

Ultrasound in Emergency Medicine



BEDSIDE IDENTIFICATION OF MASSIVE PULMONARY EMBOLISM WITH POINT-OF-CARE TRANSESOPHAGEAL ECHOCARDIOGRAPHY

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Abstract—Background: Pulmonary embolism can be difficult to diagnose, particularly in those who are hemodynamically unstable and cannot be imaged to confirm the diagnosis. Echocardiography can allow for rapid assessment of patients in shock, but requires adequate transthoracic windows to obtain clinically useful information. Emergency physician-performed transesophageal echocardiography (TEE) may be a useful tool when transthoracic echocardiography fails. **Case Report:** An 86-year-old woman presented to the emergency department after a fall at home. She rapidly decompensated in the emergency department and sustained a pulseless electrical activity cardiac arrest. Attempts made during the resuscitation to obtain transthoracic echocardiographic views to elicit the cause of the patient's cardiac arrest were unsuccessful. An emergency physician, with previous focused training in TEE, performed emergent TEE. The TEE examination rapidly revealed a dilated right ventricle and an empty, hyperdynamic left ventricle, suggestive of an unsuspected massive acute pulmonary embolism. **Why Should an Emergency Physician Be Aware of This?:** With continued growth and utility of point-of-care ultrasound in emergency medicine, TEE provides an attractive means to assess critically ill patients that may not otherwise be assessable. © 2017 Elsevier Inc. All rights reserved.

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INTRODUCTION

Point-of-care ultrasound can be a valuable resuscitation tool for assisting with the diagnosis and management of patients in cardiac arrest or undifferentiated shock (1,2). However, for multiple reasons, point-of-care ultrasound can sometimes fail to yield adequate images to provide clinically useful information. In this case report, because of ongoing chest compressions and body habitus, transthoracic echocardiography (TTE) failed to yield clinically useful information. Transesophageal echocardiography (TEE) was performed by an emergency physician, with findings consistent with a massive pulmonary embolism. It also allowed the providers to rule out alternate etiologies to the patient's cardiac arrest.

CASE REPORT

An 86-year-old woman was brought to the emergency department (ED) after a witnessed fall at home. She was initially noted to be short of breath and in rapid atrial fibrillation with Emergency Medical Services. Shortly after arrival to the ED, she went into a pulseless electrical activity (PEA) cardiac arrest with a widened QRS. She was resuscitated with endotracheal intubation, chest compressions, and intravenous epinephrine; however, she remained in PEA. Point-of-care TTE was performed. Because of inadequate ultrasound imaging windows, no

identifiable etiologies for the patient's arrest could be found. Focused TEE was performed by an emergency physician, which rapidly led to the underlying diagnosis (Figures 1 and 2).

Diagnosis

Massive pulmonary embolism. The focused TEE revealed an enlarged right ventricle, a small and hyperdynamic left ventricle (Figures 1 and 2), and a distended noncollapsing superior vena cava (Figure 3), leading to the presumptive diagnosis of an acute pulmonary embolism. In addition, the focused TEE assessment rapidly ruled out other emergent pathologies, including aortic dissection and aneurysm, pericardial effusion, and regional wall motion abnormality. TEE also allowed for assessment of the adequacy of chest compressions and prognostication, as demonstrated by the presence of cardiac activity during pulse checks. After return of spontaneous treatment occurred, the patient was stable enough to undergo a computed tomography scan of the chest that confirmed the diagnosis. The patient received appropriate treatment, including heparin and interventional therapy. The patient was successfully extubated after 2 days in intensive care and was neurologically intact.

DISCUSSION

This case shows how focused point-of-care TEE is emerging as a potentially valuable tool for the

management of critically ill patients in the ED. While noninvasive, TTE can occasionally lead to inadequate images that cannot be used to guide resuscitative efforts. There are several factors that can make TTE more challenging in resuscitation scenarios. Patients may have received bag-valve-mask ventilation, causing gastric insufflation and making subxiphoid views of the heart difficult. If chest compressions were performed, rib fractures and subcutaneous emphysema can block ultrasound waves from reaching the heart. In addition, critically ill patients cannot be easily placed into optimal positions, such as the left lateral decubitus position (3).

The frequency of inadequate image acquisition from an emergency medicine perspective is unknown. However, from a study by Vignon et al. in a critical care population, TTE was only able to provide adequate images in 38% of cases (2). The same study showed that TEE aided in 98% of clinical decisions and had a significantly higher impact on patient care than TTE (4). TEE was advocated as an emerging technology for emergency physicians by the American College of Emergency Physicians position statement on emergency point-of-care ultrasound in TEE in 2008 (5). TEE has several advantages over TTE. The probe sits in the esophagus directly behind the heart, and therefore it is possible to obtain an adequate sonographic window in almost every patient. The TEE probe itself uses a higher frequency than that used for TTE, yielding superior image quality. TEE allows for the assessment of the heart

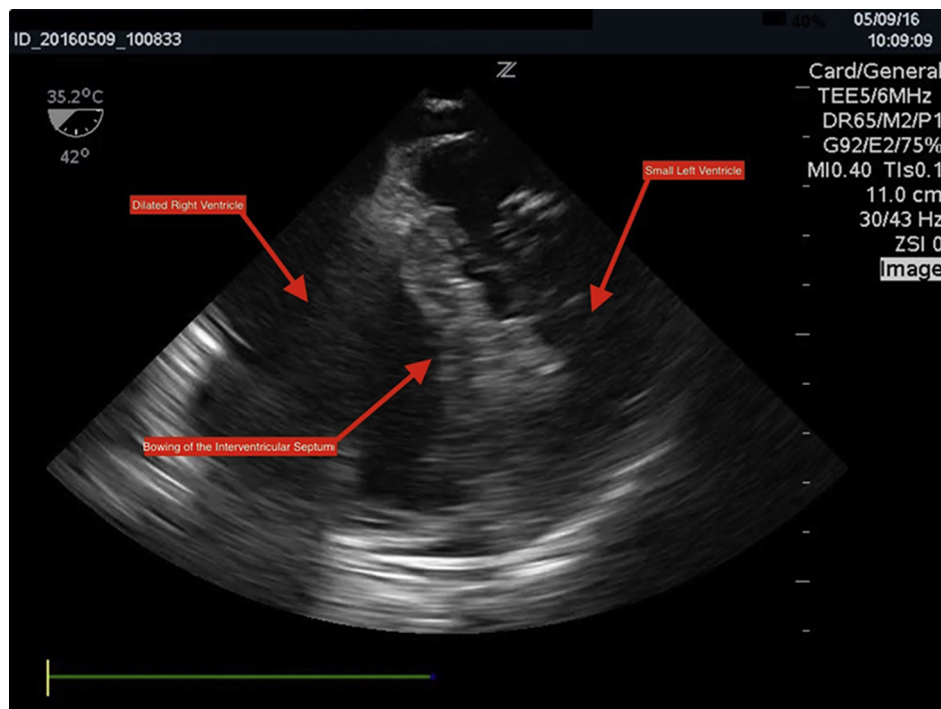


Figure 1. Midesophageal 4-chamber view, revealing a dilated right ventricle, bowing of the intraventricular septum, and an under-filled left ventricle.

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