



### Heartaches: Malignant Pericardial Effusions

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**A** 71-year-old woman named B.D. presented to the emergency department with a two-week history of fatigue, cough, and dyspnea. She complained that morning of a sudden worsening of respiratory symptoms, and a chest x-ray demonstrated an enlarged cardiac silhouette and left pleural effusion. Routine laboratory tests showed anemia, elevated liver enzymes, and renal insufficiency. A computed tomography (CT) scan of the thorax was ordered, revealing lung and liver lesions with a pericardial effusion. A follow-up 2D echocardiogram showed a pericardial effusion with evidence of cardiac tamponade. B.D. deteriorated rapidly in the emergency department. She had a decreased level of consciousness and was hypotensive with distended neck veins and muffled heart sounds. An electrocardiogram showed a rapid atrial fibrillation with electrical alternans. A echo-guided pericardiocentesis was performed at bedside. B.D. suffered cardiac arrest during the procedure but was successfully resuscitated. Two liters of fluid were drained from the pericardial sac. A surgical referral was requested for a pericardial window and an oncology referral was made because this was B.D.'s de novo presentation of metastatic disease.

A few weeks later, a 61-year-old man named S.T. presented to the chemotherapy clinic with a one-week history of increasing shortness of breath, an inability to lie flat, profound fatigue, and ankle swelling. S.T. had been receiving chemotherapy for a diagnosis of small cell lung cancer, and a CT scan showed shrinkage of his lung lesions but evidence of pleural and pericardial effusions. On examination, S.T. was tachycardic with a pulse of 150, a blood pressure of 90/60, and a pulsus paradoxus of 30 mm/Hg. Referral to a cardiologist and

subsequent admission to the cardiac care unit resulted in pericardiocentesis (1 L of straw-colored fluid removed) and, ultimately, a pericardial window was created.

#### Definitions

A malignant pericardial effusion (MPE) is an accumulation of excess fluid in the pericardial sac that surrounds the heart and is associated with both solid tumor cancers such as lung or breast as well as hematologic malignancies such as leukemia (Cope, 2011). MPE is the most common cardiac complication and is a poor prognostic factor with survival usually less than six months (Nguyen, 2008).

Cardiac tamponade is a life-threatening complication of a pericardial effusion. It most often is caused by compression of the heart by fluid and results in inadequate filling of the ventricles, decreased cardiac output, and impaired cardiac function (Kaplow, 2011). Cardiac tamponade also can be caused by constrictive pericarditis as a result of radiation, either with acute inflammation or development of fibrous tissue as a late effect (Hoit, 2013).

#### Anatomy and Pathophysiology

Surrounding the heart are two distinct sacs—the endocardium and the pericardium. The endocardium consists of a layer of endothelial cells and an underlying layer of connective tissue. The pericardium is a two-layered sac (parietal and visceral layers) that contains the heart and great vessels that come from the heart. This sac contains a small amount of fluid (about 50 cc) that prevents friction and provides lubrication. Fluid is constantly moving in and out of this space. When the fluid increases, pressure and subsequent compression

of the heart may occur. The amount of fluid in the sac is related to the degree of compression of the heart.

The sac itself can stretch and fill with almost 4 L of fluid. To maintain adequate cardiac output, the heart pumps faster and compensatory peripheral vasoconstriction occurs. Pericardial effusions can develop slowly over time or rapidly in a few hours or days. The faster the fluid collects, the more severe the distress. Although the volume is important, the speed of accumulation causes more problems because of the inability of the heart to adapt to the compression in a short period of time.

The literature shows that, at autopsy, about 20% of patients with cancer had metastatic disease in the pericardium (Newton, Hickey, & Marrs, 2009).

#### Diagnostic Tests

Many effusions are never detected, whereas others may be found via echocardiography, occasionally on chest x-ray, but most often on initial or interval extent of disease CT scans. Echocardiography has about a 96% diagnostic accuracy. Chest x-ray may highlight an increased pericardial silhouette with a water bottle-shape appearance on chest x-ray. Typically, electrocardiograms show only sinus tachycardia, but may demonstrate electrical alternans (an alteration in the amplitude of the QRS secondary to the mechanical swinging of the heart seen in large effusions) (Kaplow, 2011).

#### Culptic Cancers Associated With Pericardial Effusions

Lung and breast cancers, melanoma, and leukemias or lymphomas may be associated with pericardial effusions: lung and breast by direct extension or via the lymphatic route, and the blood-related