

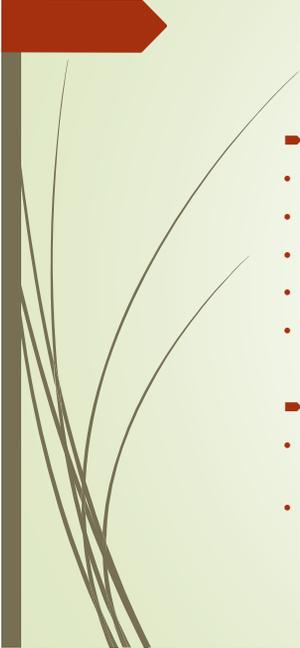


STEMI: Not Your Typical Presentation



Objectives

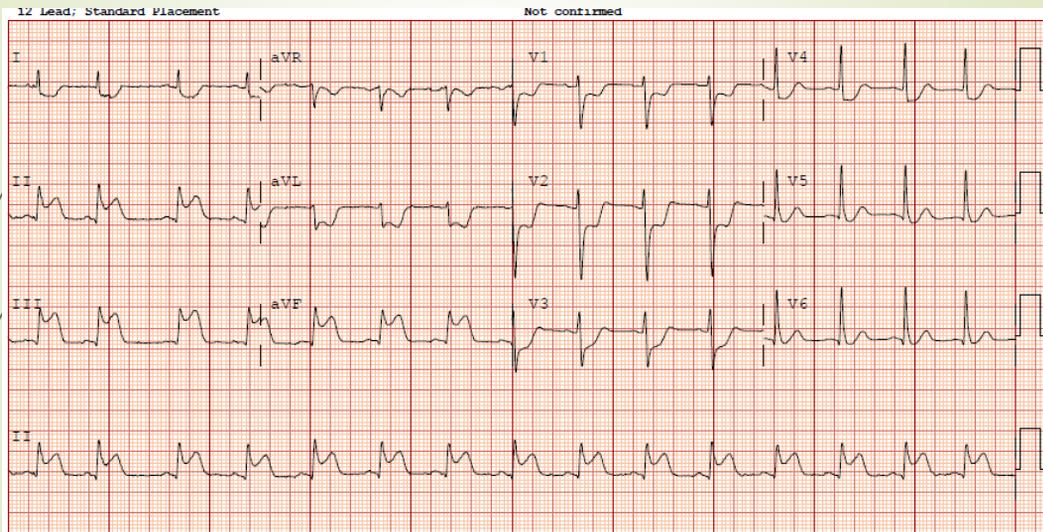
- Review case presentation for atypical STEMI.
- Discuss etiology and comorbidities related to the diagnosis.

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- 45 year old male, presented to the emergency room around 11 PM on day 1. He presented after about 40 minutes of retrosternal chest heaviness radiating to the left shoulder with associated shortness of breath, diaphoresis, and nausea. The pain was 5 out of 10 in intensity. He has had no previous similar symptoms.
 - Past Medical History
 - Degenerative joint disease of the lumbar spine with some neuropathy.
 - February 2018 colon cancer with metastasis to liver.
 - Recommended palliative chemo prior to resection of sigmoid colon mass.
 - Initiated chemotherapy March 2018. Left subclavian port placed 3/19/2018.
 - Last chemo ~1 month prior to presentation.
 - Cardiac Risk factors
 - Negative for hypertension, diabetes, hyperlipidemia, tobacco use, or family history of premature CAD.
 - Positive for untreated sleep apnea, intolerant to CPAP.



ER evaluation

- ER showed EKG obvious inferior acute STEMI.



ER evaluation

- STEMI alert called; aspirin, heparin, morphine, antiemetic, fluids, and nitroglycerin given.
- While waiting for the Cath Lab team, the patient sat up, collapsed and became unresponsive with V. fib arrest. Defibrillation x2, with ROSC and regained consciousness.
- Taken to cath lab

