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Case Report

Point-of-care ultrasound, anchoring bias, and acute pulmonary embolism: A cautionary tale and report ☆,☆☆

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ABSTRACT

Emergency physicians often rely on heuristics to facilitate clinical decisions due to the large volume of patients they see daily. Consequently, they are vulnerable to error and bias. We report the case of a 69-year-old male that presented to the emergency department (ED) with shortness of breath, productive cough, and dyspnea on exertion. One day prior to ED admission, he was diagnosed with bronchitis; however, point-of-care ultrasound (POCUS) in the ED identified acute pulmonary embolism. This case illustrates the potential dangers of anchoring bias and shows the benefits of using point-of-care ultrasound of the lungs and heart to assist in the diagnosis of acute pulmonary embolism.

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Introduction

Pulmonary embolism (PE) is a life-threatening condition frequently encountered in the emergency department (ED) [1]. Often, the clinical presentation of acute PE is nonspecific with many overlapping features of other chest related complaints including acute coronary syndrome and acute aortic pathologies. Prompt diagnosis is paramount as mortality from an acute, untreated PE is nearly 30% [1]. In addition to bedside acumen, early imaging is crucial for detection and intervention. Bedside ultrasound/echocardiography has high specificity in detection of right ventricle failure clueing in the clinician to a potential PE [2].

As total visits continue to rise, ED physicians often rely on heuristics to manage patients and expectations. This unfortunately leaves us vulnerable to error and bias despite well-intended efforts. We present a case of a 69-year-old male previously diagnosed with bronchitis who underwent point-of-care ultrasound (POCUS) of the lungs and heart that expedited the discovery and treatment of extensive PE.

Case report

On a particularly busy day, a 69-year-old male with a history of hyperlipidemia, hypertension, and gout, who formerly used tobacco, presented to the ED with shortness of breath (SOB), productive cough, and dyspnea on exertion. The patient was evaluated at an urgent care center one day prior to ED presentation for the same symptoms and had a normal chest radiograph (Fig. 1). He was diagnosed with bronchitis and started on oral steroids, antibiotics, and a metered-dose inhaler. His SOB worsened which prompted the ED visit. He admitted in the ED to a history of chronic sinusitis and stated his symptoms were consistent with previous episodes of respiratory infections.

His initial vital signs were blood pressure 124/94 mmHg, pulse 108 beats/minute, respiratory rate 36 breaths/minute, oxygen saturation 87% on room air, and temperature 97.4°F. Nursing placed the patient on 2L oxygen, and at the time of evaluation, his vital signs had normalized. POCUS of the lungs and heart was performed by the ED physician and res-

ident using a Sonosite X-Porte ultrasound system utilizing a phased array transducer which revealed a normal appearing ejection fraction, right atrial enlargement, presence of McConnell's sign, and a suspected right atrial and ventricular thrombus (Fig. 2).

A subsequent stat computed tomography chest was obtained revealing extensive bilateral pulmonary emboli, right heart strain, and presence of a blood clot in the right atria extending into the right ventricle. (Fig. 3) Laboratory work was significant for a troponin of 0.60 ng/dL (ref. range <0.05 ng/dL), Brain natriuretic peptide (proBNP) concentration 5850 pg/mL (patient's baseline 120 pg/mL; ref range <125 pg/mL).

He remained hemodynamically stable and heparin therapy was initiated. Shortly after admission, a repeat formal echocardiogram revealed further migration of the right atrial clot deeper into the right ventricle. Bilateral lower extremity venous duplex studies showed bilateral lower extremity deep vein thrombosis (DVT) involving the popliteal vein on the right and popliteal and calf veins on the left.

The patient subsequently underwent thrombolytic therapy without complication. The remainder of the hospital admission was uneventful, and he was discharged home.

