

## Cardiovascular Imaging In-a-Month

### A 64-Year-Old Normotensive Woman With Right Ventricular Dilation and Hypokinesia

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#### CASE

A 64-year-old woman was admitted to our hospital because of progressive dyspnea beginning on the previous day. She was normotensive (138/84 mmHg) and had no evidence of heart failure. Electrocardiography showed incomplete right bundle branch block, S waves in leads I and aVL, and inverted T wave in lead III (Fig. 1). Transthoracic echocardiography (Fig. 2) showed right ventricular dilation and hypokinesia which spared the apex (Fig. 2, arrow). The maximal systolic right ventricular pressure, assessed by tricuspid regurgitation, was 45 mmHg.

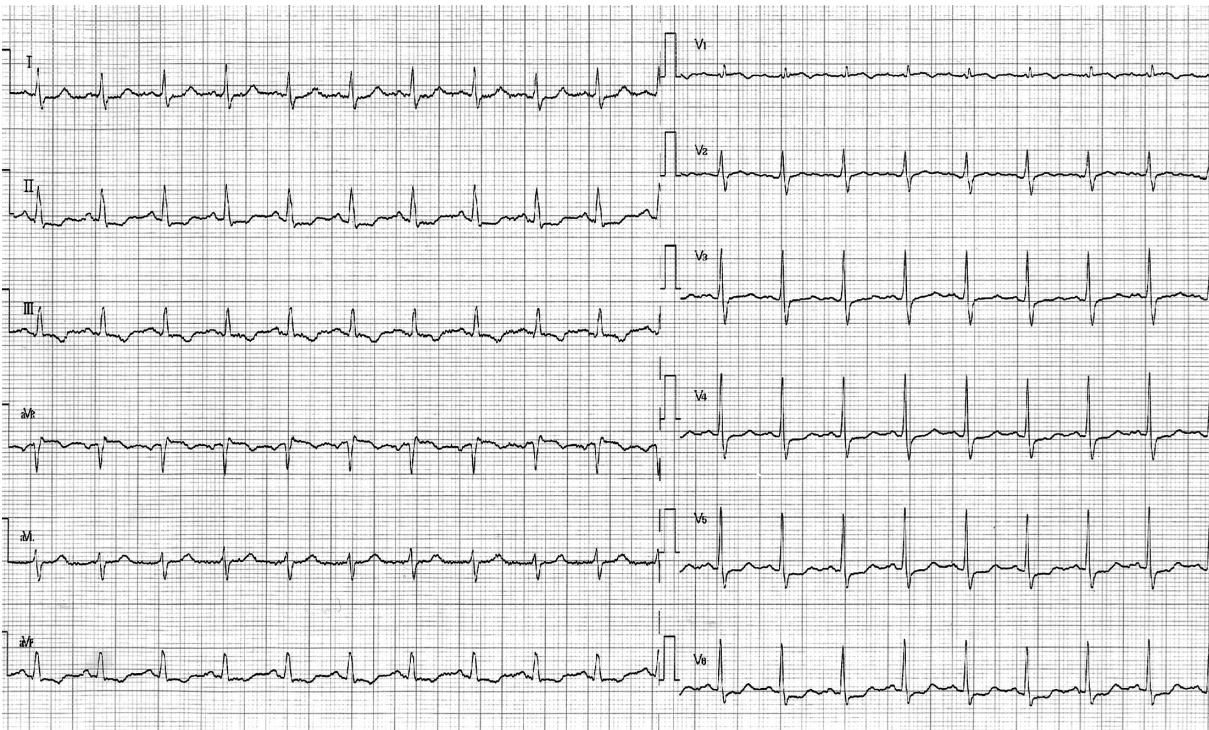


Fig. 1

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RMS = registered medical sonographer