ER Labs

| | Ref Range & Units | |
|-------------------|-------------------|----------------|
| Troponin I | <0.030 ng/mL | 0.519 ▲ |
| Resulting Agency | | RCH |

| | Ref Range & Units | |
|---------------------|---------------------------------|---------------|
| WBC | 3.7 - 9.6 10 ³ /uL | 37.6 ▲ |
| RBC | 4.10 - 5.80 10 ⁶ /uL | 4.69 |
| Hemoglobin | 13.2 - 17.2 g/dL | 14.0 |
| Hematocrit | 38.0 - 50.0 % | 42.5 |
| MCV | 82.0 - 97.0 fL | 90.6 |
| MCH | 29.0 - 34.0 pg | 29.9 |
| MCHC | 32.0 - 36.0 g/dL | 33.0 |
| RDW | 11.5 - 15.0 % | 17.2 ▲ |
| Platelets | 130 - 350 10 ³ /uL | 131 |
| MPV | 6.9 - 10.8 fL | 8.7 |
| Anisocytosis | | 1+ |
| Resulting Agency | | RCH |

| | Ref Range & Units | |
|-----------------------------|-------------------------------|---------------|
| Sodium | 135 - 145 mmol/L | 135 |
| Potassium | 3.5 - 5.1 mmol/L | 3.8 |
| Chloride | 98 - 107 mmol/L | 102 |
| CO2 | 21 - 32 mmol/L | 18 ▼ |
| Anion Gap | 3 - 11 mmol/L | 15 ▲ |
| BUN | 7 - 25 mg/dL | 35 ▲ |
| Creatinine | 0.70 - 1.30 mg/dL | 1.64 ▲ |
| Glucose | 70 - 105 mg/dL | 137 ▲ |
| Calcium | 8.6 - 10.3 mg/dL | 8.6 |
| AST | 0 - 39 U/L | 40 ▲ |
| ALT (SGPT) | 0 - 52 U/L | 36 |
| Alkaline Phosphatase | 45 - 115 U/L | 218 ▲ |
| Total Protein | 6.0 - 8.3 g/dL | 6.2 |
| Albumin | 3.5 - 5.3 g/dL | 2.9 ▼ |
| Total Bilirubin | 0.00 - 1.40 mg/dL | 0.90 |
| eGFR | >60 mL/min/1.73m ² | 50 ▼ |
| Corrected Calcium | 8.6 - 10.3 mg/dL | 9.5 |
| Resulting Agency | | RCH |

| | Ref Range & Units | |
|------------------|----------------------|----------------|
| TSH | 0.340 - 4.820 uIU/ml | 5.245 ▲ |
| Resulting Agency | | RCH |

| | Ref Range & Units | |
|------------------|-------------------|---------------|
| Free T4 | 0.60 - 1.20 ng/dL | 1.37 ▲ |
| Resulting Agency | | RCH |

| | Ref Range & Units | |
|------------------|-------------------|--------------|
| Magnesium | 1.8 - 2.4 mg/dL | 2.5 ▲ |
| Resulting Agency | | RCH |

Coronary Angiogram Findings

- ▶ Culprit vessel being the occluded distal dominant circumflex
- ▶ Vessel successfully recanalized with mechanical aspiration and vacuum-assisted thrombectomy
- ▶ Clot appeared to consist of fiber/myxomatous/thrombus material
- ▶ Intravascular ultrasound was performed post thrombectomy showed a left main appeared normal. The circumflex and proximal L PDA appeared normal. Angiogram showed that the LAD was moderate to large sized with diagonal branches, all of which appeared normal. Ramus intermedius was a dual system with no occlusive disease. The RCA was small and non-dominant with no significant occlusive disease.
- ▶ Eptifibatide (Integrilin) infusion for another 12 hours
- ▶ Plan for TEE to confirm suspicion for left atrial mass
- ▶ Aspirate specimens sent for histopathology

Coronary Angiogram



How did this clot look different?



Videos courtesy of Dr Purushottam

Normal Thrombus



World Journal of Cardiology article published online February 26, 2011.
<https://www.wjgnet.com/1949-8462/full/v3/i2/43.htm>

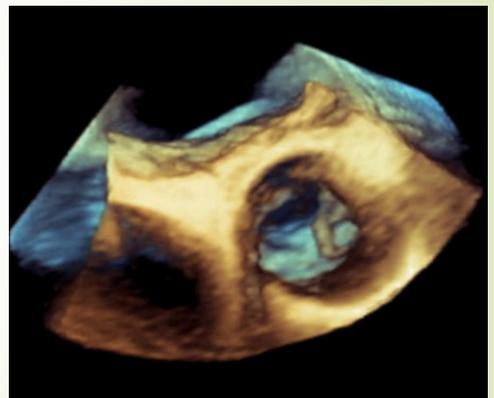
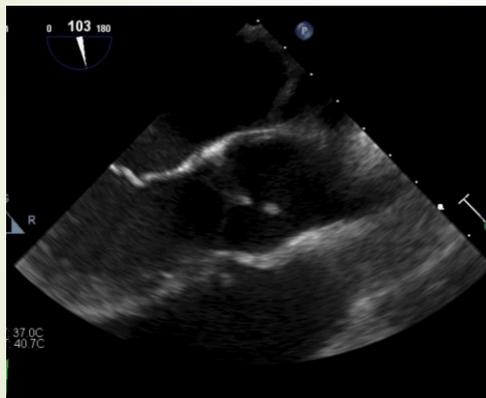
What material caused the clot?

