

Ultrasound for Critical Care Physicians: An Unexpected Target Lesion

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A 39-year-old woman was admitted to the hospital for shortness of breath. Her medical history was significant for human immunodeficiency virus infection (not on anti-retroviral therapy), superior vena cava (SVC) syndrome with history of SVC stenting, cerebrovascular accident complicated by seizure disorder and swallowing difficulties, moderate pulmonary hypertension, end-stage renal disease on hemodialysis with past episodes of acute hypoxic respiratory failure related to fluid overload. Shortly after admission, the patient experienced a cardiac arrest due to hypoxia and necessitated emergent intubation. This was presumed to be due to fluid overload. Nephrology was consulted for emergent dialysis (the patient had a right upper extremity fistula for dialysis access). Dialysis was initiated through a right arm fistula. On day three of admission, the patient was noted to have worsening right upper extremity and breast swelling and pain. Physical exam revealed indurated edema of the skin of the breast. Point of care ultrasound was performed of the patient's right neck, and the following ultrasound was obtained approximately 4cm above the clavicle in the right lateral neck.



Video 1. Ultrasound image of the right neck in the transverse plane.

What is the **most likely cause** of this patient's right upper extremity and breast swelling?

1. Right breast cellulitis
2. Ascending SVC thrombus
3. Lymphatic blockage of R axillary nodes
4. Fluid overload complicated by third spacing in the R upper extremity.

Correct!
2. Ascending SVC thrombus

Point of care ultrasound examination of the patient's right lateral neck revealed a rhythmic, target shaped change in echo density over time from anechoic to hyper-echoic with a frequency of approximately one cycle per second. The ICU team confirmed that the swelling of the patient's right breast and upper extremity were due to an ascending thrombus from the patient's chronic SVC syndrome with CT scan. This ultrasound exhibits classic findings of spontaneous echo contrast (SEC). SEC, or "Smoke", is caused by layering of cellular components of blood during states of blood flow ranging from low-velocity blood flow to complete stasis (1). It is frequently seen in the left atrial appendage in patients with atrial fibrillation, but can be seen in any component of the cardiovascular system (2). SEC present in vasculature outside the heart can signal that a thrombus is rapidly forming, and can prompt the discussion of initiating further imaging studies to evaluate more proximal veins in the chest that cannot be seen with conventional ultrasound, or initiation of anticoagulation before a thrombus truly forms. While uncommonly visualized in vascular ultrasound, this finding can be very useful in early diagnosis of intravascular thrombi.

Discussion

Spontaneous echo contrast was discovered in a series of animal studies in 1981 that blood will become more echogenic during periods of stasis when visualized with high frequency (~7.5MHz) transducers (3). The term "spontaneous echo contrast" as an ultrasonographic finding was first used in the American journal of Cardiology in 1992 as a phenomenon caused by increased ultrasonic back-scatter when red blood cells interact with plasma proteins in states of low flow or shear (1).

References

1. Merino A, Hauptman P, Badimon L, Badimon JJ, Cohen M, Fuster V, Goldman M. Echocardiographic "smoke" is produced by an interaction of erythrocytes and plasma proteins modulated by shear forces. J Am Coll Cardiol. 1992;20(7):1661-8. [\[CrossRef\]](#) [\[PubMed\]](#)
2. Siddiqui MA, Holmberg MJ, Khan IA. Spontaneous echo contrast in left atrial appendage during sinus rhythm. Tex Heart Inst J. 2001;28(4):322-3. [\[CrossRef\]](#)
3. Sigel B, Coelho JC, Spigos DG, et. al. Ultrasonography of blood during stasis and coagulation. Invest Radiol. 1981;16(1):71-6. [\[CrossRef\]](#) [\[PubMed\]](#)