

# Role of POCUS in the Diagnosis of Acute Pericarditis

Ultrasound Scholarly Concentration

Case Conference #1 5.19.2021

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- I. Case
- II. Clinical Question
- III. Literature Review
- IV. Key Points

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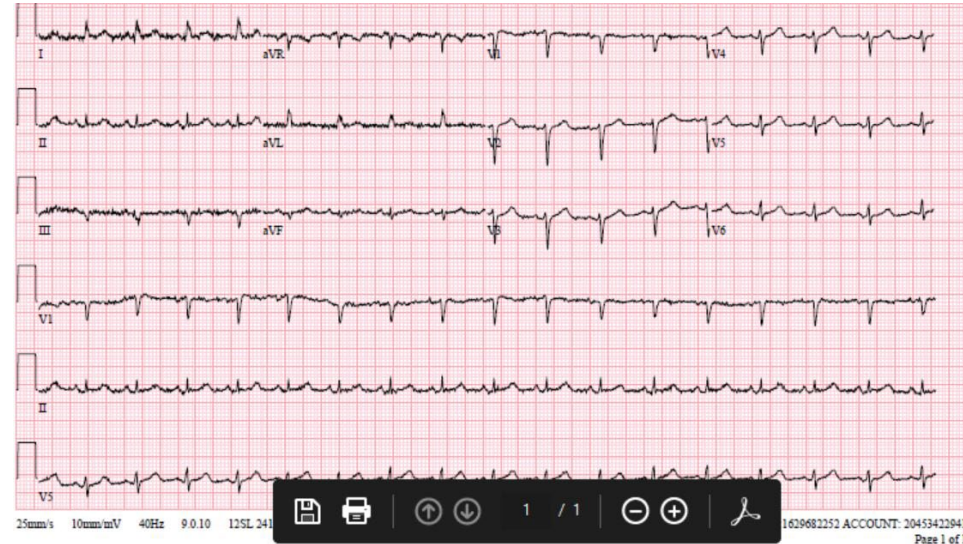


- 56-year-old female with no past medical history due to a lack of longitudinal medical care
  - >12 hours of shortness of breath, palpitations, and pleuritic chest pain
  - Denies any radiation of the chest pain, diaphoresis, nausea, vomiting, abdominal pain, dizziness, orthopnea, or peripheral edema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



- VS: Temp = 36.6 °C, Heart rate = 119 BPM , BP = 148/76 mm Hg, RR=18 breaths/min, SpO<sub>2</sub>=97% on room air
- Labs: Hb = 7.2 g/dL, MCV = 61.6 fL, Plt = 536 X 10<sup>9</sup> /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)





# Case Imaging Helical CTA



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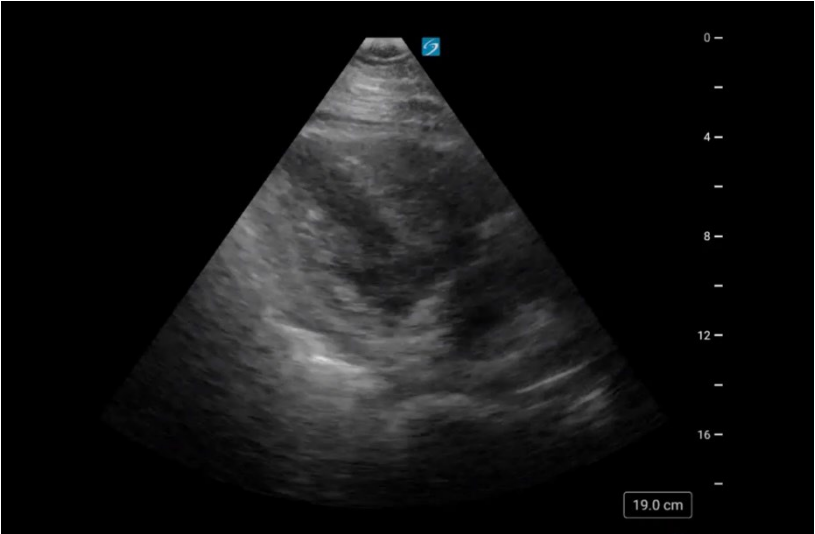


