiac source of embolism is noted.



Patient was found to have thrombotic occlusion of his first septal branch. He was allowed to infarct this area as no intervention was possible. Unclear where the thrombus arose from. Given that the patient had a large PFO with a significant amount of right to left shunting as well as an intra-atrial septal aneurysm, the decision was made to put in a septal occluder device. Patient was treated for his hypertension and non-STEMI with dual antiplatelet therapy, beta-blocker, and ACE inhibitor.



Troponin I Blood, Venous

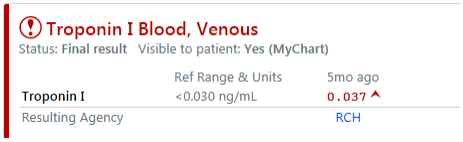
Status: Final result Visible to patient: Yes (MyChart)

Order: 221(

	Ref Range & Units	11mo ago (10/1/18)	11mo ago (9/30/18)	11mo ago (9/30/18)	11mo ago (9/30/18)	11mo ago (9/30/18)
Troponin I	<0.030 ng/mL	21.128 ⇈	20.173 ⇈	12.324 ⇈	5.091 ⇈	1.927 ⇈
Resulting Agency		RCH	RCH	RCH	RCH	RCH

Case #8

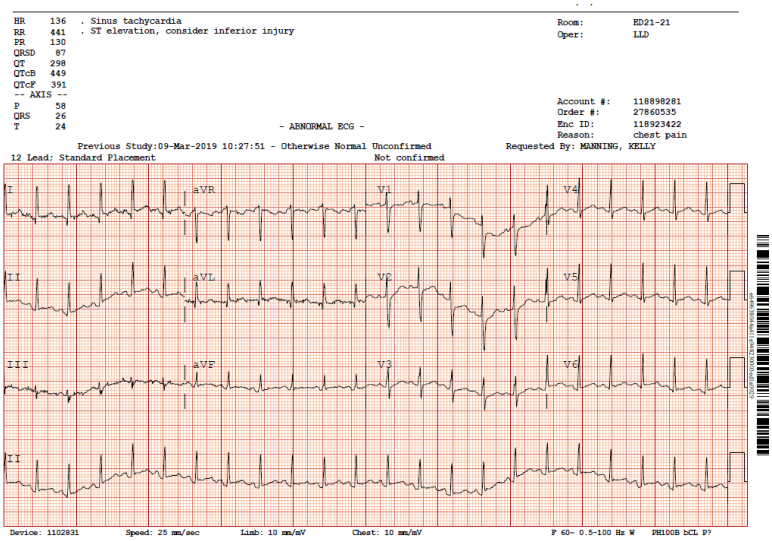
Patient is a 32-year-old female who was admitted with fever and chest pain. Her fever had been as high as 105 °F. She also described anterior chest pain. Over the past week she had also been having chills and severe night sweats. A CT scan in the emergency department demonstrated a mediastinal mass. She underwent an mediastinoscopy with a biopsy as well as mediastinal washout and drainage. During her biopsy was it was noted that she had a necrotic lymph node and had purulent discharge throughout the mediastinum.



Troponin I Blood, Venous

Status: Final result Visible to patient: Yes (MyChart)

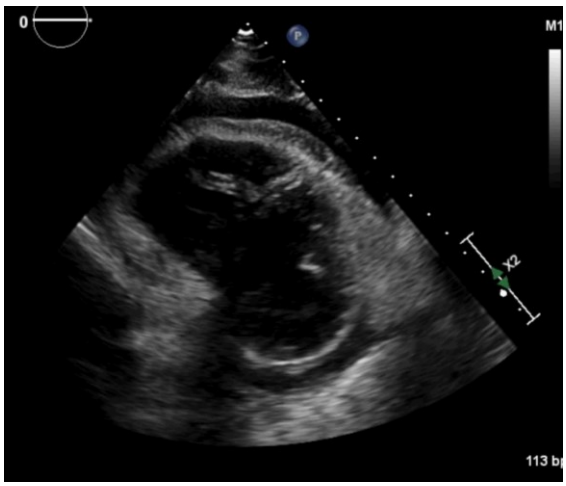
	Ref Range & Units	5mo ago
Troponin I	<0.030 ng/mL	0.037 ^
Resulting Agency		RCH

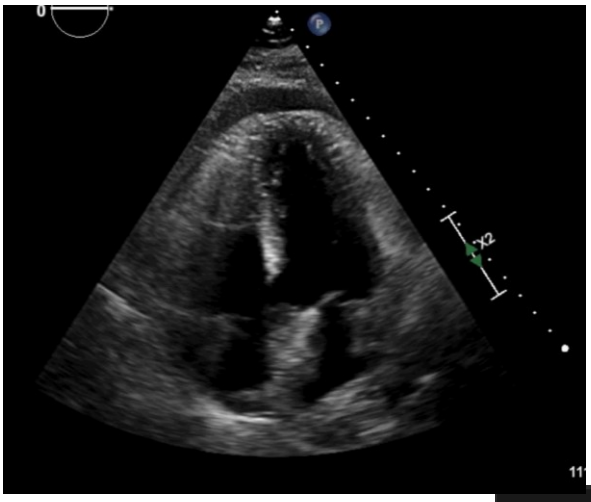


Interpretation Summary

- Normal left ventricular systolic function, no segmental wall motion abnormalities, biplane EF 56%.
- Normal left ventricular diastolic function and filling pressures.
- Normal right ventricular size and function.
- Normal biatrial size.
- Moderate circumferential pericardial effusion with largest pocket adjacent to right ventricle measuring 1.2 cm.
- Echocardiographic evidence of pericardial tamponade.
- Trace tricuspid and pulmonic regurgitation.
- Inadequate TR spectral Doppler signal for accurate assessment of RVSP.

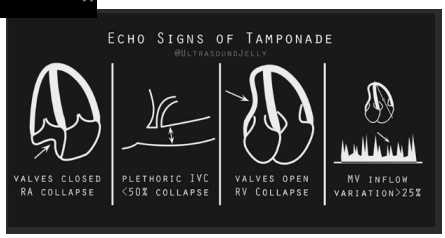
Findings discussed with Dr. Khan.
Recommend urgent cardiology evaluation.

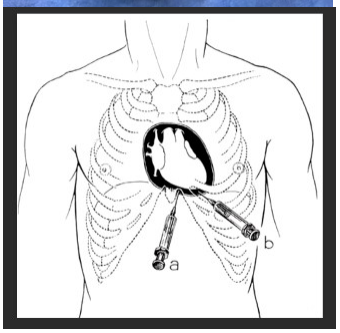




Signs and symptoms:

Tachycardia
Hypotension
Elevated JVD
Pulsus paradoxus
Pericardial rub





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Pericardial centesis drain a total of 250 cc of purulent pericardial fluid and a drain was placed.

The patient did well. She was on IV penicillin for 3 weeks and then switched to oral Zyvox due to medication reaction. She was put on colchicine and indomethacin for her pericarditis. The etiology of her mediastinal abscess was felt to be due to a bug bite she received on her upper arm. She had been treated with oral clindamycin for left arm cellulitis secondary to the bug bite approximately 1 month before her admission.

Objectives

1. Identify possible etiologies of troponin elevation in younger people.

- Acute plaque rupture
- Coronary vasospasm
- Focal myocarditis
- Methamphetamine use
- Spontaneous coronary dissection
- Coronary emboli
- Purulent pericarditis/tamponade

2. Identify common modalities used to make diagnoses.

-Elevated troponin
-Coronary angiogram for definitive diagnosis
-Other clues on EKG, echocardiogram

Thank You

Questions?