Role of POCUS in Diagnosing Etiology of Refractory Chest Pain

Ultrasound Scholarly Concentration
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Case Series Outline

I. Case
II. Clinical Question
III. Literature review
IV. Application of ultrasound
V. Key Points
POCUS Case Presentation

63-year-old female presents to the emergency department with complaint of 10/10 chest pain that has been present a couple hours prior to arrival.

The describes feeling like “a little elephant” is sitting on her chest, with associated shortness of breath.

She denies radiating pain, nausea, vomiting, extremity swelling, orthopnea.
Significant Events Leading up to Arrival

• Pt reported to outpatient cardiology roughly a month prior to this ED visit with complaints of chest pain on exertion, and was subsequently scheduled for a catheterization and angiogram a few days after that.

• Pt was found to have:
  
  70-80% occlusion of the Left Anterior Descending (LAD) artery
  
  80-90% occlusion of the LCX
  
  85-95% occlusion of the Posterior Left Ventricular (PLV) artery

• Prior to that, Pt had a stent placed an obtuse marginal (OM1) artery in 2017 and balloon angioplasty to the left circumflex (LCX) in 2019.
Coronary Anatomy

Ostium left main stem

Distal left main stem

Circumflex artery

1\textsuperscript{st}, 2\textsuperscript{nd}, and 3\textsuperscript{rd} Diagonal arteries

First obtuse marginal branch

Second obtuse marginal branch

Septal Perforators

\textless- Left Anterior Descending
Significant Events Leading up to Arrival

• Pt then underwent triple vessel Coronary Artery Bypass Graft (CABG)
• Post Operation Day (POD) two, the patient had a sudden and severe episode of chest pain with new st-segment elevations on EKG and was taken back to the cath-lab
• She was subsequently found to have a failed graft to the Right Posterior Descending Artery (RPDA) at the ostium as well as Obtuse Marginal (OM) at the anastomosis site.
• Revascularization attempts were unsuccessful, and the decision was made to medically manage the patients coronary artery disease.
• Pt was discharged to a skilled nursing facility on POD11
• ROS: Negative except previously mentioned symptoms
• Family Hx: unknown
• **Vitals**
  • Temp: 98.3
  • HR: 79
  • RR: 20
  • BP: 105/57
  • SpO2: 94

Labs:
  - Troponin 0.095, repeat 0.090
  - Pro BNP: 3,120
  - D-dimer 600 (age-adjusted normal)
  - CRP 12.21 (normal <0.5)
  - ESR (Normal)

Imaging:
  - CTA negative for PE, showed small pericardial and pleural effusions
  - EKG did not show any acute changes
• Differential? Which are most likely? What are the MUST NOT MISS diagnosis?
Differential? Which are most likely? What are the MUST NOT MISSES?

*List borrowed from WikEM.org


**Critical**
- Acute coronary syndromes (ACS)
  - STEMI
  - Non-STEMI
  - Unstable angina
- Aortic dissection
- Cardiac tamponade
- Coronary artery dissection
- Esophageal perforation (Boerhaave's syndrome)
- Pulmonary embolism
- Tension pneumothorax

**Emergent**
- Cholecystitis
- Cocaine-associated chest pain
- Mediastinitis
- Myocardial rupture
- Myocarditis
- Pancreatitis
- Pericarditis
- Pneumothorax

**Nonemergent**
- Aortic stenosis
- Arthritis
- Asthma exacerbation
- Biliary colic
- Costochondritis
- Esophageal spasm
- Gastroesophageal reflux disease
- Herpes zoster / Postherpetic Neuralgia
- Hypertrophic cardiomyopathy
- Hyperventilation
- Mitral valve prolapse
- Panic attack
- Peptic ulcer disease
- Pleuritis
- Pneumomediastinum
- Pneumonia
- Rib fracture
- Stable angina
- Thoracic outlet syndrome
- Valvular heart disease
Emergent Causes of Chest Pain

4-2-1 Rule

- 4 Heart Related Causes
  1. Acute Coronary Syndrome (ACS)
  2. Aortic Dissection
  3. Pericarditis/Myocarditis
  4. Pericardial Effusion/Cardiac Tamponade

- 2 Lung Related Causes
  1. Pulmonary Embolism (PE)
  2. Pneumothorax

- 1 Esophageal Related Cause
  1. Esophageal Perforation
Course After Admission

- Pt was admitted to the cardiology step-down unit
- Cardiology and CT Surgery were consulted
- Providers did not feel she needed an urgent catheterization that night, and would reassess the next day
- Pt was started on Heparin and Nitro drip, as well as colchicine and Ibuprofen for suspected pericarditis
Pt was taken to the cath-lab the day after admission and was found to have no changes from previous PCI, but re-stenting of the previously occluded LAD was successful and appeared to be flowing well after PCI

Pt reported initial reduction in chest pain

Overnight after PCI, cardiology was called with Pt having systolic blood pressures in the 60’s. Was improved with Levophed, Lasix and increased Oxygen support
Next morning, Cardiology was called w/Pt reporting 10/10 chest pain
What Role Does POCUS Play in the Diagnosis of Chest Pain?
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**Literature review**

Potentially useful in rapid discovery of:

- Aortic dissection, pericardial effusion (2)
- Ventricular free wall rupture (1)
- Pneumothorax, pleural effusion, pneumonia, pulmonary edema and diaphragm dysfunction (3)


WHAT VIEW IS THIS??

Any abnormalities??
Apical 4-chamber View
Apical 4-chamber Probe Placement

- Apical four-chamber view is obtained by placing the transducer in the 4th or 5th intercostal space, with the probe pointed at the patient's right shoulder.
What is the diagnosis??

Left Ventricular Free Wall Rupture
(LV Pseudoaneurysm)

The most important diagnostic method for LVFWR is transthoracic echocardiography: the presence of reduced myocardial wall thickness, hemopericardium or epicardial clots and cardiac tamponade are the most relevant findings.

Peri-operative Approach to post AMI LVFWR

Free wall Rupture: Initial Management

Surgical vs. Conservative

**Immediate Surgical**
- If hemodynamically unstable/concern for destabilization

**Conservative**
- If hemodynamically stable/not worsening
- Fluids, Inotropic support, vasopressors
- Allows tissue to heal prior to surgical intervention

Pericardiocentesis??
Pericardiocentesis

- Relatively contraindicated with effusion associated with aortic dissection or myocardial rupture due to the potential risk of aggravating the dissection or rupture via rapid pericardial decompression and restoration of systemic arterial pressure.
Continued admission course...

- CT Surgery initially elected to manage the Pt conservatively.
- That night, Pt experienced hypotension requiring vasopressors, tachycardia and increased oxygen requirements.
- The treatment plan was reconsidered, and the Pt underwent urgent surgery for LVFW repair the day after her LVFWR was discovered.
Modified Dor procedure (Modified Endoventricular Circular Plasty)

- Pt underwent Modified Dor procedure
- Pt recovered well and was eventually discharged 7 days after surgery
Thank you!

Questions/Comments?