## Differential Diagnosis

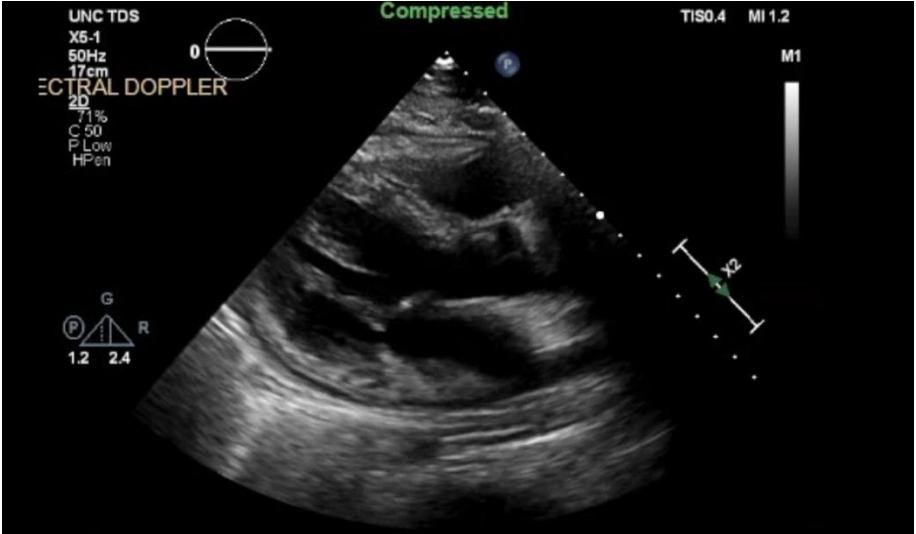
1. Microcytic anemia
  - a. Iron deficiency
  - b. ACD
  - c. Sideroblastic
  - d. Thalassemia
2. CHF
3. PAH
4. Pericarditis



