A 69-Year-Old Man Presented With Abdominal Pain and Dark, Tarry Stools

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A 69-year-old man presented to the ED with abdominal pain and dark, tarry stools. His medical history included chronic hepatitis C infection, portal vein thrombosis on anticoagulation, and end-stage renal disease on hemodialysis. While in the ED, the patient had the following vital signs recorded: BP, 73/56 mm Hg; heart rate, 127 beats/min; respiratory rate, 16 breaths/min; and arterial oxygen saturation, 96% on 2 L via nasal cannula. Initial laboratory values revealed a hemoglobin level of 7.0 g/dL (baseline, 9-10 g/dL) and an international normalized ratio (INR) of 13.7. The medical ICU (MICU) was consulted for presumed hemorrhagic shock. The patient’s physical examination revealed an alert and oriented male subject, normal breath sounds on pulmonary examination, sinus tachycardia on cardiac examination, and no evidence of edema in the lower extremities. In the MICU, a bedside whole-body ultrasound was performed (Videos 1-5, Narration Video).

Question: Based on clinical examination, physical examination, and ultrasound findings, what is the most likely diagnosis?
Answer: Cardiac tamponade with volume depletion secondary to upper GI bleed.

At the bedside, under ultrasound guidance, a pericardiocentesis was performed. There was relief of tamponade physiology with prompt improvement of the patient’s hemodynamic parameters. However, an inadvertent communication between the pericardium and the left pleural space was created, likely due to parietal puncture from the pericardial drain. This condition was diagnosed when an agitated saline study to ensure placement of the pericardial drain revealed bubbles in the left pleural space. Subsequent placement of a left-sided chest tube allowed drainage of both the pericardial fluid and the left pleural effusion. The chest tube was removed 5 days later.

Discussion

The patient presented in shock, presumably hemorrhagic (hypovolemic) in origin. However, goal-directed echocardiography revealed a large circumferential pericardial effusion with tamponade features, likely due to an elevated INR with end-stage renal disease. Videos 1 to 5 show transthoracic images recorded by the MICU team. Video 1 (the parasternal long-axis view) shows a pericardial effusion. To help distinguish a left pleural effusion (which is common in critically ill patients) from a pericardial effusion, the examiner must understand the spatial relationship that exists between the pleura, pericardium, and descending aorta; pericardial effusion lies anterior to and pleural effusion posterior to the descending aorta in the supine position.

Echocardiographic findings of cardiac tamponade include diastolic collapse of the right ventricle, and if present, can be well visualized in the parasternal long-axis. We do not see this scenario in the study patient; however, the sensitivity of right ventricular (RV) diastolic collapse is only 60% to 90% and may be absent. This finding, along with the discussion that follows, highlights the need for clinical interpretation of echocardiographic findings to diagnose an etiology for shock. Video 2 (the parasternal short-axis view) shows the pericardial effusion with normal left ventricular function. The apical four-chamber view again shows a large circumferential pericardial effusion. However, clear evidence of right atrial (RA) systolic collapse, which is both sensitive and specific, is missing. This outcome may be caused by chronic elevations in RA/RV pressures due to underlying pulmonary hypertension, which can cause a pressure gradient to exist between the pericardial space and the RV chamber, with no effect on the contour of the RV free wall itself.

In the present case, if Videos 3 and 7 are compared, there is a distinct increase in chamber size following pericardiocentesis. Although visualization of the changes (RA/RV changes) may help in the diagnosis of echocardiographic features of tamponade, their absence does not exclude tamponade, especially in a patient with a large pericardial effusion and shock. As in the present case, we appreciated a small RA/RV size but with subsequent drainage of the pericardial fluid, the chambers doubled in size. Although a plethoric inferior vena cava without respirophasic changes is highly sensitive, as seen in this patient, it is not specific (Videos 5, 8).

Video 3 shows an apical four-chamber view at the time of the pericardiocentesis. The position of the catheter is confirmed by injecting agitated saline, creating a "bubble appearance" within the pericardial effusion (Video 6). However, while imaging in the apical four-chamber view, a hypoechoic space with bubbles appeared to enlarge, representing a left pleural effusion. A repeat saline injection through the catheter confirmed that the pericardiocentesis catheter must have migrated through the pericardium into the left pleural space, creating a pericardial window. The patient’s hemodynamic parameters immediately improved following drainage of the pericardial space. A left-sided chest tube was placed to facilitate removal of the fluid. One liter of bloody fluid was evacuated, which allowed removal of the pericardial drain. There was no re-accumulation of pericardial fluid. The chest tube was removed a few days later. The patient’s INR was reversed with prothrombin complex concentrate before the procedure, and he received a blood transfusion with appropriate response.

Ultrasonography should be considered an essential imaging modality in the MICU used to diagnose and guide the treatment of cardiopulmonary failure. This approach is exemplified in the present case, when a life-threatening diagnosis (pericardial tamponade) may not have been diagnosed if an assessment of the shock state was just due to the GI bleed. Furthermore, the hypovolemic state may have a dramatic effect on the hemodynamic variables of a patient with pericardial fluid leading to tamponade.
Reverberations
1. Whole-body ultrasonography and goal-directed echocardiography are essential in the diagnosis and treatment of patients with cardiopulmonary failure.

2. Echocardiographic features of tamponade include diastolic collapse of the right ventricle and systolic collapse of the right atrium. However, even in their absence, whenever a large pericardial effusion accompanies a patient in shock, one must consider tamponade as a diagnosis.

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Additional information: To analyze this case with the videos, see the online version of this article.

References