- Was it metastatic disease from his colon cancer?
- Was it infectious or other vegetation?

Further evaluation.....

- Echocardiogram performed Day 2 indicated an EF of 46% with inferior wall motion abnormality, small nodular mass noted on the aortic side of the aortic valve. Mildly dilated right ventricle with normal function. No mention of aortic valvular dysfunction.
- TEE performed the same day indicated a 1.4 x 0.3 cm mobile linear mass attached to the right coronary cusp of the aortic valve with aortic side. **Valvular function was preserved at that time.**

TEE images



How is the patient doing after cath?

| | Ref Range & Units | |
|-----------------------|-------------------|-----------------|
| Troponin I | <0.030 ng/mL | 50.757 ↑ |
| Resulting Agency | | RCH |
| | Ref Range & Units | |
| Triglycerides | <=149 mg/dL | 214 ↑ |
| Cholesterol | 0 - 199 mg/dL | 104 |
| HDL | >=40 mg/dL | <3 ↓ |
| LDL Calculated | 20 - 99 mg/dL | >58 |
| Fasting? | | Yes |
| Resulting Agency | | RCH |

- ▶ Day 2 patient developed a 39.2 °C fever.
- ▶ Possible etiology for fever included cancer, response to recent MI and angiogram, but **highest suspicion is for catheter infection due to history of port/chemo.**
- ▶ Cultures obtained. Empiric antibiotics started.
- ▶ Vital signs:
 - Blood pressure 95-142 systolic
 - Heart rate 76-149, atrial fibrillation or atrial flutter versus atrial tachycardia and occasional accelerated junctional rhythm. P waves only visible intermittently.
- On IV amiodarone
- Reported some residual chest pain but otherwise stable

What would be another suspicion for cause of infection?

- ▶ Colon cancer history
- ▶ Known infectious endocarditis relation with E. Faecalis organism and colon source
- ▶ Also concern for group D streptococci and colonic neoplasm

www.uptodate.com, Overview of management infective endocarditis in adults

Digging deeper.....

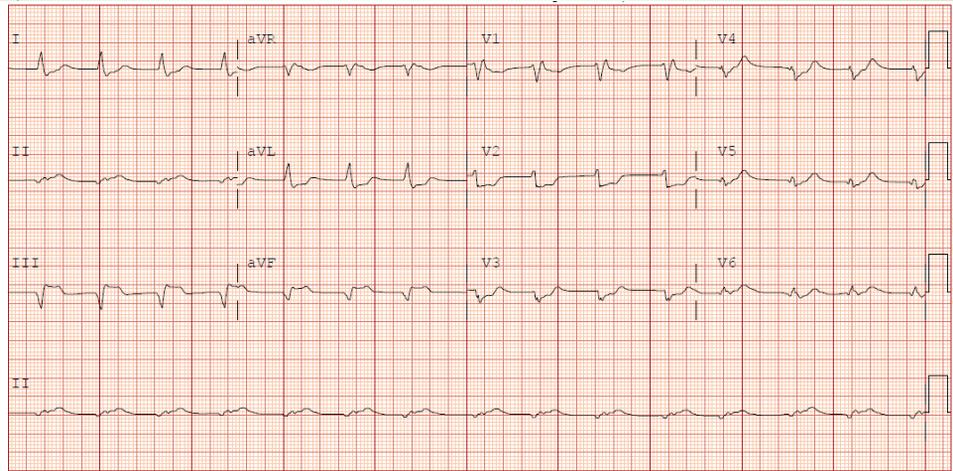
- The day prior to hospitalization, the patient had an oncology outpatient visit.
- Reported chills and rigors, temp no higher than 99.8 °F
- UA not convincing. No respiratory or other abdominal complaints.
- Symptoms thought to be known side effects of methocarbamol.
- Recommendation to watch temperature closely and follow-up in 1 week with labs
- Known WBC elevation from 1 month prior thought to be consistent with response to chemotherapy

