Acute pulmonary embolism (PE) is a life-threatening illness associated with high mortality in patients with massive PE and shock. Echocardiography can readily identify the hemodynamic consequences of severe PE and help guide management. Thrombolytic therapy is recommended for this group of patients, particularly when other alternatives (radiologic or surgical thrombectomy) are not readily available. Although thrombolysis is highly efficacious, it can cause major complications, such as intracranial and nonintracranial hemorrhage.

We present a case in which transthoracic echocardiography was used to diagnose posterior mediastinal hematoma causing compression of the left atrium, following administration of thrombolytic therapy for massive PE.

CASE PRESENTATION

A 66-year-old man was admitted to the emergency department in shock after he collapsed at home. His medical history was unremarkable except for a laparoscopic Nissen fundoplication 3 weeks earlier for gastroesophageal reflux. Focused echocardiography at the bedside raised the suspicion of acute PE, which was subsequently confirmed on computed tomographic pulmonary angiography (Videos 1 and 2, Figure 1).

Despite resuscitative treatment, the patient remained hypotensive and tachycardic with clinical signs of shock and an elevated lactate level. Thrombolysis with alteplase (10-mg bolus, followed by an infusion of 90 mg over 2 hours) was administered in the absence of absolute contraindications, and the patient was transferred to the intermediate care unit. His hemodynamic state rapidly improved, with normalization of arterial blood pressure without further vasopressor or inotropic support, although the patient remained tachycardic. Ongoing anticoagulation was continued with heparin infusion.

Follow-up transthoracic echocardiography was performed the next morning, demonstrating improvement in right ventricular size and function. Unexpectedly, a new large mass was visualized, positioned behind the left atrium, significantly compressing the left atrium and causing high mitral inflow velocities (Figures 2 and 3, Videos 3–5).

Point-of-care ultrasound of the veins in the lower limbs was performed to exclude residual deep venous thrombosis. It demonstrated residual thrombus in the right popliteal vein.

Considering the history of recent diaphragmatic surgery, it was suspected that thrombolysis had caused bleeding from the surgical site. The patient was referred for another computed tomographic scan for detailed evaluation of the hematoma and planning of further management.

Contrast computed tomography was performed, which revealed a large posterior mediastinal hematoma extending superiorly from the retrocrural space to the level of the aortic arch. Contrast blush was seen within the hematoma consistent with ongoing bleeding (Figure 4).

Heparin infusion was stopped, and heparin anticoagulation effects were reversed with protamine. An inferior vena cava filter was inserted by the interventional radiologist. Given the high risk for acute localized cardiac tamponade with possible hematoma expansion, the patient was urgently transferred to a center with the capability of emergency venoarterial extracorporeal membrane oxygenation implantation to enable immediate life support should the need arise.

The posterior mediastinal hematoma was uneventfully drained via mini-laparotomy the next day. The patient was discharged from intensive care 2 days later. Although no further bleeding was observed, the risk for rebleeding was deemed too high, and the multidisciplinary decision was made to withhold anticoagulation at this stage.

Unfortunately, 2 days later the patient experienced a cardiac arrest on the ward. Resuscitation included immediate cannulation and initiation of extracorporeal cardiopulmonary resuscitation with femoro-femoral venoarterial extracorporeal membrane oxygenation implantation. Transesophageal echocardiography during extracorporeal cardiopulmonary resuscitation demonstrated a paradoxical embolic event with embolic masses crossing from right to left through a patent foramen ovale (Videos 6 and 7).

After stabilization on venoarterial extracorporeal membrane oxygenation, the patient underwent computed tomography of the brain, which revealed devastating ischemic stroke. In liaison with the patient’s family, the decision was made to stop ongoing life support.

DISCUSSION

This case highlights the extraordinary usefulness of ultrasound in managing patients with shock. In fact, the focused cardiac ultrasound examination by an emergency physician at the bedside led to rapid...
identification of the dilated right ventricle, which then led to the performance of computed tomographic pulmonary angiography without further delay. Focused cardiac ultrasound is used as an adjunct to clinical examination and follows simple two-dimensional-based protocols that require minimal training and are therefore increasingly used in emergency situations.1

Echocardiography was also the imaging modality that revealed the rare complication of a mediastinal hematoma after thrombolysis in this patient and guided further management. Although thrombolysis is a well-established treatment for life-threatening PE, significant iatrogenic

Figure 1 Initial computed tomographic pulmonary angiographic scan showing bilateral pulmonary embolism (white arrows indicate thrombi).

Figure 2 Parasternal long-axis view after thrombolysis showing a large mass (white arrows) behind the left atrium.

Figure 3 Apical long-axis view. Continuous-wave Doppler through the mitral valve inflow signal showing high inflow velocities.
complications from this therapy are not uncommon. Major hemorrhage complicates about 10% of cases after thrombolysis, and intracranial or fatal hemorrhage occurs in 1.7%. According to recent guidelines, thrombolysis is therefore considered a major contraindication in circumstances such as previous intracranial hemorrhage and recent brain or spinal surgery. However, these contraindications might become relative contraindications in a patient with immediately life threatening high-risk pulmonary embolism. Thrombolysis carries the risk for potential complications, which are not limited to massive hemorrhage or devastating hemorrhage within the central nervous system. Even a small hemorrhage after recent surgery and thrombolysis can be life threatening when confined to a small volume around the cardiac cavities.

The management of massive PE becomes even more complicated after hemorrhage, as the question when to reintroduce anticoagulation is not yet solved and inferior vena cava filters do not provide perfect protection against another thromboembolic event, as demonstrated in this case.

Unfortunately, the patient experienced a cardiac arrest after initially successful treatment of PE and the mediastinal hematoma. Current guidelines recommend the use of echocardiography during cardiopulmonary resuscitation, as it can help identify reversible causes, but one must be aware that this can lead to prolonged no-flow times. Transesophageal echocardiography might therefore be a better choice in this setting, and the American College of Emergency Physicians has recently published guidelines for the use of transesophageal echocardiography in the emergency department for cardiac arrest.

CONCLUSIONS

Echocardiography is extraordinarily useful for managing patients with shock or experiencing cardiac arrest, as it can help rapidly identify the cause of shock and guide further management.

SUPPLEMENTARY DATA

Supplementary data related to this article can be found online at https://doi.org/10.1016/j.case.2017.12.002.

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