Role of POCUS in the Diagnosis of Acute Pericarditis

Ultrasound Scholarly Concentration

Case Conference #1 5.19.2021

Diwash Thapa, MS3
Case Series Outline

I. Case

II. Clinical Question

III. Literature Review

IV. Key Points

This presentation contains video and audio clips. Please click on the underlined text to be directed to the appropriate media online.
Case Presentation

- 56-year-old female with no past medical history due to a lack of longitudinal medical care
- >12 hours of shortness of breath, palpitations, and pleuritic chest pain
- Denies any radiation of the chest pain, diaphoresis, nausea, vomiting, abdominal pain, dizziness, orthopnea, or peripheral edema
Objective Data

- **VS:** Temp = 36.6 °C, Heart rate = 119 BPM, BP = 148/76 mm Hg, RR=18 breaths/min, SpO₂=97% on room air

- **Labs:** Hb = 7.2 g/dL, MCV = 61.6 fL, Plt = 536 X 10⁹ /L, pro-BNP = 411 pg/mL, Ca = 8.2 mg/dL, d-dimer = 990 ng/mL, troponin = <0.034 ng/mL, ALP = 202 U/L, AST = 41 U/L, ALT = 15 U/L

- **EKG** showing no signs of ischemia but sinus tachycardia and low voltage (resolved in subsequent EKG)
Differential Diagnosis
1. Microcytic anemia
   a. Iron deficiency
   b. ACD
   c. Sideroblastic
   d. Thalassemia
2. CHF
3. PAH
4. Pericarditis
Case Imaging US Parasternal Long

POCUS

Formal ECHO
Case Imaging US Parasternal Short (Apex)

POCUS

Formal ECHO
Case Imaging US Apical 4 Chamber

POCUS

Formal ECHO
Case Presentation Continued...

• Review of systems: patient reports heavy menses one a week ago (not an unusual occurrence with her monthly menses including ~4 days requiring 3-4 pads)

• Family history: both her parents had sudden cardiac death. One of her sisters died at age 44 due to an atypical MI that was thought to be cholecystitis and another sister has SLE which first presented as anemia
Hospital Course for Management and Workup of Anemia and Pericardial Effusion

Full Autoimmune workup due to suspected SLE was negative

- ESR 49 mm/h
- CRP 87.4 mg/L
- ANA Positive (Titer 1, 1:160 and Titer 2, 1:80)
- ANCA IF Positive, Perinuclear Pattern
- MPO ELISA Negative
- PR3 ELISA Negative
- C3 141 mg/dL
- C4 30.5 mg/dL
- dsDNA Negative
- ENA Negative
- QuantiFERON TB Gold Plus Negative

Case resolution: discharge home after diagnosis of acute pericarditis on day 4 with

- Colchicine 0.6 mg BID
- Ibuprofen 600 mg TID for 12 days
- Famotidine 40 mg once daily for 12 days

Follow up with PCP for age-appropriate outpatient cancer screening

- Colonoscopy
- Endometrial biopsy
- Mammography
- Pap smear
Could the diagnosis of acute pericarditis have been made sooner based on symptoms and imaging findings?
Acute pericarditis = inflammation of the pericardial sac.

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<thead>
<tr>
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<tbody>
<tr>
<td>Idiopathic</td>
<td>516 (55.0%)</td>
<td>32 (13.7%)</td>
</tr>
<tr>
<td>Specific etiology</td>
<td>417 (46.0%)</td>
<td>201 (86.3%)</td>
</tr>
<tr>
<td>- Neoplastic</td>
<td>85 (8.9%)</td>
<td>22 (9.4%)</td>
</tr>
<tr>
<td>- Tuberculosis</td>
<td>4 (&lt;1.0%)</td>
<td>161 (69.5%)</td>
</tr>
<tr>
<td>- Autoimmune etiology</td>
<td>25 (2.6%)</td>
<td>12 (5.2%)</td>
</tr>
<tr>
<td>- Purulent</td>
<td>29 (3.0%)</td>
<td>5 (2.1%)</td>
</tr>
</tbody>
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Data from:
At least two of these features should be present to make the diagnosis.

- **Chest pain** – Typically sharp and pleuritic, improved by sitting up and leaning forward
- **Pericardial friction rub** – A superficial scratchy or squeaking sound best heard with the diaphragm of the stethoscope over the left sternal border
- **Electrocardiogram (ECG) changes** – New widespread ST elevation or PR depression
- **Pericardial effusion**

While one may infer the presence of pericardial effusion via clinical evaluation together with ECG and CXR findings, echocardiography is usually required to confirm the diagnosis, a practice supported by the 2015 ESC Guidelines.

Bedside Echocardiography by Emergency Physicians

Study objective: Timely diagnosis of a pericardial effusion is often critical in the emergency medicine setting, and echocardiography provides the only reliable method of diagnosis at the bedside. We attempt to determine the accuracy of bedside echocardiography as performed by emergency physicians to detect pericardial effusions in a variety of high-risk populations.

Original Contribution


Study design: Prospective
Inclusion criteria: High risk population for pericardial effusion
Total participants: 515 patients, of which 103 were ultimately deemed to have a pericardial effusion
Comparative standard/ground truth: ECHO read by an echocardiographer from the Department of Cardiology
Result: “Emergency physicians who participated in a 16-hour course on ultrasonography with 1 hour of instruction and 4 hours of practical training detected pericardial effusion with a sensitivity of 96% (95% confidence interval [CI] 90.4% to 98.9%), specificity of 98% (95% CI 95.8% to 99.1%), and overall accuracy of 97.5% (95% CI 95.7% to 98.7%).”
“Initial testing in all suspected cases:

An ECG

Chest radiography

Complete blood count, troponin level, erythrocyte sedimentation rate, and serum C-reactive protein level

Echocardiography, even a small effusion can be helpful in confirming the diagnosis of pericarditis, although the absence of an effusion does not exclude the diagnosis

Selected additional testing

Blood cultures if fever higher than 38°C (100.4°F), signs of sepsis, or a documented, concomitant bacterial infection (eg, pneumonia).

Viral studies but they are not routinely obtained, since the yield is low and management is not altered for the vast majority of patients.

Antinuclear antibody (ANA) titer in selected cases (eg, young women, especially those in whom the history suggests a rheumatologic disorder). Rarely, acute pericarditis is the initial presentation of systemic lupus erythematosus (SLE).

Tuberculin skin test or an interferon-gamma release assay if not recently performed.

Cardiac magnetic resonance (CMR) with administration of gadolinium or computed tomography (CT) imaging for selected patients (eg, nondiagnostic echocardiography, concerns about constrictive pericarditis, complicated course, suspicion of specific etiology, etc)

Pericardiocentesis should be performed for therapeutic purposes in patients with cardiac tamponade”

Key Points

- Acute pericarditis can be diagnosed with \( \geq 2 \) of 4 cardinal signs and symptoms: 1. pleuritic chest pain, 2. pericardial friction rub, 3. EKG changes, 4. pericardial effusion on imaging.
- POCUS has an excellent sensitivity and specificity in the detection of pericardial effusion.
- Chasing the etiology of acute pericarditis may be difficult! Base it on clinical judgment and risk factors for the etiologies.