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Impact of Careful Survey of Pulmonary Arteries During Echocardiographic Examination on Diagnosis and Treatment

An Echocardiographic Snapshot Makes Them Different

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A 56-year-old man was referred to the outpatient clinic of our cardiology department with a complaint of chest pain and dyspnea on exertion (New York Heart Association functional class II to III). According to his past medical history, he had visited a private hospital and had a diagnosis of idiopathic pulmonary arterial hypertension a few months earlier. He also had an episode of hoarseness due to left vocal cord palsy. On physical examination at our hospital, his blood pressure was 124/86 mm Hg, and his heart rate was 104 bpm. ECG showed sinus tachycardia, right atrial enlargement, and right ventricular hypertrophy (Figure 1). Initial transthoracic echocardiography revealed dilated right-sided chambers and right ventricular hypertrophy without any intracardiac or extracardiac shunt (Figure 2A; online-only Data Supplement Movie I). Continuous-wave Doppler evaluation of tricuspid regurgitation showed a markedly increased right ventricular systolic pressure (118 mm Hg, maximal tricuspid regurgitation velocity 4.95 m/s), with an assumption of right atrial pressure of 20 mm Hg (Figure 2B). On color Doppler study of the modified parasternal short-axis view, however, extrinsic compression by a mediastinal mass was suggested at the site where the main pulmonary artery divides into the left and right pulmonary branches (Movies II through IV, online-only Data Supplement). Given the pressure gradient between the stenotic sites (Figure 2C and 2D), distal pulmonary artery systolic pressure was estimated to be within the normal range. The presence of a mediastinal mass was proven by CT, according to which it appeared to encase and invade the bifurcating portion of the main pulmonary artery (Figure 3). The patient underwent needle biopsy under CT guidance and was confirmed to have thymic carcinoma. The close proximity of and difficulty in removing the mass resulted in chemotherapy being considered as the first-line treatment. After completing the first cycle of chemotherapy (with a combination of cyclophosphamide, doxorubicin, and cisplatin) without complications, the patient was given permission to leave the hospital.

Echocardiography is widely accepted as a useful noninvasive tool for estimating systolic pulmonary artery pressure with the aid of a modified Bernoulli equation (ie, systolic pulmonary artery pressure=(maximal tricuspid regurgitation velocity)^2+right atrial pressure).[1] One important point we should keep in mind is that this equation is ultimately realized on the assumption that pulmonary arterial or valvular stenosis does not exist. This assumption is simple but is frequently forgotten in clinical practice. We believe that the present case is important and instructive in that without careful and thorough investigation of the pulmonary arteries for the possible presence of stenosis, diagnosis and treatment could be seriously altered. Therefore, it is imperative that a modified parasternal short-axis view be incorporated into routine echocardiographic views to avoid overlooking the presence of clinically significant stenosis at any level in the pulmonary arteries.

Disclosures

None.

Reference

1. Yock PG, Popp RL. Noninvasive estimation of right ventricular systolic pressure by Doppler ultrasound in patients with tricuspid regurgitation. *Circulation*. 1984;70:657–662.

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The online-only Data Supplement, consisting of movies, is available with this article at http://circ.ahajournals.org/cgi/content/full/117/3/450/DC1.