| | Ref Range & Units | | Ref Range & Units | |
|-------------------|------------------------------------|--------|-------------------|-----------------------------------------|
| WBC | 3.7 - 9.6 10 ³ /uL | 13.7 ▲ | WBC | 3.7 - 9.6 10 ³ /uL 16.6 ▲ |
| RBC | 4.10 - 5.80 10 ⁶ /uL | 4.39 | RBC | 4.10 - 5.80 10 ⁶ /uL 4.41 |
| Hemoglobin | 13.2 - 17.2 g/dL | 13.7 | Hemoglobin | 13.2 - 17.2 g/dL 13.7 |
| Hematocrit | 38.0 - 50.0 % | 40.0 | Hematocrit | 38.0 - 50.0 % 40.8 |
| MCV | 82.0 - 97.0 fL | 91.1 | MCV | 82.0 - 97.0 fL 92.7 |
| MCH | 29.0 - 34.0 pg | 31.2 | MCH | 29.0 - 34.0 pg 31.0 |
| MCHC | 32.0 - 36.0 g/dL | 34.3 | MCHC | 32.0 - 36.0 g/dL 33.5 |
| RDW | 11.5 - 15.0 % | 15.5 ▲ | RDW | 11.5 - 15.0 % 17.1 ▲ |
| Platelets | 130 - 350 10 ³ /uL | 78 ▼ | Platelets | 130 - 350 10 ³ /uL 89 ▼ |
| MPV | 6.9 - 10.8 fL | 7.9 | MPV | 6.9 - 10.8 fL 7.8 |
| Resulting Agency | | | RCH | |

Day 3

- No further chest pain. Continues to be fairly stable, but drowsy.
- Closely monitoring respiratory status as he is hypoxic and tachypneic. At risk for ARDS due to sepsis.
- Area of vegetation unusual for metastasis. More suspicious for subacute bacterial endocarditis.
- Awaiting blood cultures and aspirate specimen histopathology.
- IV heparin for full anticoagulation
- Infectious disease consulted. Antibiotic therapy adjusted. Highly suspicious that the organism is MSSA, awaiting final confirmation.
- Port considered potential source
- Ultrasound of the soft tissue around the port to look for fluid pockets was negative.
- GFR and creatinine deteriorating but making urine. Monitoring.

Day 3 EKG



Guidelines

- Determination of whether a patient with infectious endocarditis requires early surgical treatment depends upon many clinical and prognostic factors.
- Referral for early valve surgery is indicated in patients with left-sided native valve infectious endocarditis and one or more of the following:
 - Valve dysfunction causing heart failure symptoms
 - Complicated infection (annular or aortic abscess, destructive penetrating lesion, heart block, or difficult to treat pathogen including fungi or multidrug-resistant organisms such as *Pseudomonas aeruginosa* and vancomycin resistant enterococcus.) *Methicillin sensitive staph aureus pathogens are not an absolute indication for valve replacement surgery.
 - Persistent infection defined as persistent bacteremia or fever lasting greater than 7 days after initiation of appropriate antibiotic therapy, providing other signs of infection and causes of fever have been excluded
 - Large vegetation (greater than 10 mm)
 - Criteria for patients with large vegetation recommendations have varied. Individualized risk-benefit assessment is necessary, considering multiple factors including diameter and volume of the vegetation, change in size of the vegetation on appropriate antibiotic therapy, history of prior systemic embolization, likelihood .
 - Vegetation >10 mm had a significantly higher risk of embolic events and in-hospital mortality. However, data are limited regarding the effect of surgery on clinical outcomes in patients with mobile vegetations >10 mm.

www.uptodate.com, Overview of management infective endocarditis in adult

Day 4

- ▶ Patient showing signs of septic shock requiring IV pressors
- ▶ Tele starting to show bradycardia; amiodarone discontinued.
- ▶ Respiratory status declining with concern for pulmonary edema; intubated.
- ▶ GFR & creatinine continue to deteriorate; started CRRT.
- ▶ LFT's elevating; stop statin

