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Uremic Pericarditis: Distinguishing Features in a Now-Uncommon Clinical Syndrome

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Abstract

We present the case of a 47-year-old man with a history of diabetes mellitus and diabetic nephropathy who was admitted to our hospital with acute uremic myopericarditis. Echocardiography demonstrated a fibrinous pericardial effusion. The patient was initiated on hemodialysis for hyperkalemia, metabolic acidosis, and uremia. He subsequently developed shock from cardiac tamponade, which required emergent pericardiocentesis. He was notably without tachycardia while he was hypotensive, and his admission electrocardiogram did not show typical ST- or PR-segment changes typically associated with acute pericarditis. This case highlights important differences between uremic pericarditis and other prevalent types of acute pericarditis, including the lack of tachycardia during tamponade and normal electrocardiography. Uremic pericarditis is now a less common diagnosis. It is often seen in the setting of previously undiagnosed advanced kidney disease or when patients are ineffectively dialyzed. Given its atypical features, low incidence, and adverse attendant complications, internists must maintain a high degree of suspicion to correctly diagnose acute uremic pericarditis.

Keywords

cardiac tamponade; end-stage renal disease; pericardial effusion; uremic pericarditis

Uremic pericarditis was originally described by Richard Bright of Guy's Hospital, London, in 1836 in patients dying of renal failure.¹ In the predialysis era this was a common diagnosis in uremic patients, with an incidence approaching 50%.¹ After renal replacement therapies became widely available in the United States, the incidence gradually dropped to <5%. Clinicians, however, continue to encounter patients presenting with this uremic complication, particularly in those with little or no medical care representation. We present a contemporary case of acute uremic pericarditis and describe his subsequent clinical course and therapy.

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Case Report

A 47-year-old man presented with 2 weeks of dyspnea and pleuritic chest pain to the emergency department of an academic medical center. His chest pain markedly worsened upon recumbence and improved upon leaning forward. A review of previous laboratory values revealed a marked progressive worsening of his renal function. His medical history included type 2 diabetes mellitus with resultant diabetic nephropathy, obstructive sleep apnea, and essential hypertension. The patient had noted the onset of myalgia and anorexia preceding these symptoms and began to take naproxen in addition to lisinopril. During this time, he noticed the development of pedal edema, followed by anuria and his presenting symptoms.

General Medicine Service Commentary

The pleuritic character of the patient's presenting symptom helps narrow the differential of his chest pain syndrome. Pleuritic chest pain could be indicative of pulmonary embolism, pleuritis, pneumonia, costochondral pain, pericarditis, or pneumothorax and generally decreases the likelihood of myocardial ischemia when present; however, his history of advanced diabetes mellitus and obstructive sleep apnea also predispose him to underlying coronary disease. Physical examination should focus on the cardiopulmonary examination, looking for friction rubs or evidence of pulmonary pathology in addition to palpation of the ribcage. The postural nature of his symptoms is suggestive of acute pericarditis because pericarditis pain often improves upon leaning forward as a result of reduction of pressure on the parietal pericardium, allowing the diaphragm to expand further, thus reducing splinting. If pericarditis is suspected, then auscultation for a paradoxical pulse should be performed and evaluation of the patient's right-sided filling pressures should be assessed.

Vital signs on admission showed a blood pressure of 166/90 mm Hg, a heart rate of 75 bpm, a temperature of 99.0°F, and a pulsus paradoxus of 8 mm Hg. Physical examination on admission was notable for distended neck veins and bilateral lower extremity edema. Laboratory data on admission showed serum creatinine of 10 mg/dL (prior baseline was 3 mg/dL), blood urea nitrogen (BUN) of 90 mg/dL, potassium of 6.5 mEq/L, anion gap metabolic acidosis, and an elevated troponin level.

Cardiology Service Commentary

Cardiac biomarkers often are modestly elevated in patients with end-stage renal disease (ESRD).² With broad-scale introduction of high-sensitivity troponin assays across the United States, most patients with advanced kidney disease will be expected to have detectable troponin levels. The absolute level of cardiac troponin in ESRD may vary over short intervals during and after hemodialysis and represents a marker of adverse cardiovascular prognosis. Exact biomarker cutoffs for the detection of myocardial injury are not available, and data regarding detailed cardiovascular imaging (including cardiac magnetic resonance imaging) are limited in the context of acute pericarditis.

Electrocardiography, obtained during an episode of chest pain, showed normal sinus rhythm with a first-degree atrioventricular block, but no ST-segment elevations or PR-segment depressions, and was unchanged from his prior tracings.

