

# New Onset Atrial Fibrillation and Pulmonary Embolism in a Hospitalized Patient: Which Comes First?

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**Abstract Background:** Atrial fibrillation (AF) is associated with increased rates of stroke and other thrombo-embolic events, heart failure, reduced quality of life, reduced exercise capacity, left ventricular (LV) dysfunction and death. Atrial fibrillation can be a risk factor for pulmonary embolism (PE) or a consequence of PE. This case report highlights the complex relationship between AF and PE. **Case report:** We report a case of a hospitalized 69-year-old male with new onset AF with rapid ventricular response with concurrent newly diagnosed PE. The rate uncontrolled AF in the hospitalized patient triggered the investigation for PE in this patient. **Conclusion:** For hospitalized patients with new onset AF, PE should be considered and searched for even in patient on prophylactic venous thromboembolism anticoagulation especially if patient is symptomatic (palpitations, shortness of breath, syncope, hypoxia, chest pain) or echocardiogram shows signs of right heart strain.

**Keywords:** Atrial fibrillation, rapid ventricular response, pulmonary embolism, case report

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## 1. Introduction

Atrial fibrillation (AF) is a supraventricular tachyarrhythmia with irregular atrial activity and ineffective atrial contraction and characterized by irregular R-R intervals and absence of distinct repeating P waves on electrocardiogram (ECG). [1,2] AF is the most common sustained cardiac arrhythmia that increases in prevalence with increasing age. [1,2] While about 1% of patients with AF are less than 60 years of age, more than 30% of patients with AF are 80 or more years of age. [1] AF is associated with a variety of medical conditions including hypertension, symptomatic heart failure, valvular heart diseases, cardiomyopathies, coronary artery disease, thyroid dysfunction, diabetes mellitus, chronic obstructive pulmonary disease (COPD), chronic kidney disease, obesity and sleep apnea. Additionally, AF is associated with increased rates of stroke and other thrombo-embolic events, heart failure, reduced quality of life, reduced exercise capacity, left ventricular (LV) dysfunction and death.<sup>2</sup> Many authors have suggested a relationship between atrial fibrillation and pulmonary embolism based on pathophysiologic hypotheses. [3] AF could lead to PE through embolization of right atrium thrombi formed as a result of the stasis in the atria secondary to AF. Conversely, pulmonary embolism could increase the right atrium pressure which could trigger atrial fibrillation. We report a new onset AF with rapid ventricular rate in a

hospitalized patient with PE. The rate uncontrolled AF in the hospitalized patient triggered the investigation for PE in this patient. We are unclear if the PE led to the AF or vice versa.

## 2. Case Report

69-year-old male with underlying benign prostatic hyperplasia (BPH), COPD, hypertension, hypothyroidism, rheumatoid arthritis, and history of stroke was admitted for acute urinary retention relieved by foley catheter with significant pyuria and concerns for complicated urinary tract infection. Patient has been to the hospital three times (this is the 3rd) for urinary retention that was only relieved by foley placement. He has episodes of normal urinary function between episodes of urinary retention. Patient denies any prior cardiac history. Of note, the patient had recently been admitted to the hospital twice with similar symptoms and was treated with a Foley catheter.

On admission, blood pressure was 103/56mmHg, heart rate 87, respiratory rate 17, and temperature 97.4F. Physical examination revealed a patient that was alert and oriented with bilateral costovertebral angle tenderness and slight right upper and lower extremity motor weakness. Laboratory testing showed a white blood cell count of 10,500/ml, and hemoglobin, platelet, electrolytes, hepatic and renal parameters were normal. Urinalysis showed moderate blood, trace protein, small leukocyte esterase, negative nitrite, 10-15 WBC, few bacteria and urinary

culture had no growth. Kidney and bladder ultrasound were unremarkable. Blood culture grew pan-sensitive *E. coli*. ECG on admission showed sinus rhythm, consistent with his previous ECGs. Patient received intravenous Levaquin 500 mg daily for five days; which was switched to oral Levaquin 750 mg daily for a total of 14 days. Patient also continued his home medications including lisinopril, tamsulosin, atorvastatin, levothyroxine, and Plavix and received subcutaneous enoxaparin for deep venous thrombosis prophylaxis.

On day two of admission, patient developed new onset AF with rapid ventricular response (RVR) and complained of mild chest discomfort. Heart rate was in 130-150 range. Thyroid hormone was normal, and echocardiogram showed ejection fraction of 55-60% with mildly dilated right atrium. Patient was placed on Cardizem and Metoprolol tartrate and later Amiodarone was added when the AF with RVR persisted. A chest computed tomography (CT) angiogram showed embolism in bilateral pulmonary arteries with additional embolus extending to the bilateral interlobar pulmonary arteries and scattered subsegmental pulmonary arteries with no right heart strain. It also showed an expansile mass located at anterior right rib 5 with chondroid matrix suspicious for chondrosarcoma. Patient stated that he had a biopsy of the rib mass a year ago which was negative for cancer and refused to pursue a new biopsy of the rib mass. Patient was placed on Eliquis 10mg bid for 1 week, then continued 5mg bid.

### 3. Discussion

Atrial fibrillation can be a risk factor for PE or a consequence of PE. [4,5,6] For our patient, it is not entirely clear whether AF precedes pulmonary embolism or vice versa. Clinical features like palpitations, shortness of breath, syncope, hypoxia, chest pain can be present in both AF and PE. [4] It is easier to diagnose AF with RVR compared to PE in a hospitalized patient and focusing the treatment on AF without thinking about the possibility of PE can delay PE diagnosis. In a study of 1142 patients with PE, 333 (29%) had AF. [7] While 207 patients (18%) had documented baseline AF during index PE admission, 126 (11%) developed AF post PE admission. [7] However, some studies did not find any association between AF and PE especially in patients without preexisting heart conditions, [3,8,9,10] but many of those studies has several weaknesses such as small sample size, selection bias, and lack of adjustment for confounding factors that limited the studies ability to detect an association between AF and PE. [3]

Atrial fibrillation could lead to platelet and coagulation cascade with disordered fibrin turnover, which promotes the procoagulant state. Additionally, blood stasis in both atria during AF facilitates thrombus formation and embolization of right atrium thrombi formed as a result of the stasis in the atria could cause PE. AF is frequent finding in PE, affecting more than 10% of PE patients and is higher than the prevalence in the general population (3 to 5%). [6,11]

Conversely, AF could be a consequence of PE. PE could lead to an abrupt increase in pulmonary vascular resistance, right ventricle dilation, tricuspid regurgitation

and stretch injuries of right atrium leading to AF. Increased risk of late-onset AF has been observed in patients after acute PE during long term follow up. [4,6] The possible predictors of subsequent AF in PE patients include age, diabetes mellitus, obstructive sleep apnea, congestive heart failure, and admission sodium (hypernatremia). [4] There is worse prognosis in patients admitted due to PE with baseline or subsequent AF. [7]

In conclusion, for hospitalized patients with new onset AF, PE should be considered and searched for even in patient on prophylactic venous thromboembolism anticoagulation especially if patient is symptomatic (palpitations, shortness of breath, syncope, hypoxia, chest pain) or echocardiogram shows signs of right heart strain.

### Key Message

Atrial fibrillation can be a risk factor for pulmonary embolism (PE) or a consequence of PE. PE should be considered and searched for in hospitalized patients with new onset AF, even in patient on prophylactic venous thromboembolism anticoagulation especially if echocardiogram shows signs of right heart strain.

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