

CARDIAC case studies

The most current case studies in cardiology at EMORY

March 2007

The Encased Heart: Evaluating Constrictive Pericarditis

By Michael Hoskins, MD, Clinical Cardiology Fellow,
Emory University School of Medicine

A 64-year-old African American male presented to the hospital complaining of six months of progressively worsening shortness of breath, exertional fatigue and lower extremity swelling. The patient experienced no chest pain or palpitations. He had a history of chronic obstructive pulmonary disease and had attributed his symptoms to that condition. Thus, he had not sought medical attention prior to this presentation despite gaining approximately 50 pounds during the course of his symptoms.

The patient had no history of heart disease. He smoked until several years prior to this illness. He required a splenectomy after a motor vehicle crash 20 years before. Several years later, he was hospitalized with pneumococcal pneumonia associated with acute respiratory distress syndrome (ARDS) that resolved after a prolonged course.

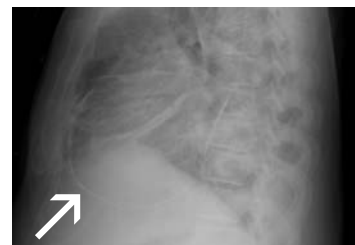
The patient was admitted to the hospital and begun on standard heart failure therapy with ACE-inhibitors and IV diuretics. Initially, he diuresed well but had significant lower extremity edema that persisted. Cardiology was consulted for assistance with his management.

Physical Examination

The patient's blood pressure was 127/82 mmHg and his heart rate was 90 beats per minute. His lungs had minimal crackles at bilateral bases. A cardiovascular exam revealed a fourth heart sound. There were no rubs, and no third heart sound (pericardial knock) was present. His apical impulse was diffuse at 6 cm and displaced slightly laterally. His neck veins were distended with an estimated central venous pressure of 14 cm and a prominent y-descent. Kussmaul's sign was present. The patient had significant ascites and lower extremity edema.

Diagnosis

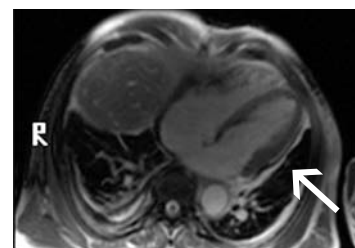
A review of the patient's chest radiograph revealed concentric calcification of the pericardium (right). The cardiac silhouette was not enlarged. The electrocardiogram demonstrated sinus rhythm with borderline low voltage. A transthoracic echocardiogram revealed preserved left and right ventricular systolic function with no significant pericardial effusion. A diagnosis of constrictive pericarditis was suspected.



Magnification of lateral view of chest radiograph showing calcified pericardium surrounding the heart.

Computed tomography (CT) is useful to outline pericardial anatomy when constrictive pericarditis is suspected. Typical findings include thickening and calcification of the pericardium, and absence of these findings should make one question the diagnosis. Gated CT images also can aid in the diagnosis because failure of adjacent structures to pulsate with the heart support constrictive physiology. CT of this patient showed diffuse pericardial calcification and thickening up to 8 mm.

Gated cardiac magnetic resonance imaging (MRI) is an additional modality used to define pericardial anatomy. Gated MRI images of this patient demonstrated a thickened, calcified pericardium that was fixed during systole and diastole (right). The left and right ventricles moved normally, although there was an apparent decrease in distensibility of the left ventricle during diastole.



Axial MRI slice showing thickened, calcified pericardium

continued on reverse

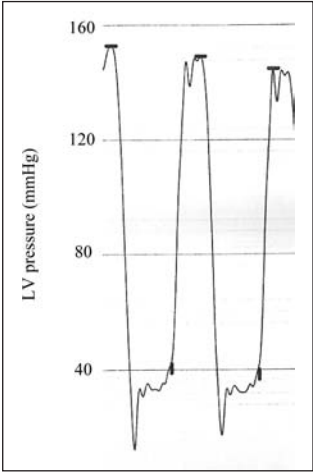
EMORY HEALTHCARE

EMORY HEART & VASCULAR CENTER

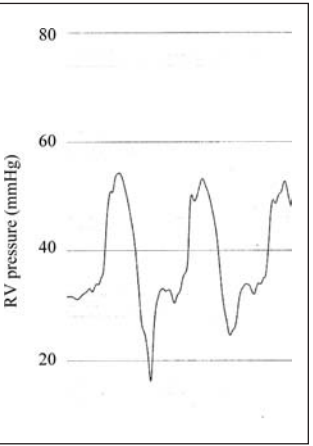
Editor: Robin Tricoles

Hemodynamic Evaluation

Hemodynamic evaluation using left and right heart catheterizations can be useful to demonstrate typical physiologic characteristics seen in constrictive pericarditis. Typical findings include:



Left ventricular (LV) pressure tracing showing the "square root" sign. Note the initial rapid fall in LV pressure during early diastole followed by a plateau phase during mid and late diastole.



Right ventricular (RV) pressure tracing showing the "square root" sign. Note the RV end-diastolic pressure is equal to the LV end-diastolic pressure.

- Elevated right atrial pressures
- Prominent x- and y-descents of right atrial pressure tracings, representing rapid initial filling of the right atrium and ventricle.
- Equalization of right and left ventricular diastolic pressures.
- "Square root" sign seen during right and left ventricular diastolic pressure tracings, representing a rapid early diastolic pressure drop followed by rapid filling that is limited by pericardial compression during mid to late diastole.

Right and left heart catheterizations were performed that revealed a mean right atrial pressure of 30 mmHg with equalization of right and left ventricular diastolic pressures at 32 mmHg. Pressure tracing of ventricular pressures exhibited the "square root sign" during diastole (left).

Further workup of constrictive pericarditis is directed at identifying possible causes for the pericardial disease. Pericarditis of any cause eventually may lead to constrictive pericarditis.

Common causes include:

- Idiopathic or viral
- Post-cardiac surgery
- Previous radiation
- Connective tissue disorders
- Post-infectious (tuberculosis or purulent pericarditis)
- Malignancy

Blood cultures and purified protein derivative (PPD) in our patient were negative.

Management

Constrictive physiology occurs because the heart is encased within a non-distensible pericardium. Thus, while diuretics may be used initially to remove volume, their effectiveness often is limited. Most cases are persistent, and ultimately, surgical removal of the pericardium is required for definitive treatment. Mortality from pericardectomy varies but is increased significantly in patients with renal disease or those with radiation-induced pericarditis.

Our patient underwent surgical pericardectomy without complications. Histologic examination of the pericardium revealed fibrous, calcified pericardial tissue with no evidence of malignancy. In the week following surgery, he diuresed rapidly and was discharged from the hospital. At one-month follow up in the cardiology clinic, he was doing well with no recurrent symptoms of heart failure. The exact cause of his pericardial disease remains unknown. It is possible he had undiagnosed pericarditis at the time of his pneumococcal pneumonia that was subsequently treated.

To talk with an Emory cardiologist, call the Emory Physician Consult Line at 404-778-5050 or 800-22-EMORY.

Advancing the Possibilities®

EMORY FLIGHT

EMORY HEALTHCARE

24-HOUR AIR MEDICAL TRANSPORT

- Only accredited rotor-wing air medical transport provider in the state of Georgia
- Critical care RNs and Medic Teams on all flights
- Immediate response
- State-of-the-art critical care life support

Emergency Transport Request
888-763-1010

EMORY HEART & VASCULAR CENTER
1365 Clifton Road, NE
Atlanta, Georgia 30322

NON-PROFIT
ORGANIZATION
U.S. POSTAGE
PAID
ATLANTA, GA
PERMIT NO. 3604