General Medicine Commentary

The diagnosis of acute pericarditis is made by a combination of clinical, electrocardiographic, and echocardiographic criteria, including suggestive history, friction rub, expected ST-segment changes, and pericardial effusion. Despite his unchanged electrocardiogram and lack of pericardial friction rub on auscultation, his advanced renal disease and history would be suggestive of uremic pericarditis, and thus an echocardiogram should be obtained to evaluate for the presence of a pericardial effusion. If present, he would meet two of the four criteria and thus be given the diagnosis of acute pericarditis.

Because of the patient's chest pain and elevated cardiac biomarkers, a transthoracic echocardiogram was obtained, which showed fibrinous deposition on the visceral pericardium, and a small pericardial effusion without evidence of cardiac tamponade.

Cardiology Service Commentary

Echocardiography shows a pericardial effusion in >50% of cases of uremic pericarditis, and frequently there is evidence of fibrin deposition on the pericardial surfaces²; however, note should be made that the incidence of noninflammatory effusions in patients with ESRD is high and that the etiology of the effusion may not be caused by serositis in asymptomatic patients. Additional serologic studies can be useful in establishing the presence of an autoinflammatory disease, which could predispose the patient to concomitant acute kidney injury and serositis.

Anti-nuclear antibodies, anti-neutrophil cytoplasmic antibodies, rheumatoid factor, and anti-cyclic citrullinated peptide antibodies were negative. The urinalysis was notable for proteinuria, and the evaluation of the urinary sediment showed granular casts. A diagnosis of acute pericarditis was made. Given his progressive renal failure and his negative serologic studies, the patient's myopericarditic syndrome was deemed to be of uremic etiology.

Nephrology Service Commentary

Pericardial involvement in patients with ESRD can manifest as asymptomatic noninflammatory effusions, acute uremic pericarditis, dialysis pericarditis, or, more rarely, as chronic constrictive pericarditis.^{3,4} Dialysis pericarditis is distinguished from acute uremic pericarditis by the onset of symptoms or clinical features of the disease occurring 8 weeks after the initiation of dialysis. When present, a diagnosis of acute uremic pericarditis is an indication for initiation of dialysis. In one case series, it was found that patients with acute uremic pericarditis tend to be younger and have not had contact with longitudinal nephrology care at presentation, suggesting that most present with new, advanced kidney disease.^{5,6} The pathogenesis of uremic pericarditis remains poorly understood. It is generally accepted that it is mediated by toxic levels of an unknown metabolite, resulting in serosal and systemic inflammation. This theory is supported by the resolution of acute uremic pericarditis with initiation of hemodialysis in >70% of cases and the fact that dialysis

pericarditis improves with intensification of the dialytic regimen, which would suggest that the latter may be attributable to inadequate hemodialysis.⁷

The patient was dialyzed successfully overnight on the day of admission because of progressive acidosis and hyperkalemia. The next day, the patient became hypotensive and unresponsive to intravenous fluid administration. A repeat pulsus paradoxus was 30 mm Hg, and his electrocardiogram showed electrical alternans. Notably, the patient was not tachycardic at the time of his hypotension. There was respiratory pulse pressure variability noted on his pulse oximetry waveform.

Cardiology Service Commentary

His new shock, elevated pulsus paradoxus, and electrical alternans are suggestive of cardiac tamponade. Although pericardial effusions are common in patients with renal disease, these effusions typically accumulate gradually with progressive renal disease, and clinical tamponade is rare in undialyzed patients. It is noteworthy that pericardial tamponade can be observed in 5% to 10% of those undergoing hemodialysis, perhaps related to short-term intravascular fluid shifts.¹ Repeat echocardiography and urgent pericardiocentesis should strongly be considered.

A repeat urgent transthoracic echocardiogram showed right atrial inversion, excessive respiratory mitral inflow variability, and inferior vena cava dilation, which are consistent with elevated intrapericardial pressures. The patient underwent pericardiocentesis with removal of 500 mL of serosanguinous fluid, after which his intrapericardial pressures dropped from 21 to 5 mm Hg and his blood pressures normalized. His pericardial drain was removed 2 days later, and the patient was then initiated on a regular hemodialysis regimen. He was discharged home and is now listed for renal transplant.

