

Huge Left Atrium Thrombus Presenting with Syncope and Sudden Death, Diagnosed by Point-of-care Ultrasound

CME Credits

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Abstract

The left atrium (LA) thrombus is a life-threatening disease that can result in systemic embolization and sudden death if misdiagnosed. Point-of-care ultrasound (POCUS) is an efficient tool able to assist emergency physicians in accurately and promptly identifying patients with LA thrombus. We present a 72-year-old man who presented at the emergency department with out-of-hospital cardiac arrest. The patient received cardiopulmonary resuscitation and achieved spontaneous circulation upon arrival. The patient had a past history of mitral valve regurgitation and valve replacement, followed by warfarin treatment for 5 years. Clinical examination, including POCUS, resulted in a diagnosis of LA thrombus with systemic thromboembolism events affecting the brain, kidney, and lower limbs. Although an emergency thrombectomy was performed immediately, the patient eventually died. POCUS should be performed in patients with any prior history of structural heart disease, especially those who received valve replacement surgery, to identify life-threatening thromboembolism events and facilitate prompt treatment.

Keywords: Left atrium thrombus, point-of-care ultrasound, sudden death, syncope

INTRODUCTION

Mobile left atrium (LA) thrombus may have catastrophic consequences, including systemic embolization or sudden death due to obstruction of the left ventricular inflow. Underlying diseases, such as mitral stenosis, atrial fibrillation, rheumatic heart disease, and previous embolic episodes, or LA volume >4.5 cm might result in the development of an LA thrombus. Point-of-care ultrasound (POCUS) is a simple and easy-to-use diagnostic tool that can be used for the immediate and accurate diagnosis of life-threatening diseases in the emergency department (ED).

CASE REPORT

A 72-year-old man with a prior medical history of mitral valve regurgitation, bovine valve replacement, and taking warfarin 3.5 mg QD without adjustment for 2 years; embolic infarction of the right hemisphere 4 years prior; type 2 diabetes mellitus; and hypertension presented to the ED for out-of-hospital cardiac arrest (OHCA), which was witnessed by his family.

Cardiopulmonary resuscitation (CPR) was performed immediately, and the patient arrived at the ED 15 min following OHCA, with spontaneous circulation achieved upon arrival.

At triage, the patient's vital signs were recorded as follows: blood pressure, 172/123 mmHg; heart rate, 121 beats/min; respiratory rate, 28 breaths/min; body temperature, 37.1°C; and Glasgow Coma Scale, 3 points. Endotracheal intubation was performed immediately. Physical examination revealed pupil 3–4–, with eyes deviated to the left. The electrocardiogram showed atrial fibrillation with a rapid ventricular response. Chest X-ray disclosed cardiomegaly [Figure 1]. Laboratory tests showed white blood cell counts of 8790/μL, a prothrombin time/international normalized ratio value of 16.6/1.48, troponin-T level of 41 ng/L, and liver and kidney function within the normal range. According to a previous ED visit, the patient had symptoms including intermittent palpitation, shortness of breath, and fatigue.

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POCUS was performed and revealed a huge free-floating LA thrombus intermittent with left ventricle diffuse hypokinesia and estimated left ventricular ejection fraction was 10% [Figure 2]. There was no mitral valve dysfunction while performing the POCUS with peak velocity 1.2 m/s, mean pressure gradient 2 mmHg. Brain computed tomography (CT) was performed and revealed a hypodense area in the left middle cerebral artery region. Contrast aortic CT was also performed, showing a large LA thrombus, sized 100 mm × 37 mm × 35 mm [Figure 3a]; left common carotid artery occlusion [Figure 3b]; left renal infarction [Figure 4a]; and total occlusion of the left proximal common iliac artery [Figure 4b].

Due to the finding of an LA thrombus with multiple thromboembolic events, a cardiovascular surgeon was consulted, and the patient underwent an emergency thrombectomy. Although the operation was successful, the patient had dilated pupils on the 2nd day of admission. After discussing the situation with the patient's family, the patient's family signed a "do not resuscitate" agreement, and the patient eventually died.