Discussion

This case highlights both the benefits of using POCUS of the lungs and heart to identify acute PE in the ED and the potential dangers of anchoring bias. Anchoring bias, or the tendency of an individual to rely too heavily on an initial piece of information presented when making decisions, can lead to inappropriate clinical assessments. In our case, the patient was initially suspected to have bronchitis based on his history of similar symptoms, including SOB, productive cough, and dyspnea on exertion, and given medication based on that initial suspicion. It was not until the patient experienced worsened SOB, and as a result visited the ED, that further imaging was used to discover an acute PE. Use of POCUS in the ED allowed the emergency physicians to identify signs of an acute PE, and this additional information could be used to start the patient on a thrombolytic therapy to manage his condition. There is a strong likelihood that the patient's condition could

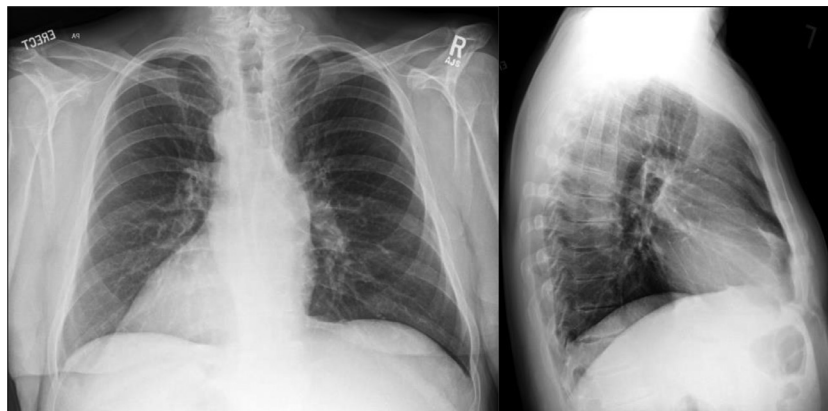


Fig. 1 – Normal PA and lateral chest radiograph.

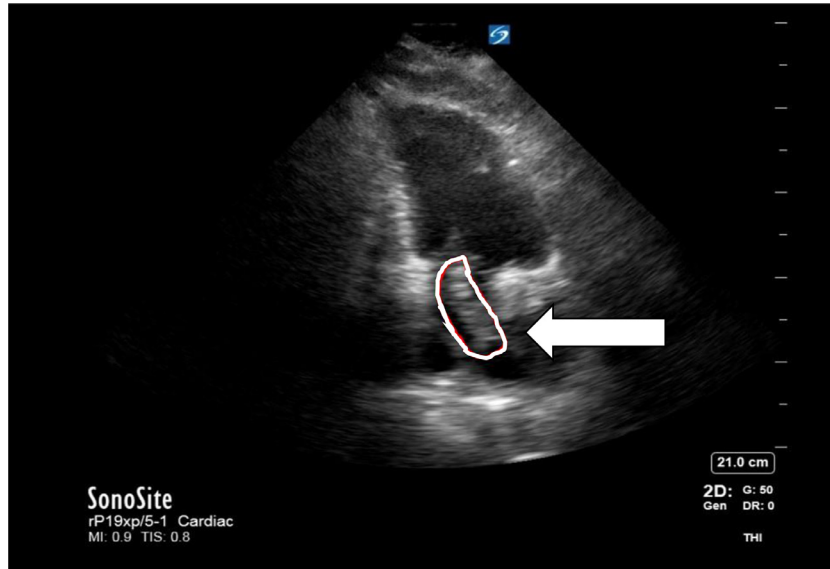


Fig. 2. – Point-of-care ultrasound showing both clot extension and an enlarged right ventricle suggestive of acute pulmonary embolism.

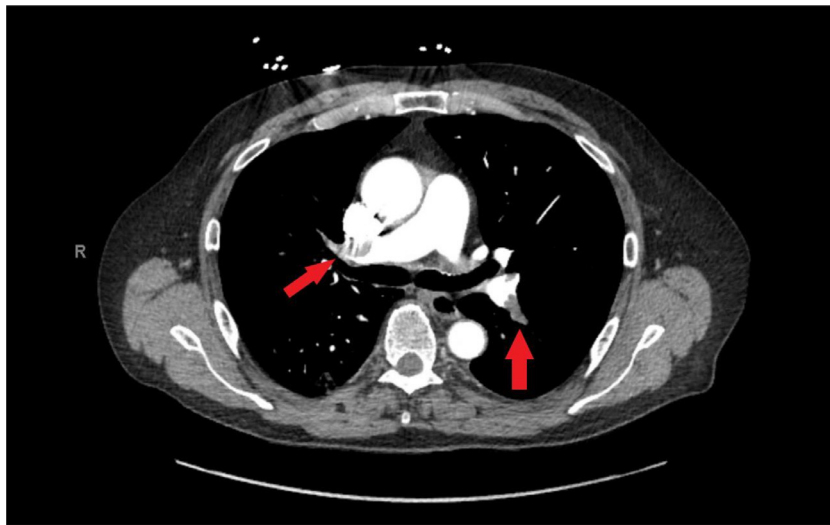


Fig. 3 – CT chest showing bilateral thrombi extending into the right and left pulmonary arteries (arrows).