## POCUS

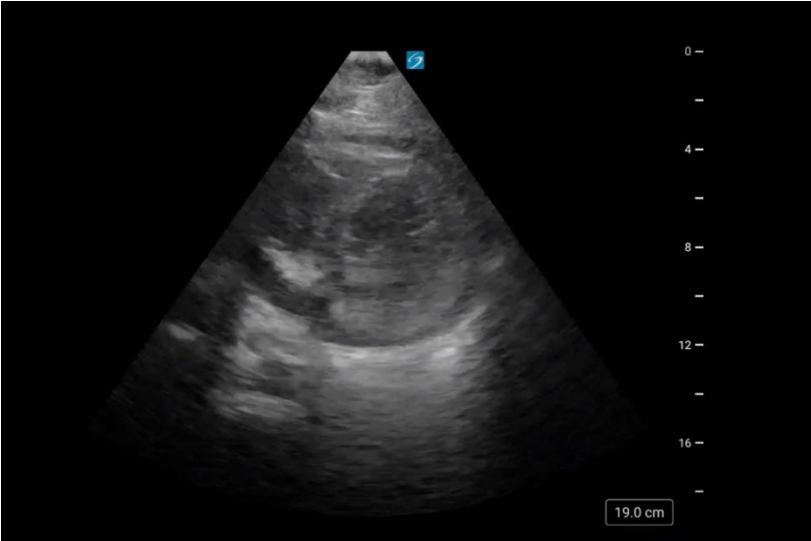


## Formal ECHO





## POCUS

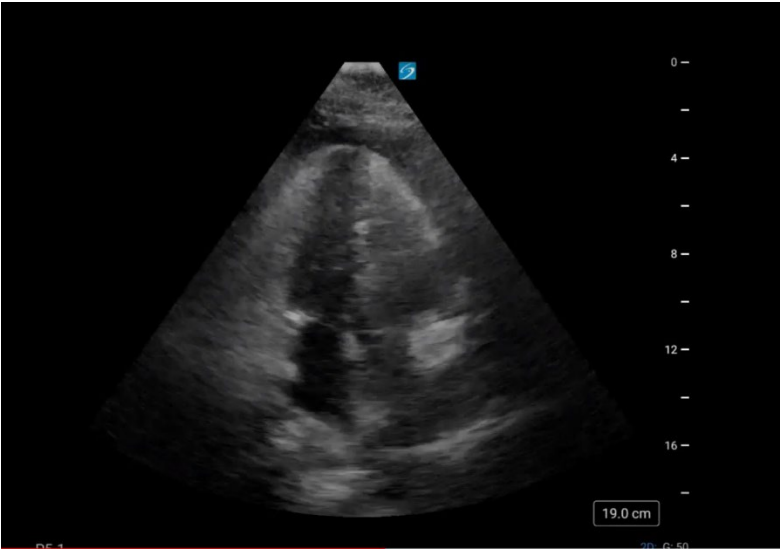


## Formal ECHO

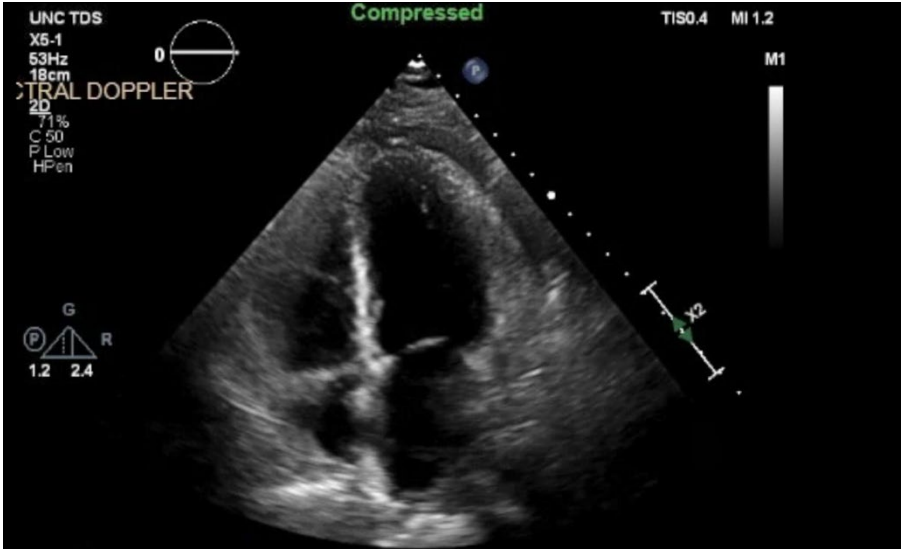




## POCUS



## Formal ECHO







- 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
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# Hospital Course for Management and Workup of Anemia and Pericardial Effusion



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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?

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## Acute pericarditis = inflammation of the pericardial sac.

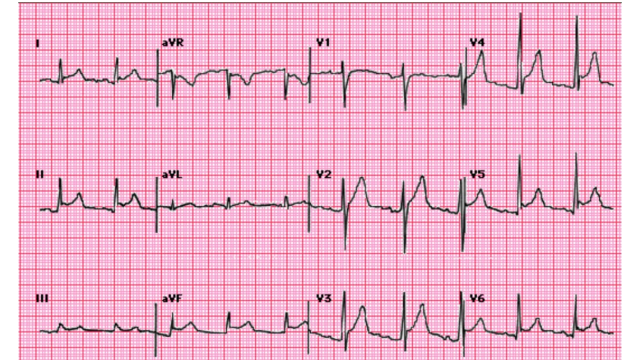
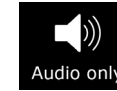
	Western Europe (2007-2012) <sup>1</sup>	Africa (1995-2001) <sup>2</sup>
Idiopathic	516 (55.0%)	32 (13.7%)
Specific etiology	417 (46.0%)	201 (86.3%)
• Neoplastic	85 (8.9%)	22 (9.4%)
• Tuberculosis	4 (<1.0%)	161 (69.5%)
• Autoimmune etiology	25 (2.6%)	12 (5.2%)
• Purulent	29 (3.0%)	5 (2.1%)

