

Right Atrial & Systemic Venous Function

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Connections of Right Atrium

- **Inflows**

- Inferior vena cava

- Right posterior margin of the inferior wall

- Superior vena cava

- Right anterior portion of the superior wall

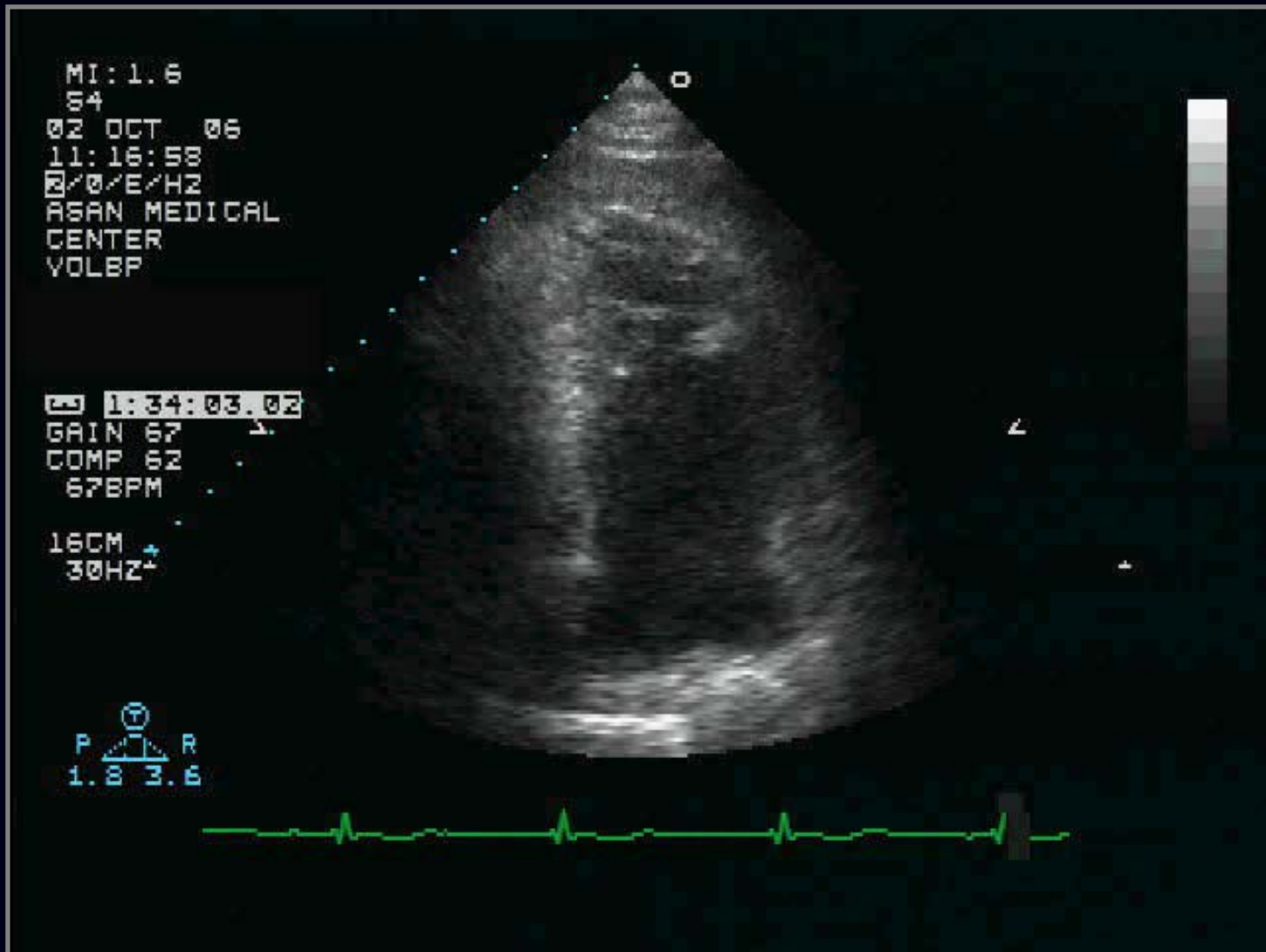