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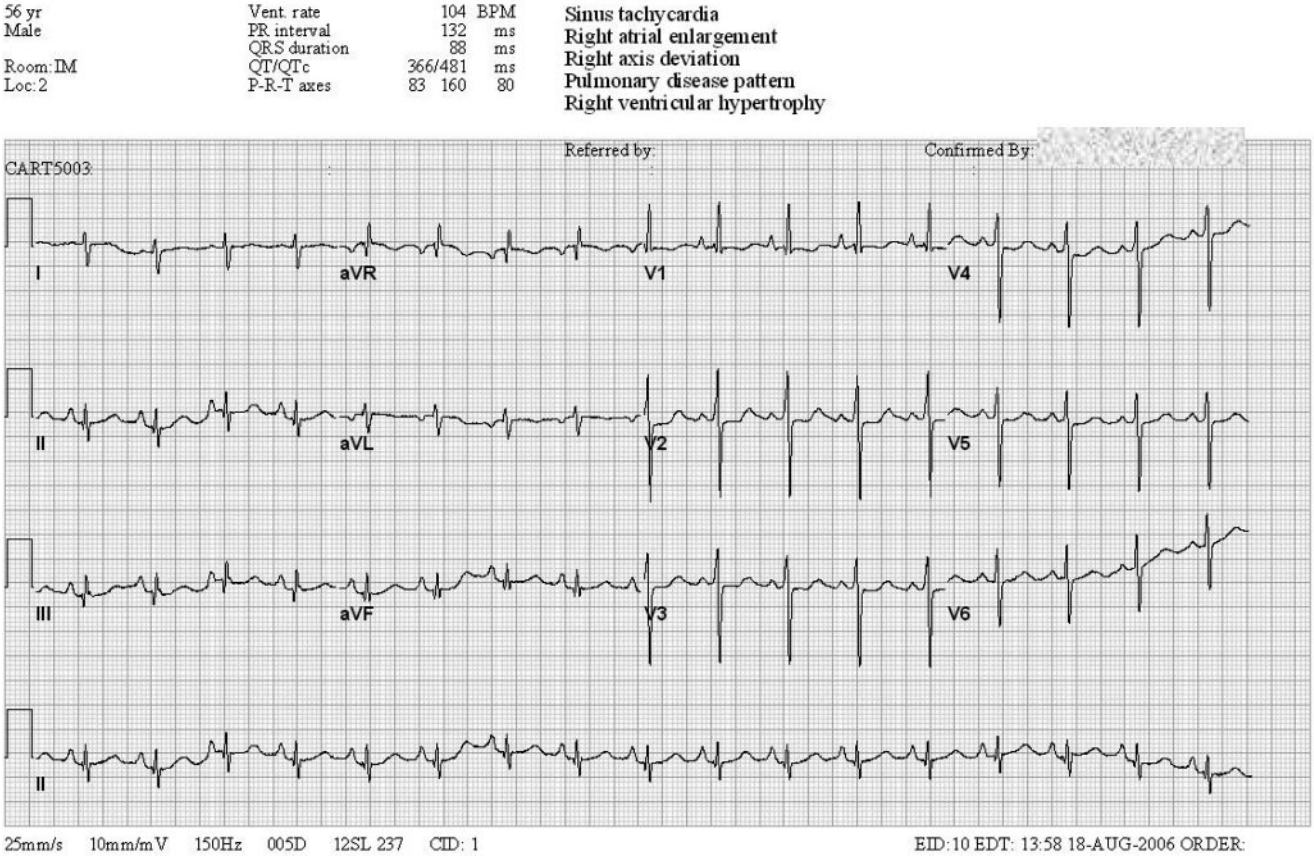

Figure 1. ECG suggests right ventricular hypertrophy and right atrial enlargement together with right-axis deviation.