Data from:

1. Gouriet F, Levy PY, Casalta JP, et al. Etiology of pericarditis in a prospective cohort of 1162 cases. *Am J Med* 2015; 128:784.
2. Reuter H, Burgess LJ, Louw VJ, et al. The management of tuberculous pericardial effusion: experience in 233 consecutive patients. *Cardiovasc J S Afr* 2007; 18:20.

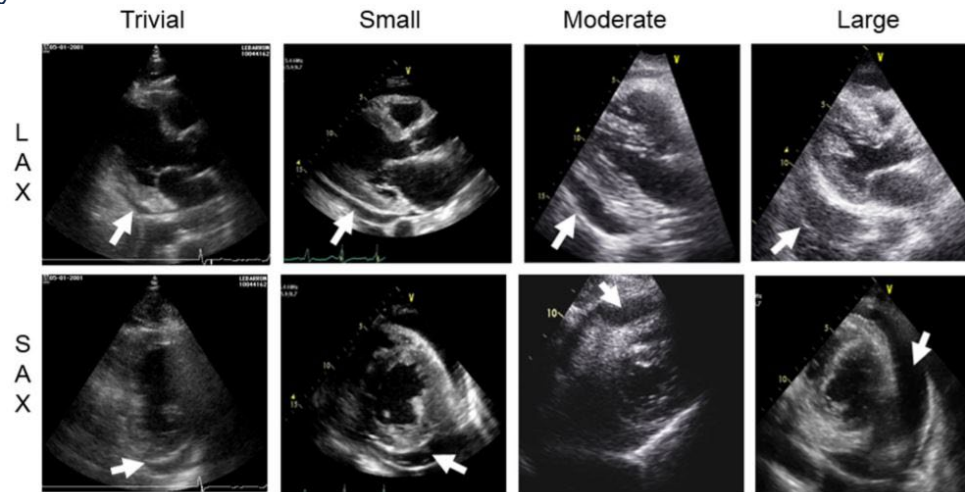
At least two of these features should be present to make the diagnosis.

- **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**



Adler Y, Charron P, Imazio M, Badano L, Barón-Esquivias G, Bogaert J, Brucato A, Gueret P, Klingel K, Lionis C, Maisch B, Mayosi B, Pavie A, Ristic AD, Sabaté Tenas M, Seferovic P, Swedberg K, Tomkowski W; ESC Scientific Document Group. 2015 ESC Guidelines for the diagnosis and management of pericardial diseases: The Task Force for the Diagnosis and Management of Pericardial Diseases of the European Society of Cardiology (ESC) Endorsed by: The European Association for Cardio-Thoracic Surgery (EACTS). *Eur Heart J*. 2015 Nov 7;36(42):2921-2964. doi: 10.1093/eurheartj/ehv318. Epub 2015 Aug 29. PMID: 26320112; PMCID: PMC7539677.

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



**Fig. 1** Representative trivial, small, moderate, and large pericardial effusions (arrows) viewed from the parasternal long axis (LAX, top) and short axis (SAX, bottom) (reprinted from Klein AL et al. *J Am Soc Echocardiogr* 2013; 26:965–1012, with permission from Elsevier) [13••]



## ORIGINAL CONTRIBUTION

### Bedside Echocardiography by Emergency Physicians

From the Department of Emergency Medicine, Los Angeles County+University of Southern California Medical Center, Keck School of Medicine at the University of Southern California, Los Angeles, CA.

Author contributions are provided at the end of this article.

**Diku P. Mandavia, MD, FRCPC**  
**Richard J. Hoffner, MD**  
**Kevin Mahaney, MD**  
**Sean O. Henderson, MD**

**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.

**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%).”

# Did We Choose Wisely?



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## “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
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