- Coronary sinus

- Just superior to the posterior margin of the tricuspid annulus

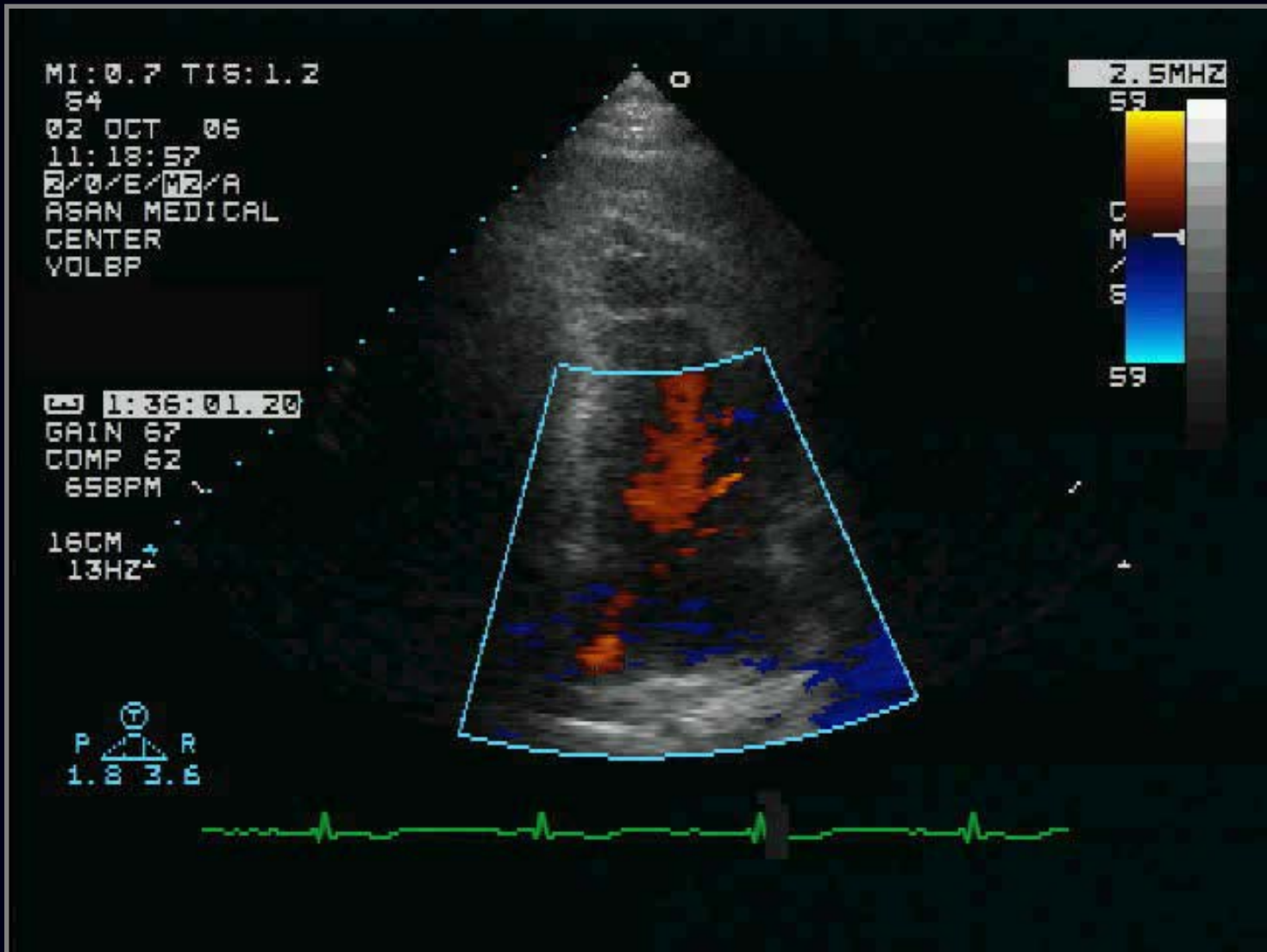
- **Outflows**