DISCUSSION

POCUS plays a crucial role in identifying reversible causes of cardiac arrest during CPR by facilitating the detection of conditions such as tamponade physiology resulting from pericardial effusion, right heart strain due to massive pulmonary embolism, and hypovolemia – All of which are

potential reversible causes of cardiac arrest. For instance, the ultrasound-circulation airway breathing protocol evaluates the heart and inferior vena cava in sequence (cardiac and cava, C), followed by the assessment of the trachea (airway, A), and the examination of the lungs (breathing, B).^[1]

The risk of heart failure or sudden death associated with the total occlusion of main vessels should be considered in patients with certain underlying diseases, including mitral valve replacement, mitral stenosis, rheumatic heart disease, LA chamber dilation, or previous embolic episodes.^[2] The presence of an LA thrombus is a risk factor for systemic thromboembolism, and physicians should treat such patients immediately and aggressively.

The diagnosis of a free-floating thrombus requires that two criteria be met: First, the thrombus should have a smooth surface without attachment to the atrial wall. Second, the thrombus should be larger than the mitral valve orifice.^[3] A free-floating LA thrombus might cause intermittent obstruction of the mitral valve orifice,^[4] resulting in heart failure, dyspnea, pulmonary congestion, syncope, or sudden death.

POCUS should be performed in patients with any history of mechanical valve replacement to evaluate possible life-threatening thromboembolism events. In the present case, the patient suffered from a systemic thromboembolic event, affecting the brain, kidney, and main arteries. POCUS in patients with suspected thromboembolism events should focus on four crucial regions with high embolism risk.^[5,6] First, the neck

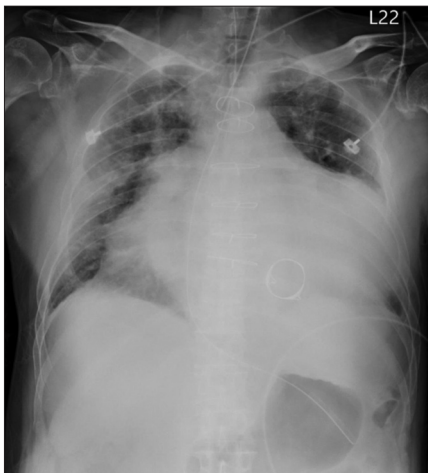


Figure 1: Chest X-ray showing cardiomegaly with a tortuous aorta. Valve replacement was also noted

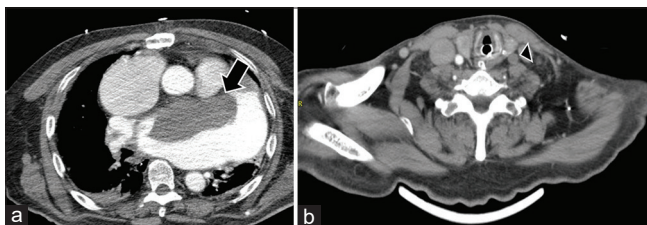


Figure 3: (a) Huge left atrium thrombus, sized 100 mm × 37 mm × 35 mm, with a filling defect (arrow). (b) Left common carotid artery occlusion (arrowhead)

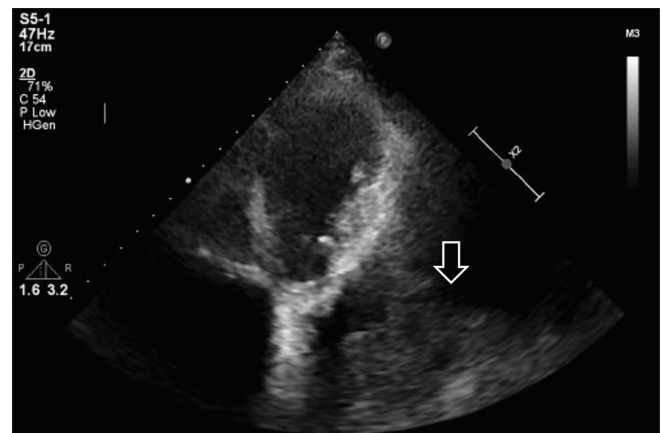


Figure 2: Apical four-chamber view showing a huge left atrium dilation and a large hyperechoic thrombus *in situ* (arrow)

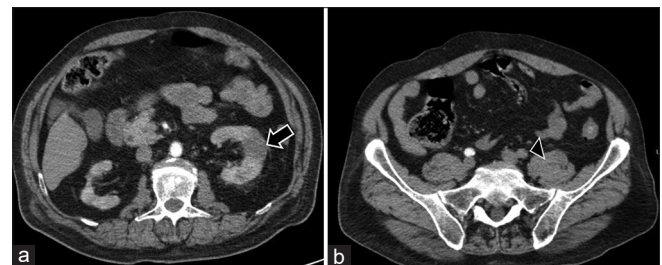


Figure 4: (a) Left kidney view showed a wedge shape hypodense area, indicating renal infarction (arrow). (b) Left common iliac artery occlusion (arrowhead)