have been fatal if the emergency physicians failed to look beyond the initial diagnosis of bronchitis as the root cause of the patient's worsening SOB. This case occurred before the COVID-19 pandemic, had it occurred during the pandemic, the bias against considering embolism as an etiology early in the workup might have been accentuated, thus underscoring the importance of early POCUS of the lungs and heart for presenting signs of SOB.

The consequences of anchoring bias on the overall diagnosis and clinical management of patients has been explored in several other reports [3–5]. With a constant high volume of patients and the necessity for quick clinical management, emergency physicians are particularly prone to anchoring bias [6]. The strong emphasis on efficiency and the depth of cognitive thinking required to manage existing and new patient infor-

mation can lead an emergency physician to diagnose a patient based on their first clinical suspicion, despite receiving additional information suggestive of another diagnosis [6]. This, in turn, may result in a delayed or inappropriate diagnosis, in addition to patient dissatisfaction and medical complaints [7].

Emergency physicians can be especially susceptible to anchoring bias when dealing with medical conditions that have multiple clinical presentations, such as acute PE, with presentations ranging from no symptoms to shock to death [8]. Many times, preventable deaths due to PE are a result of misdiagnosis, rather than the failure of a treatment therapy to work properly [9]. Patients commonly have symptoms affecting both the cardiovascular and pulmonary systems, including chest pain, dyspnea, cough, tachypnea, and oxygen desaturation [10]. As such, it can be difficult to decipher whether the

patient's symptoms are the result of an acute PE, or another cardiac-related condition like acute coronary syndrome. In turn, this requires emergency physicians to constantly modify their clinical assessment of a patient using supplemental information in order to correctly diagnose them.

Using POCUS of the lungs and heart in the ED can assist emergency physicians in identifying whether a patient's symptoms are the result of an acute PE [11–13]. Especially in the ED, transthoracic echocardiography (TTE) and duplex venous Doppler of the lower extremities are useful in identifying acute PE and relatively easily obtained [14]. When imaging the heart using TTE in the presence of acute PE, images will commonly demonstrate right heart strain or dysfunction [14]. The sudden pressure that the right ventricle can experience due to PE can cause the ventricular wall to balloon outward and display a McConnell sign, tricuspid regurgitation, or ventricular septal bowing in systole [14]. McConnell's sign is a distinctive ultrasound finding present in patients with PE; specifically, it represents mid-wall right ventricular akinesia with normal motion at the apex [15]. In our case, use of bedside TTE identified McConnell's sign and moderate tricuspid regurgitation which prompted suspicion of acute PE and expedited further imaging.

While using supplemental tools and other strategies can be used by emergency physicians to combat cognitive biases, the first step is recognizing and understanding that bias can influence clinical decisions and impact patient care. To combat cognitive biases, especially anchoring biases, it is important for clinicians to always consider important alternative scenarios [16]. Considering the opposite explanation for a clinical diagnosis has been found experimentally to mitigate the influence of anchoring bias [15]. In addition to considering the opposite scenario, other strategies can be used, including bias-specific teaching sessions, checklists, and teaching clinicians statistical principles [15].

Conclusion

This case demonstrates the potential dangers of anchoring bias when making clinical decisions as well as the benefits of using POCUS of the lungs and heart to expedite the diagnosis of acute PE. Without obtaining supplemental information and adjusting our patient's treatment based on our findings, there is a high likelihood that our patient's condition could have been fatal. Therefore, it is important for emergency physicians to be aware of cognitive biases, like anchoring bias, when determining the appropriate clinical management of a patient. In addition, we recommend that ED providers use POCUS of the lungs and heart as a supplemental imaging technique if acute PE is suspected based on a patient's clinical presentation and/or medical history to narrow down differentials and expedite treatment, if possible.

Patient Consent

We confirm that written, informed consent for publication of this case was obtained from the patient.

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