IMAGES IN CARDIOLOGY

Dependency of Tissue Doppler Imaging

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A 50-year-old male was referred for echocardiographic evaluation for effort breathlessness. Echocardiography showed normal thickness and functions of left ventricle. Right atrium and right ventricle were normal in size. Right ventricular free wall thickness was 7 mm. Pulse Doppler evaluation of tricuspid and pulmonary artery flow were normal. Pulmonary artery end diastolic pressure was 10 mmHg by pulmonary regurgitation jet. Right ventricular systolic pressure was 30 mmHg by tricuspid regurgitation jet. Tissue Doppler imaging of medial and lateral mitral annulus and medial and lateral tricuspid annulus were normal except that there was significant inspiratory increase in Ea velocity of lateral tricuspid annulus (Figure 1).

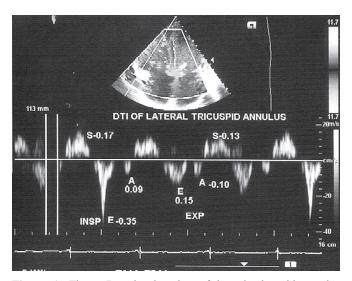


Figure 1. Tissue Doppler imaging of lateral tricuspid annulus showing significant inspiration increase in Ea velocity.

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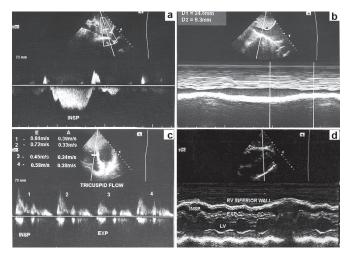


Figure 2. (a) Pulsed Doppler evaluation of hepatic vein flow showing forward flow mostly in inspiration with hardly any flow in expiration. (b) M-mode echocardiograph showing dilatation of inferior vena cava during expiration with marked inspiratory collapse. (c) Pulsed Doppler evaluation of tricuspid flow showing significant inspiratory increase in E wave velocity. (d) M-mode echocardiography from subcostal view showing significant inspiratory increase in right ventricular dimension.

Patients of emphysema have increased intrathoracic pressure swings. Forceful and prolonged expiration is followed by forceful inspiration using accessory muscles of respiration. This results in significant inspiratory increase in sucking of blood from vena cave to right atrium and right ventricle. This pathophysiological mechanism is supported by following echocardiographic findings. Hepatic vein flow was mostly confined to inspiration with hardly any flow in expiration (Figure 2a). Inferior vena cava was abnormally dilated in expiration (24.6 mm) with marked collapse during inspiration (9.3 mm) (Figure 2b). These two findings suggest increased inspiratory sucking of blood from vena cava to right atrium. Tricuspid flow Doppler showed nearly 100% increase in E-wave velocity during inspiration (Figure 2c). M-mode evaluation of right ventricular dimension from subcostal view showed significant inspiratory increase in right ventricular dimension (Figure 2d). These two findings support exaggerated inspiratory filling of right ventricle. This abnormal inspiratory increase in right ventricular filling could contribute to abnormal inspiratory increase in Ea velocity of lateral tricuspid annulus in our case.

Grant Support

None

Source of Funding

None

Conflict of Interest

None