Hydralazine-Associated Massive Pericardial Effusion Causing Tamponade Without Hypotension

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History

- A 42-year-old man with hypertension, hyperlipidemia, premature ventricular contractions, bipolar disorder, and obstructive sleep apnea presented with four days of worsening dyspnea, dizziness, and palpitations.
- He was on **chronic hydralazine therapy** since 2021, with his dose escalated to **100 mg three times daily** in 2023 for blood pressure control.
- No history of autoimmune disease, malignancy, or infection.
- He denied chest pain, cough, fever, or leg swelling.

Presentation

- At the urgent care, he was found to have **tachycardia at 187 bpm** and was transferred to the emergency department.
- On arrival he was afebrile, **HR 112 bpm**, **systolic BP 105–130 mmHg,** oxygen saturation 98% on room air.
- Physical exam: Elevated jugular venous pressure, muffled heart sounds, and tachypnea, but **no hypotension**.
- **ECG**: Sinus rhythm with intraventricular conduction delay and **electrical alternans.** (Figure 1).
- **Chest X-ray**: Marked cardiomegaly and small left pleural effusion. (Figure 2).
- **Echocardiogram**: Large circumferential pericardial effusion (up to 6.9 cm posteriorly) with **right ventricular diastolic collapse** and a plethoric IVC, consistent with **tamponade physiology** (Figure 3).
- Despite these findings, the patient remained **normotensive**, illustrating “low-pressure tamponade.”

Investigation and Management

- WBC 18 × 10³/μL, CRP 80 mg/L, ESR 34 mm/hr. Normal thyroid function and troponin.
- **Lithium toxicity (2.6 mmol/L)** and thyroid function panel was normal.
- ANA 1:80 (homogeneous), **p-ANCA 1:1280**, borderline **MPO-ANCA 20 U/mL**, elevated kappa (40 mg/L) and lambda (40 mg/L) light chains. Negative dsDNA, Sm, RF, CCP, complements, and infection panels.
- **CTA:** Moderate pericardial effusion post-drain, with concurrent **left pleural effusion.** (Figure 4).
- **Follow-up TTE:** Only **small residual effusion** after drain repositioning. (Figure 5).
- **Emergent pericardiocentesis** yielded **1,860 mL of serosanguineous fluid,** lowering pericardial pressure from 25 → 4 mmHg, relieving symptoms. **Exudative effusion**: protein 4.5 g/dL, LDH 1109 U/L.
- Drain repositioned next day; additional **600 mL** removed in total.
- **Left-sided chest tube** placed for pleural effusion, draining 1.28 L over 24 h.
- **Hydralazine was discontinued**, and **prednisone 60 mg daily** started with taper.
- He was given antibiotics for possible pneumonia, and **colchicine** was prescribed for **3 months.**

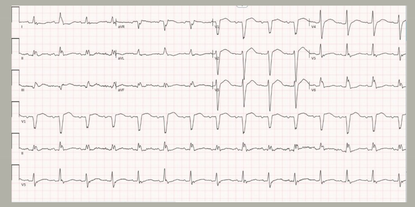

Figure 1: 12-lead electrocardiogram demonstrating sinus rhythm with intraventricular conduction delay and electrical alternans.

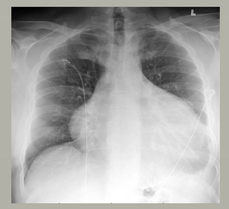

Figure 2: Chest radiograph demonstrating a large cardiac silhouette with trace left-sided pleural effusion.

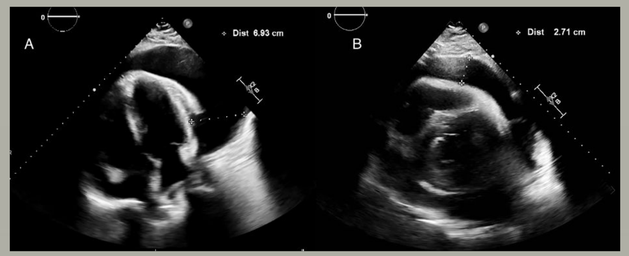

Figure 3: TTE demonstrating a large pericardial effusion **a.** measuring 2.71 cm anteriorly and **b.** approximately 6.93 cm posteriorly and laterally (indicated by the dotted white line).

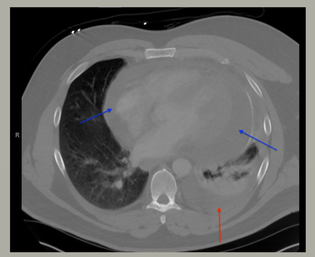

Figure 4: Computed tomography angiography of the chest demonstrates a moderate circumferential pericardial effusion with the pericardial drain in situ (indicated by the blue arrow), and a moderate left-sided pleural effusion is present (indicated by the red arrow).

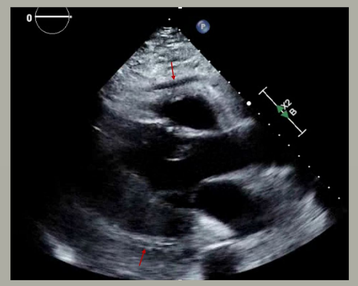

Figure 5: TTE demonstrating minimal pericardial effusion after the dislodgement of the pericardial drain (indicated by the red arrow).

Outcome and Follow-up

- The pericardial drain ceased output by postoperative day 4 and was dislodged without complication.
- **Follow-up echocardiogram**: minimal residual effusion (Figure 5).
- The patient remained hemodynamically stable, was asymptomatic, and discharged on day 6 with improved exercise tolerance.
- At outpatient follow-up two days post-discharge: mild left-sided chest discomfort and transient dizziness, but no recurrent dyspnea or chest pain.
- He remained off hydralazine, continued the prednisone taper, and showed progressive clinical recovery.

Discussion

- This case demonstrates that **cardiac tamponade is a physiologic diagnosis** as it can occur **without hypotension**, as compensatory mechanisms maintain cardiac output until late.
- **Drug-induced pericardial effusion** is rare but should be suspected in patients on **hydralazine**, which has the **highest reporting odds ratio (27.1)** for pericardial effusion among drugs reported to the FDA Adverse Event Reporting System.[1]
- Hydralazine can trigger **autoimmune vasculitis** characterized by **ANA, MPO-ANCA, and p-ANCA positivity**, leading to pleuropericardial inflammation. In a cohort of 323 ANCA-associated vasculitis cases, **3.7% were linked to hydralazine**, with one-third demonstrating pericardial effusions.[2]
- This patient’s high-titer p-ANCA, borderline MPO, and absence of alternative etiologies strongly support **hydralazine-associated pericardial effusion**.
- The lack of hypotension underscores that **tamponade can exist with normal blood pressure**, reported in only **15% of tamponade patients** in one large ED series.[3] Gradual accumulation of large fluid volumes (nearly 2 L) can allow pericardial stretch, explaining normotension despite compression.
- **Controlled drainage** over 24 hours prevented **pericardial decompression syndrome**, a complication in fewer than **5 % of patients**

Conclusion

- **Cardiac tamponade can present without hypotension**, emphasizing the need to rely on echocardiographic rather than hemodynamic clues.
- **Hydralazine** is an underrecognized but important cause of **drug-induced pericardial and pleural effusions**, especially in patients with **positive ANA and ANCA serologies**.
- **Medication review** is critical in any unexplained pericardial effusion, identifying and discontinuing the offending agent is both diagnostic and curative.

References

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