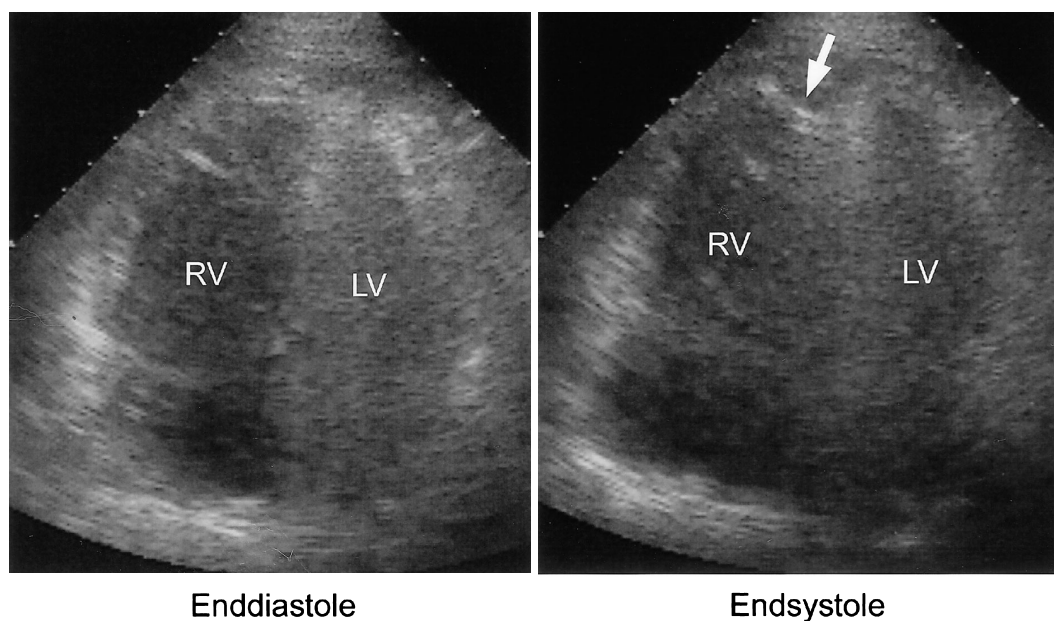


Fig. 2

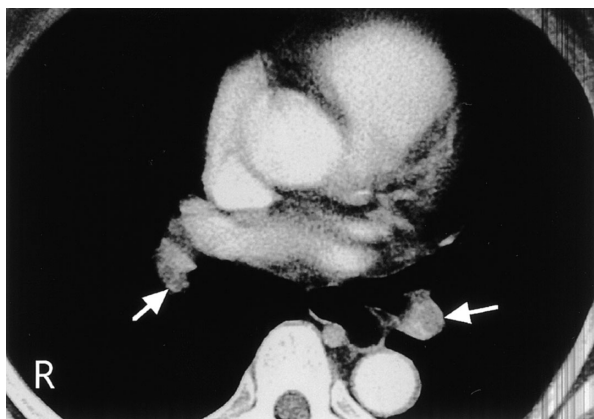
### Points for Diagnosis

Chest radiography showed distension of the descending right pulmonary artery with rapid tapering after the enlarged portion. Echocardiography also observed D-shaped left ventricular configuration and paradoxical septal motion. Her partial pressure of arterial oxygen was 58 mmHg.

Lower-limb ultrasonography found no floating proximal vein thrombus. Chest computed tomography with contrast medium demonstrated the presence of thrombi in the right and left pulmonary segmental arteries (Fig. 3, arrows). The diagnosis was submassive (without arterial hypotension or hemodynamic compromise) pulmonary embolism. Anticoagulation treatment with intravenous heparin was started. On the third hospital day, the patient suddenly died from pulmonary embolism recurrence accompanied by shock despite emergent rescue thrombolysis. Echocardiography obtained during thrombolysis revealed a floating thrombus in the right atrium protruding into the right ventricle.

“Submassive” pulmonary embolism is a term referring to pulmonary embolism with echocardiographic evidence of right ventricular dysfunction but no arterial hypotension or hemodynamic instability<sup>1,2</sup>. Thrombolytic therapy is recommended for patients with “massive” (hemodynamically unsta-

ble) pulmonary embolism, whereas there is no consensus on whether thrombolysis is beneficial for patients with submassive pulmonary embolism<sup>3</sup>. The results of a large-scale, double-blind, and prospective randomized trial of thrombolysis for submassive pulmonary embolism showed that a combination of alteplase and heparin did not reduce mortality, but it did minimize early clinical and hemodynamic deterioration requiring the escalation of treatment, especially secondary (rescue) thrombolysis<sup>2</sup>. Echocardiography could help identify a subgroup of patients with submassive pulmonary embolism at high risk of adverse outcomes (“impending hemodynamic instability”) among patients with normotensive pulmonary embolism patients<sup>4</sup>. Only the subgroup with echocardiographic right ventricular dysfunction showed adverse outcomes when treated with only heparin. Thus, echocardiographic evidence of right ventricular dysfunction could be an appropriate criterion for deciding on thrombolytic therapy for patients with normotensive pulmonary embolism<sup>1,2,4,5</sup>. Echocardiography showed a distinct regional pattern of right ventricular dysfunction in cases of rapid increase in right ventricular afterload, which predominantly affected the mid to basal free wall



**Fig. 3**

and spared the apex<sup>6)</sup>. This sign, known as the McConnell sign<sup>5,6)</sup>, appears to be a relatively sensitive and specific marker for acute pulmonary embolism.

We speculate that more aggressive therapeutic strategies, including primary thrombolytic treatment, might have prevented the irreversible clinical deterioration in our patient. We believe that expansion of the indications for thrombolysis in carefully selected, normotensive patients with pulmonary embolism who have moderate or severe right ventricular dysfunction should be given careful consideration<sup>1,2,4)</sup>.

**Diagnosis:** Acute submassive pulmonary thromboembolism with fatal outcome

**Key Words:** Pulmonary embolism; Echocardiography, transthoracic; Thrombolysis

#### Acknowledgment

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**Fig. 1** Electrocardiogram on admission showing incomplete right bundle branch block, S waves in leads and a L, and inverted T wave in lead

**Fig. 2** Transthoracic echocardiogram on admission in the apical four-chamber view showing right ventricular dilation and severe hypokinesia with sparing of the apex (arrow)

RV = right ventricle; LV = left ventricle.

**Fig. 3** Chest computed tomography scan with contrast medium showing thrombi in the right and left pulmonary segmental arteries (arrows)