Case Report

Congestive heart failure presenting as diffuse pulmonary nodules on CT✩✩

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Abstract

Congestive heart failure (CHF) patients have typical radiological features that assist in diagnosis. This is a case that demonstrates an atypical radiologic presentation for CHF which showed diffuse pulmonary nodules on CT. Diffuse nodules can be present in several disease processes and clinical correlation is a necessity for diagnosis. It is important for radiologists and clinicians to be aware of uncommon radiological features of CHF to avoid unnecessary procedures or treatments.

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Introduction

Congestive heart failure presents with an increase in hydrostatic pressure leading to pulmonary edema. CT findings typically include ground glass opacification, bronchovascular bundle thickening, interlobular septal thickening, or pleural effusions. In this case, we discuss a rare radiological presentation of pulmonary edema in a nodular pattern. Due to the patient’s continued symptoms and atypical presentation of pulmonary edema on CT, the patient was scheduled to have a CT guided lung biopsy when it was ultimately shown to be unnecessary, as the nodules resolved with diuresis.

Case report

A 48-year-old female with a past medical history of fibromyalgia, migraines and polysubstance abuse presented to the emergency department for fatigue, abdominal pain and shortness of breath that started several months prior to presentation. The patient also noted night sweats, weight loss, early satiety, and nausea. On the morning of her presentation, her shortness of breath was severe. She did not have any improvement after diuresis in the emergency department. The patient’s physical exam was significant for tachycardia. Her CBC w/diff, BMP, and cardiac enzymes were within normal limits.

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Her chest x-ray in the emergency department showed an interval increase in heart size with vascular congestion and perihilar and lower lung opacities bilaterally favoring CHF (Fig. 1). The patient then had a CTA chest, abdomen, and pelvis, which showed innumerable new fluid density bilateral pulmonary nodules predominantly in the periphery and lower half of the lungs in a perilymphatic distribution, the largest measuring approximately $1.2 \times 0.9$ cm at the right midlung. Multiple nodular opacities were measured to have 5 to -30HU, representing water density (Fig. 2, 3, 4). These findings were new compared to a CT from one year ago and favored a nodular pattern of pulmonary edema. Infectious process was lower on the differential given the patient’s absence of leukocytosis, no recorded fevers, or sputum changes. The CT also showed gastrohepatic lymphadenopathy and GI evaluation was recommended. A short interval CT was also recommended to rule out a neoplastic process after resolution of the patient’s CHF symptoms.

The patient was subsequently admitted to the medicine service for new-onset heart failure and received diuresis throughout her admission. However, the patient had continued worsening of symptoms with chest pain. Cardiology was consulted, who obtained an echocardiogram which demonstrated an ejection fraction of 15%. A cardiac catheterization was then conducted, which demonstrated non-ischemic cardiomyopathy. The patient was subsequently diagnosed with new-onset CHF with new-onset end-stage cardiomyopathy of unknown etiology but suspected to be due to the patient’s long history of substance abuse (cocaine, alcohol). Cardiology opted to start the patient on GDMT in consultation with the advanced heart failure service. The patient was also seen by pulmonology, who recommended a biopsy of the lung nodules due to concern for an infectious, malignant, or inflammatory process. Other differentials such as sarcoidosis and amyloidosis were considered less likely and not worked up during this hospital visit. Interventional radiology was consulted for a CT guided lung biopsy which was delayed several times due to the patient’s chest pain. On arrival to the IR suite, the initial CT scout image showed complete resolution of the pulmonary nodules which was consistent with a diagnosis of nodular interstitial pulmonary edema (Fig. 5, 6). The lung biopsy was subsequently cancelled.
During the admission the patient was placed on triple therapy for H. Pylori, with amoxicillin substitute for metronidazole due to concurrent trichomonas infection. However, the patient refused the medication until a couple days after her lung biopsy was attempted. The patient did not receive any other antibiotics during her admission. The patient had a GI consultation for her gastrohepatic lymphadenopathy and positive H. Pylori after the lung biopsy was cancelled. An EGD and EUS were recommended to rule out MALT lymphoma. Her EGD was unremarkable, and she had a fine needle aspiration of 4 lymph nodes during her EUS, which did not demonstrate malignancy. The patient was discharged home with improvement of her symptoms and PCP follow-up.

Discussion

Pulmonary nodules on a chest CT are defined as focal opacities measuring less than 3cm and can be solitary or multiple. Multiple lung nodules can have variable densities, patterns, and locations which can better delineate an underlying etiology. Diffuse pulmonary nodules typically represent different disease processes such as sarcoidosis, silicosis, malignancy, infection, or other inflammatory processes with varying characteristics (3). Pulmonary nodules can be non-specific, and a thorough differential is required.

Malignant processes, such as metastasis, lymphoma and bronchioloalveolar carcinoma (BAC), can present with multiple nodules. Hematogenous metastasis will typically demonstrate a peripheral and lower lung distribution when limited in number, however, innumerable metastasis can have a more uniform distribution. Lymphangitic metastasis is associated with pulmonary vessels or nodular thickening of the peribronchovascular interstitium and interlobular septa. Hilar lymphadenopathy may also be present. Lymphoma may present with multiple nodules in the lower lobes along with hilar and mediastinal lymphadenopathy. BAC can have multiple small nodules that can be randomly distributed or centrilobular (1).

Sarcoidosis on CT can present with 1-5mm irregular nodules with interstitial thickening in the upper lobes. It can also present with ground glass opacities, cysts and cavitations, along with fibrous distortion in later stages. Amyloidosis can present with multiple nodules, with cavitation, calcification, or ossification (1).

We report on a case of CHF that demonstrated innumerable bilateral diffuse fluid dense pulmonary nodules that were new compared to a CT one year ago. They were predominantly in the periphery and lower half of the lungs with a perilymphatic distribution with HU indicative of water density. The largest nodule measured up to 12mm. The patient's initial clinical picture of CHF favored pulmonary edema with a nodular pattern. However, given her worsening symptoms and extensive polyps substance history, she was scheduled for a biopsy to evaluate for a malignant vs infectious vs inflammatory process. After 2 weeks of diuretic treatment, these nodules were no longer present on a scout CT prior to the lung biopsy, resulting in the cancellation of the biopsy.

CHF causes pulmonary edema due to an increase in hydrostatic pressure in the pulmonary vasculature, which is most typically seen on CT as ground glass opacification, bronchovascular bundle thickening, interlobular septal thickening, or pleural effusions (2). However, instead of the typical smooth interlobular septal thickening, there have been reported cases of a nodular variant that suggested prominent septal veins (3). Increases in transmural arterial pressure greater than 25mm Hg can cause fluid draining from the extravascular space to exceed maximum capacity. This can lead to sudden extension of edema into alveolar spaces and create small nodular areas with increased opacity (4).

This is a rare finding of pulmonary edema with diffuse pulmonary nodules that had complete resolution in the setting of CHF. The patient nearly had an unnecessary lung biopsy for these nodules. With better understanding of the possible etiologies of diffuse pulmonary nodules and clinical correlation, unnecessary invasive procedures such as lung biopsies can hopefully be avoided.

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