Discussion

Pericarditis is a common problem encountered by general internists in both the inpatient and outpatient arenas. Conversely, uremic pericarditis is now a rare clinical entity because of the advent of and widespread access to dialysis and improved dialytic techniques. Through the present case, we aimed to describe the incidence, pathophysiology, clinical presentation, and distinguishing features of acute uremic pericarditis to facilitate prompt diagnosis and treatment of this syndrome.

Clinically, acute uremic pericarditis can manifest with great similarity to nonuremic pericarditis. When present, symptoms include pleuritic chest pain that is relieved by the patient's leaning forward and worsened with recumbence; however, there may be echocardiographic evidence of fibrinous effusions in asymptomatic patients. Fever, myalgias, and malaise can be seen as well. Dyspnea, exertional or at rest, and orthopnea frequently are associated with the presence of a pericardial effusion. Physical examination can show a pericardial friction rub in 30% to 80% of cases and is the most specific physical finding for the diagnosis of acute pericarditis.⁷ If a hemodynamically significant effusion is present, the examination may show hypotension, narrowed pulse pressure, distant heart sounds, jugular venous distention, elevated pulsus paradoxus, and increasing jugular venous

pressure upon inspiration (Kussmaul sign). In contrast to other etiologies of tamponade, tachycardia often is absent despite significant intrapericardial pressures, which has been attributed to concomitant autonomic neuropathy and inadequate hemodynamic response to smaller stroke volumes.⁶

Although the electrocardiogram plays an important role in the diagnosis of nonuremic pericarditis, electrocardiography in patients with acute uremic pericarditis is frequently devoid of the characteristic ST-segment elevation and PR-segment depression seen in cases of idiopathic, viral, or autoimmune pericarditis. An accumulation of intrapericardial fluid may lead to lowered voltage or electrical alternans if the effusion is large enough to result in tamponade. As stated above, the echocardiogram often shows a pericardial effusion. Basic serum chemistries are often reflective of advanced renal disease, with metabolic derangements and electrolyte disorders also frequently seen. Even though levels of BUN and serum creatinine are similar in ESRD patients with and without acute uremic pericarditis, the diagnosis is rarely seen at a BUN <60 mg/dL and becomes more common as levels rise above 100 mg/dL.⁶

Cardiac biomarkers often are measured and are detectable in many patients presenting with acute uremic pericarditis. At present, clinical management of acute pericarditis related to uremia is typically not altered with or without detectable cardiac biomarkers.² The triage and management of patients with suspect acute coronary syndromes in patients with ESRD should continue to be based on practice guidelines supporting the rise and fall of cardiac biomarkers in the appropriate clinical context.

The exact incidence of uremic pericarditis is uncertain, with postmortem studies in the prehemodialysis era showing an incidence of 8% to 50% of patients who died of renal failure and studies incorporating clinical criteria showing a lower incidence around 20%, suggesting that asymptomatic serosal inflammation may be seen in a significant number of cases. Other studies in the era of modern hemodialysis estimate an incidence of <5% in patients with ESRD.^{5,6} Both hemodialysis and peritoneal dialysis have been used in the treatment of acute uremic pericarditis, but hemodialysis is the preferred therapy here because of the ability to deliver greater solute clearance.

The presence of a hemodynamically significant pericardial effusion should delay the initiation of dialysis because large amounts of ultrafiltration can precipitate circulatory collapse (ie, clinical tamponade) in a preload-dependent state, which may have been the case with our patient. Drainage of pericardial effusions is indicated if there is echocardiographic evidence of early tamponade or if a large effusion fails to respond to 1 to 2 weeks of an adequate dialysis regimen.^{7,8}

Care should be taken to limit systemic anticoagulation in patients with uremic pericarditis because their risk of intrapericardial hemorrhage is already heightened by uremic platelet dysfunction.⁹ When dialysis alone is inadequate, indomethacin, colchicine, and systemic or intrapericardial corticosteroids have been used in small case series.^{8,10–12} The need for pericardiectomy is rare in modern hemodialysis; however, thoracoscopic approaches have been successful when needed.¹³

This case highlights some of the atypical features that differentiate acute uremic pericarditis from other etiologies of pericarditis, including the absence of electrocardiogram changes and the lack of tachycardia despite elevated intrapericardial pressures. This patient was able to provide a concise history, which prompted the appropriate diagnostic testing, but in patients with uremic encephalopathy there may be a delay in diagnosis. Given that acute uremic pericarditis is an uncommon condition in the era of improved dialytic techniques and increased access to hemodialysis, a high degree of suspicion is necessary to make the diagnosis.

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