| | Ref Range & Units | |
|----------------------|-------------------------------|---------|
| Sodium | 135 - 145 mmol/L | 137 |
| Potassium | 3.5 - 5.1 mmol/L | 4.6 |
| Chloride | 98 - 107 mmol/L | 102 |
| CO2 | 21 - 32 mmol/L | 19 ▼ |
| Anion Gap | 3 - 11 mmol/L | 16 ▲ |
| BUN | 7 - 25 mg/dL | 51 ▲ |
| Creatinine | 0.70 - 1.30 mg/dL | 2.62 ▲ |
| Glucose | 70 - 105 mg/dL | 164 ▲ |
| Calcium | 8.6 - 10.3 mg/dL | 8.2 ▼ |
| AST | 0 - 39 U/L | 1,465 ▲ |
| ALT (SGPT) | 0 - 52 U/L | 1,050 ▲ |
| Alkaline Phosphatase | 45 - 115 U/L | 280 ▲ |
| Total Protein | 6.0 - 8.3 g/dL | 5.8 ▼ |
| Albumin | 3.5 - 5.3 g/dL | 2.7 ▼ |
| Total Bilirubin | 0.00 - 1.40 mg/dL | 5.91 ▲ |
| eGFR | >60 mL/min/1.73m ² | 28 ▼ |
| Corrected Calcium | 8.6 - 10.3 mg/dL | 9.2 |

Day 5

- ▶ Blood pressure deteriorated requiring maximal pressor support for blood pressure control.
- ▶ In and out of uncontrolled atrial fibrillation alternating with bradycardia, requiring isoproterenol.
- ▶ Limited echo showed an EF of 63%. There was **central moderate to severe aortic valve regurgitation as well as probable perforation of the right coronary cusp** with attached bulky and elongated vegetation. The right ventricle was moderately dilated with normal function.
- ▶ CV surgery consulted
- ▶ Histopathology from initial clot resulted, found to be acutely inflamed fibrous tissue with bacterial overgrowth; no malignancy.
- ▶ Blood cultures confirm MSSA bacteremia

Day 5 continued

- Patient taken to surgery for AVR. 27 mm Medtronic Mosaic porcine tissue valve utilized.
- Right heart cath/Swan-Ganz line placement indicated mild to moderately narrowed left subclavian vein system due to indwelling chronic catheter is in some **associated fibrous/thrombotic material**.
- Preoperative TEE indicated normal RV size and function.
- Intraoperative assessment suggested an acutely dysfunctional heart consistent with additional compromise, probably from additional embolization since last echocardiogram.
- No additional endocarditis lesions other than the aortic valve was noted on intraoperative TEE.
- The patient needed substantial inotropic support to wean from the pump with significant right greater than left ventricular dysfunction.
- Swan Ganz catheter exchange for Impella RP. Impella CP placed to the left ventricle.
- Postop TEE showed adequately functioning aortic bio prosthetic valve, mildly dilated right atrium and right ventricle with moderate right ventricular hypokinesis and inferior wall hypokinesis of the left ventricle.
- Transported emergently from OR to the Cath Lab for angiography due to suspected embolic occlusion of the RCA.

Day 5/6 Coronary Angiogram

- Left main normal, LAD unchanged from previous angiogram, left circumflex patent with previous site of coronary embolism and thromboembolectomy showing normal flow
- RCA shows an occlusive thrombus/debris at the ostium with extension into the conus branch totally occluding the distal RCA/RPDA
- Successful vacuum-assisted aspiration thrombectomy of the ostial/proximal and distal RCA
- Balloon angioplasty to the distal RCA with a 2 mm balloon

Post AVR Angiogram



Day 6

- Limited echo shows moderately globally impaired left ventricular function, dilated and severely hypokinetic right ventricle. Bio prosthetic aortic valve appears to be functioning normally. No pericardial effusion.
- Less than 4 hours after AVR and angiogram, patient had marked hypotension with poor pacemaker capture leading to cardiac arrest/asystole with CPR. ROSC achieved.
- Labs showed significant metabolic acidosis, treatment initiated.
- Significant oxygen saturation decline along with significant pulmonary hemorrhage with copious amounts of blood suctioning via ET tube.
- Repeat cardiac arrest with eventual ROSC
- Continuing and more significant pulmonary hemorrhage
- Pressors maximized with deteriorating hemodynamics



Day 6 continued

- Despite maximal medical support including vasoactive drips and mechanical circulatory support with right and left ventricular assist devices, the patient continued to have progressive acidosis and evidence of irreversible multiorgan failure coagulopathy and pulmonary hemorrhage leading to hypoxia and repeat cardiopulmonary arrest.
- Efforts felt to be futile, family desired no further aggressive intervention.
- Patient expired
- Cause of death due to acute bacterial endocarditis with irreversible multiorgan failure likely as a complication of the colon cancer with chronic IV access for chemotherapy.
- Pathology from native aortic valve returned showing the aortic valve tissue with mild degenerative changes and culturing positive for MSSA.



Discussion and Questions