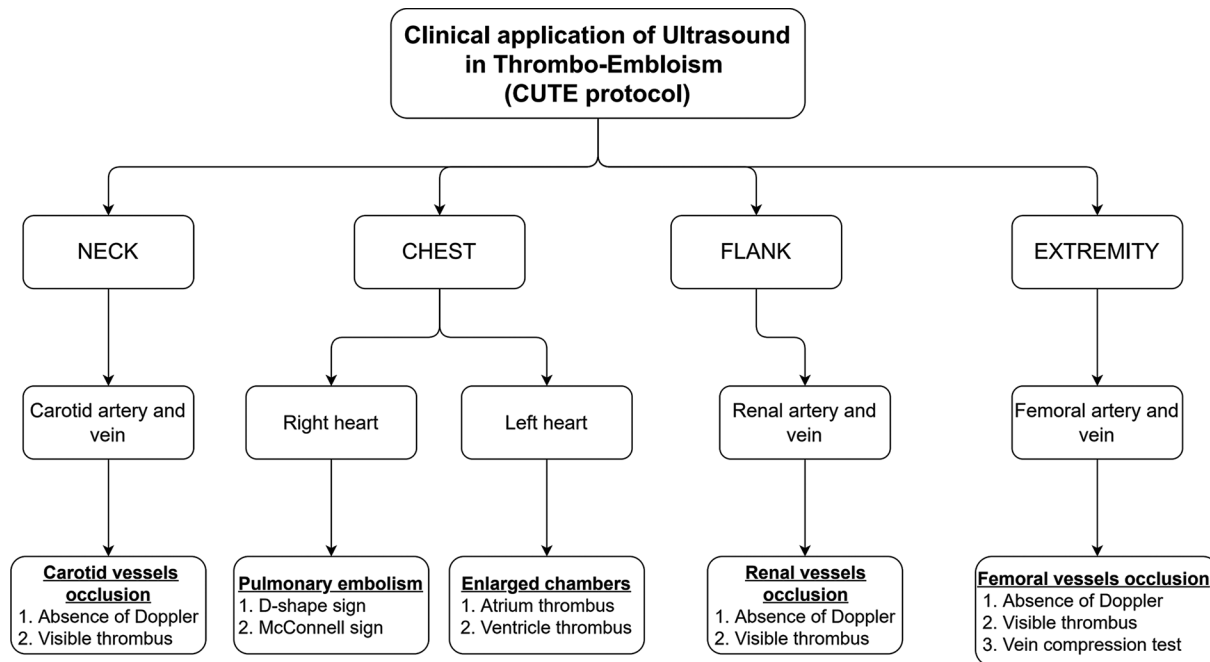


Figure 5: The “Clinical application of ultrasound in thromboembolism” (CUTE) flowchart

region, carotid artery, and vein occlusion can be identified by the absence of Doppler flow or the identification of a visible hyperechoic thrombus over the target vessel.^[7] Second, the chest region, cardiac thrombus, including left atrial thrombus, can be identified by either direct visualization of thrombus or enlarged chambers (ventricles or atriums) in the apical four-chamber view; pulmonary artery embolism can be recognized by either a D-shaped chamber sign in the parasternal short-axis view or a McConnell sign in the apical four-chamber view.^[8] Third, flank region, bilateral kidney artery, and vein occlusion can be detected by either the absence of an intrarenal Doppler flow or a tardus parvus waveform (the absence of an early systolic peak and a diminished waveform amplitude).^[9] Fourth, lower extremities, bilateral femoral artery, and vein occlusion can be diagnosed by the absence of Doppler flow or the direct visualization of a thrombus over the target vessel.^[10] [The systemic flowchart: “Clinical application of Ultrasound in ThromboEmbolism” (CUTE) is illustrated in Figure 5].

Immediate therapeutic interventions are necessary to avoid catastrophic outcomes. Effective therapy for LA thrombus includes surgical intervention, thrombolytics, and anticoagulants. Although thrombolysis may increase the risk of fragmented thrombi, leading to systemic thromboembolic events, thrombolysis represents an alternative option for patients with coagulopathies, who are at high perioperative risk, or who present with contraindications to operation.^[11]

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that his name and initials will not be published and due efforts will be made to conceal his identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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