Case Report

Prehospital lung ultrasound in the distinction between pulmonary edema and exacerbation of chronic obstructive pulmonary disease

Abstract

We present 2 cases of dyspneic patients, where prehospital lung ultrasound helped to distinguish between pulmonary edema and acute exacerbation of chronic obstructive pulmonary disease.

An ambulance vehicle was dispatched to a 67-year-old man with acute onset of dyspnea 2 hours ago. On emergency medical services arrival, the patient presented in a sitting position, was unable to speak due to severe shortness of breath, and was highly anxious and agitated. The physical examination revealed tachypnea, the blood pressure was 180/95 mm Hg, electrocardiogram showed a sinus tachycardia of 140 beats/min, and the transcutaneous oxygen saturation was 92% (FiO₂, 21%). Auscultation revealed diffuse wheezing but no crackles.

The patient’s medical history revealed chronic obstructive pulmonary disease (COPD) stage IV and coronary heart disease. His usual treatment consisted of home oxygen therapy, stage IV COPD medication, and antipsychotic drugs. The patient had been hospitalized several times throughout the year due to exacerbation of COPD.

The nebulization of terbutaline was prepared for the treatment of a suspected exacerbation of COPD, and a peripheral venous catheter was placed. Meanwhile, a rapid bedside sonography of the lung was performed at the scene using a 4- to 2-MHz microcurved probe (SonoSite 180 PLUS; SonoSite, Bothell, Wash). The scan showed positive lung sliding and predominant B-Lines (comet-tail artifacts) across the anterior and lateral lung surface, highly suspicious for pulmonary edema (Fig. 1). The nebulization of terbutaline was canceled, and 25 mg of urapidil was administered intravenously.

Minutes later, the patient’s clinical situation had improved. His blood pressure had dropped to 140/70 mm Hg and the pulse rate to 115 beats/min. The dyspnea had improved, and the patient was able to speak normally again. He was in a stable cardiorespiratory condition on arrival at the emergency department (ED).

An ambulance vehicle was dispatched to a 72-year-old man with acute deterioration of shortness of breath. A severely dyspneic patient was found in a sitting position. The patient’s medical history revealed heart failure, COPD stage IV, and diabetes. The patient’s long-term medication consisted of phenprocoumon, bronchodilators, steroids, diuretics, and antihypertensives. His vital signs were as follows: tachypnea of 25/min, blood pressure of 160/75 mm Hg, heart rate of 90 beats/min, and pulse oxymetry of 94%. Physical examination showed mild ankle edema and wheezing as well as rhonchi over the lung. The electrocardiogram revealed atrial fibrillation with a ventricular rate of 90 beats/min.

After placement of a peripheral venous catheter, a focused ultrasound examination of the lung was performed using a 4- to 2-MHz microcurved probe (SonoSite 180 PLUS; SonoSite). The ultrasound findings were as follows: positive lung sliding and bilateral predominant A-Lines at the anterior and lateral surface of the lung. Based on these findings, interstitial and alveolar pulmonary edemas were ruled out, and acute exacerbation of COPD was suspected. Fifty milligrams of intravenous prednisolone and 0.5 mg of nebulized terbutaline were administered.

On arrival at the ED, the patient’s situation had improved, and the suspected diagnosis was confirmed during the patient’s hospital stay.
Patients presenting with acute shortness of breath frequently have a history of both COPD and congestive heart failure (CHF) \[1,2\]. Whereas two thirds of patients with acute dyspnea due to CHF present with crackles, one third present with cardiac asthma defined as CHF with wheezing. The outcome was shown to be the same in both groups \[3\]. The distinction between cardiac and pulmonary origin of acute dyspnea can be very challenging in the prehospital setting, and especially in older patients, misdiagnoses are common \[4,5\].

Appropriate prehospital medication improves survival in patients with acute heart failure, whereas wrong prehospital treatment of patients misdiagnosed in the field seems to worsen outcome in the case of both COPD and heart failure \[6,7\].

In the past few years, the usefulness of lung ultrasound in the management of the dyspneic patients has been highlighted. Lichtenstein et al \[8\] first described a correlation between comet-tail artifacts arising from the pleural line and interstitial syndrome. Further studies found a high diagnostic value of pulmonary ultrasound in the distinction between pulmonary edema and exacerbation of COPD \[9-11\]. In these studies, disseminated B-Lines at the anterior and lateral lung surface were present in patients with pulmonary edema, whereas patients with dyspnea due to exacerbation of COPD without congestion had predominant A-Lines. It has been shown that prehospital emergency physicians can acquire skills needed for ultrasound diagnosis of pulmonary edema in short training modules \[12\].

To our knowledge, this is the first description of a successful implementation of pulmonary ultrasound in the prehospital management of patients with acute dyspnea. In the future, larger studies will be needed to determine the benefit of routine prehospital pulmonary ultrasound in acute dyspneic patients.

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**References**


