

Bigger Is Not Always Better:

A Case of Dialysis Graft Associated High-Output Heart Failure

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Background: High-Output Heart Failure (HOHF) is characterized by clinical heart failure and a documented cardiac index greater than 3.9 L/min/m². As the prevalence of diseases associated with HOHF increases (obesity, liver, and renal disease), clinicians should be mindful of this often-overlooked diagnosis.

Presentation: A 51-year-old man presented to pulmonary outpatient clinic with fatigue, hypoxia, and restrictive PFTs. He reported sub-acute progressive exertional dyspnea and intermittent resting hypoxemia with a new supplemental oxygen requirement. He was limited to walking only 20 feet before needing to rest while three months prior he regularly took short hikes. He endorsed occasional orthopnea but denied cough, chest pain, palpitations, edema, or PND. His past medical history was significant for Type 2 diabetes mellitus, ESRD on hemodialysis with past failed AV fistula and recent AV graft placement, labile hypertension, severe untreated OSA, and mild pulmonary hypertension related to HFpEF.

Examination: He was normotensive and normoxic on arrival, but subsequently found to be hypoxic with SpO₂ of 75% after a brief nap. This improved both with voluntary increase in ventilation and with supplemental O₂. Examination revealed an elevated JVP of 13 cm H₂O with positive Kussmaul's sign, an S₄, clear lungs with dullness and scant inspiratory crackles at both posterior bases, no peripheral edema, and a thrill over a left arm AV graft. Cardiac Point of Care Ultra Sound revealed E-point septal separation <0.7cm suggestive of normal LVEF, and trace bilateral pleural effusions.

Prior Diagnostics: Recent diagnostic testing included a V/Q scan with homogeneous perfusion and very low probability for PE, chest CT showing mild pulmonary edema and trace pleural effusions, and PFTs with mild restriction and no obstruction. Room air ABG was 7.34, PaCO₂ 42 mmHg, PaO₂ 75 mmHg, 94%.

Diagnostic Reasoning: Progressive, severe exercise intolerance with near normal PFTs and the presence of Kussmaul's sign suggested a restrictive or constrictive cardiac process. More detailed history demonstrated a temporal correlation of mild symptom onset after AV fistula placement nine months earlier, with precipitous further decline in exercise tolerance after the AV graft was placed two months earlier, raising concern for possible High-Output Heart Failure.

Confirmatory Testing: Additional testing went on to show a negative bubble echocardiogram for right-to-left intracardiac shunt and a right heart catheterization with borderline pulmonary hypertension, elevated PCWP, and a cardiac output and index of 13.0/6.7 L/min/m² consistent with a diagnosis of HOHF.

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This case demonstrates the importance of a broad differential diagnosis for acute onset dyspnea in a patient with multiple comorbid processes.

Arteriovenous fistula and grafts for hemodialysis are associated with High-Output Heart Failure.

Physical exam findings may include Kussmaul's Sign.



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| Right Heart Cath Findings | | |
|---------------------------------------|-----------|----------|
| Cardiac Output (Thermodilution) | Patient | 13 L/min |
| Cardiac Index (L/min/m ²) | Patient | 6.7 |
| | Reference | 2.5-4.0 |