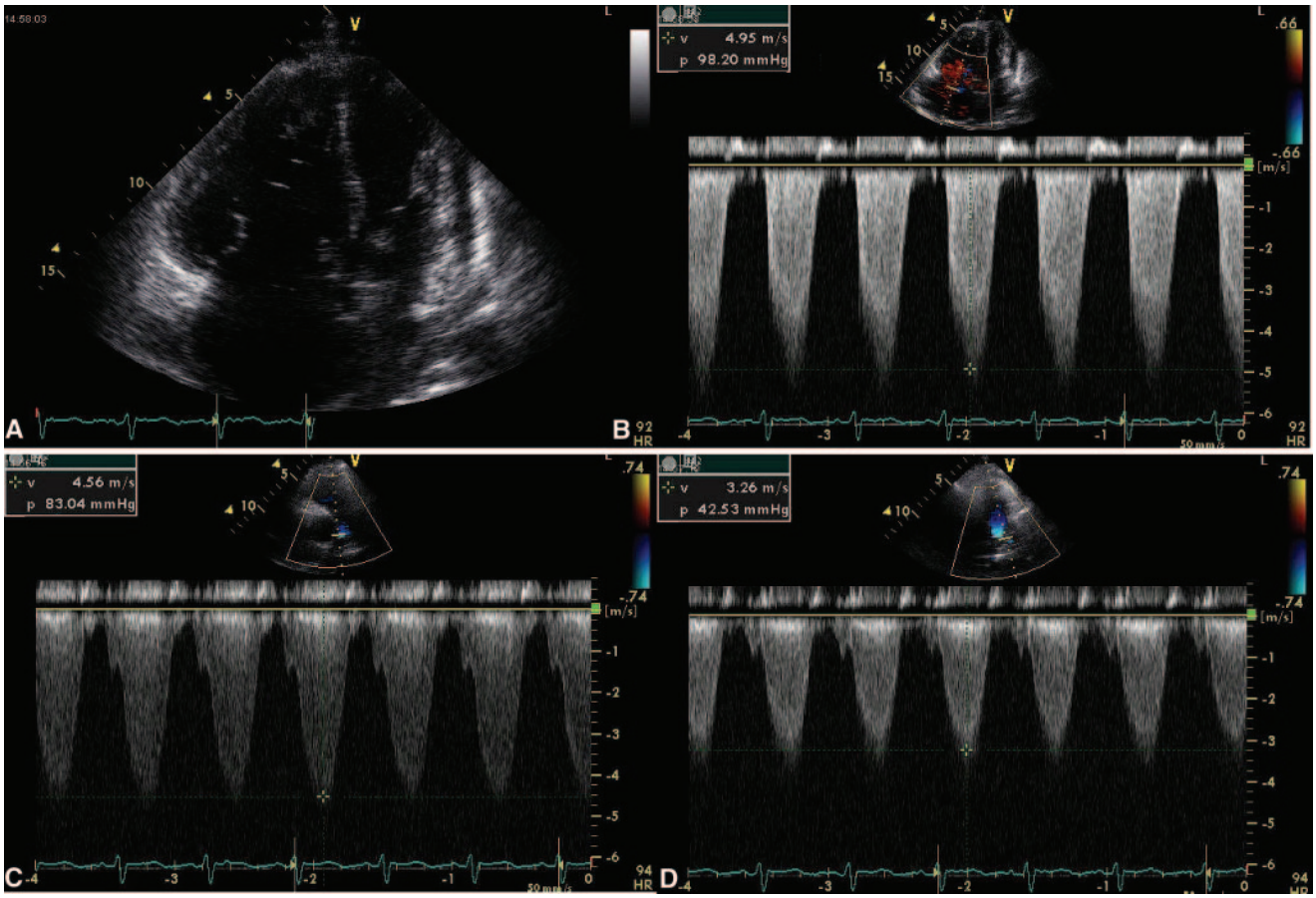

Figure 2. A, Apical 4-chamber view reveals markedly dilated right ventricle with an increment of right ventricular wall thickness. B, Doppler examination of tricuspid regurgitation demonstrates maximal velocity of 4.95 m/s, indicative of a significant elevation of right ventricular systolic pressure. C, Continuous-wave Doppler shows significant pressure gradient (83 mm Hg) between distal main pulmonary trunk and proximal right pulmonary artery. D, Continuous-wave Doppler displays significant pressure gradient (42.5 mm Hg) between distal main pulmonary trunk and proximal left pulmonary artery.

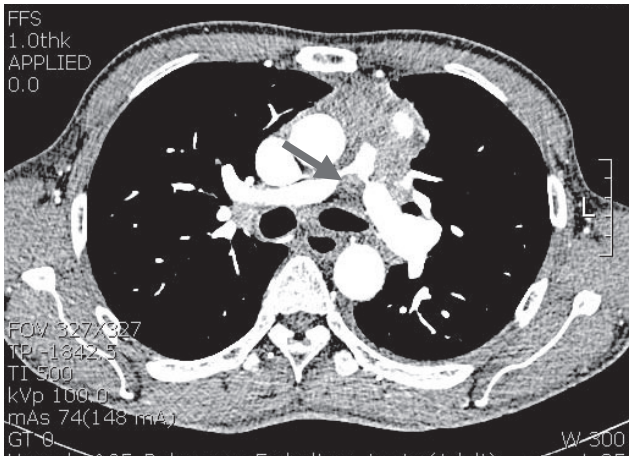

Figure 3. Contrast-enhanced CT angiography shows the low-attenuation soft tissue mass around the bifurcating portion of the distal main pulmonary artery (arrow).