- Tricuspid orifice

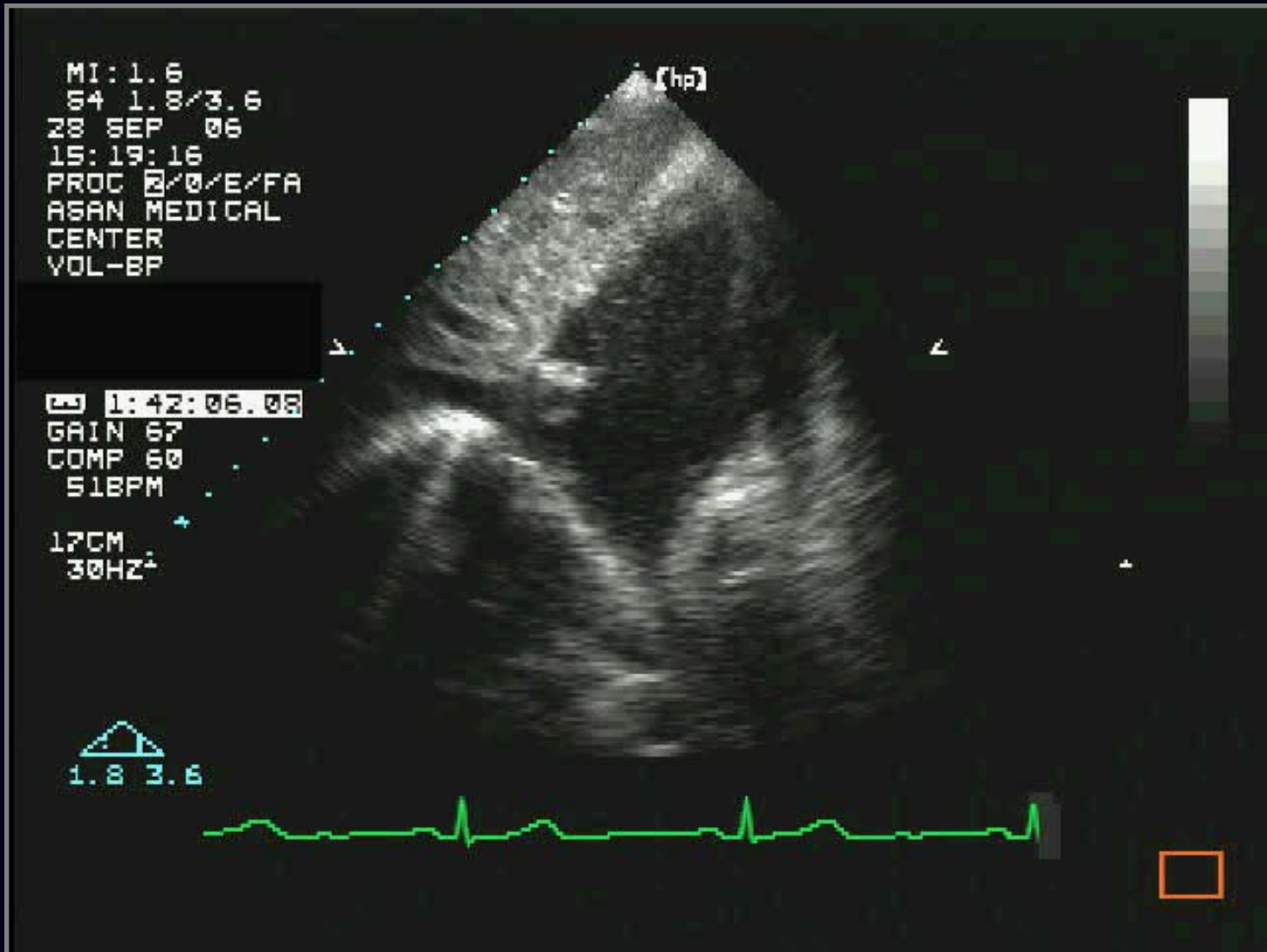
Connections of Right Atrium



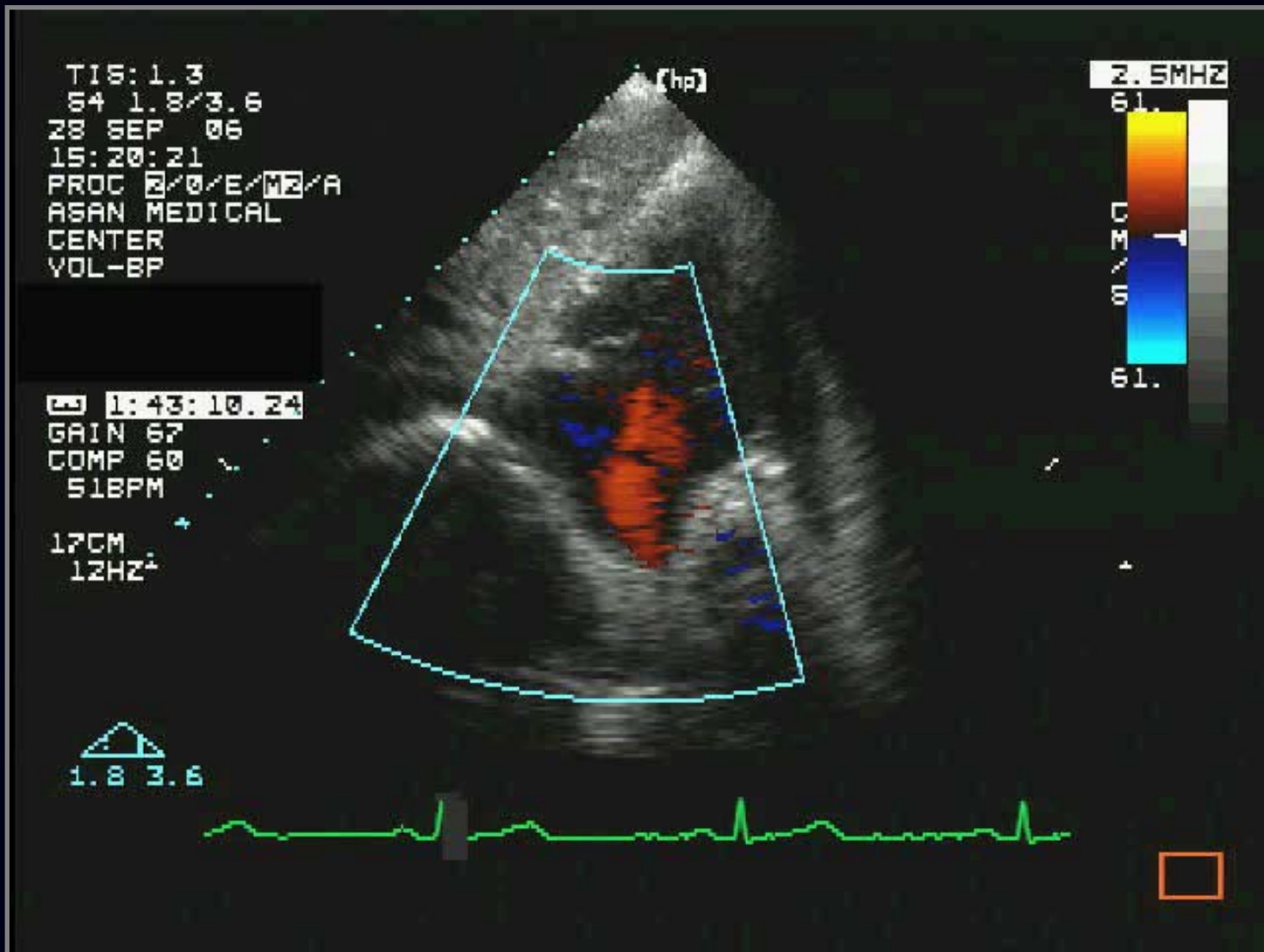
Connections of Right Atrium



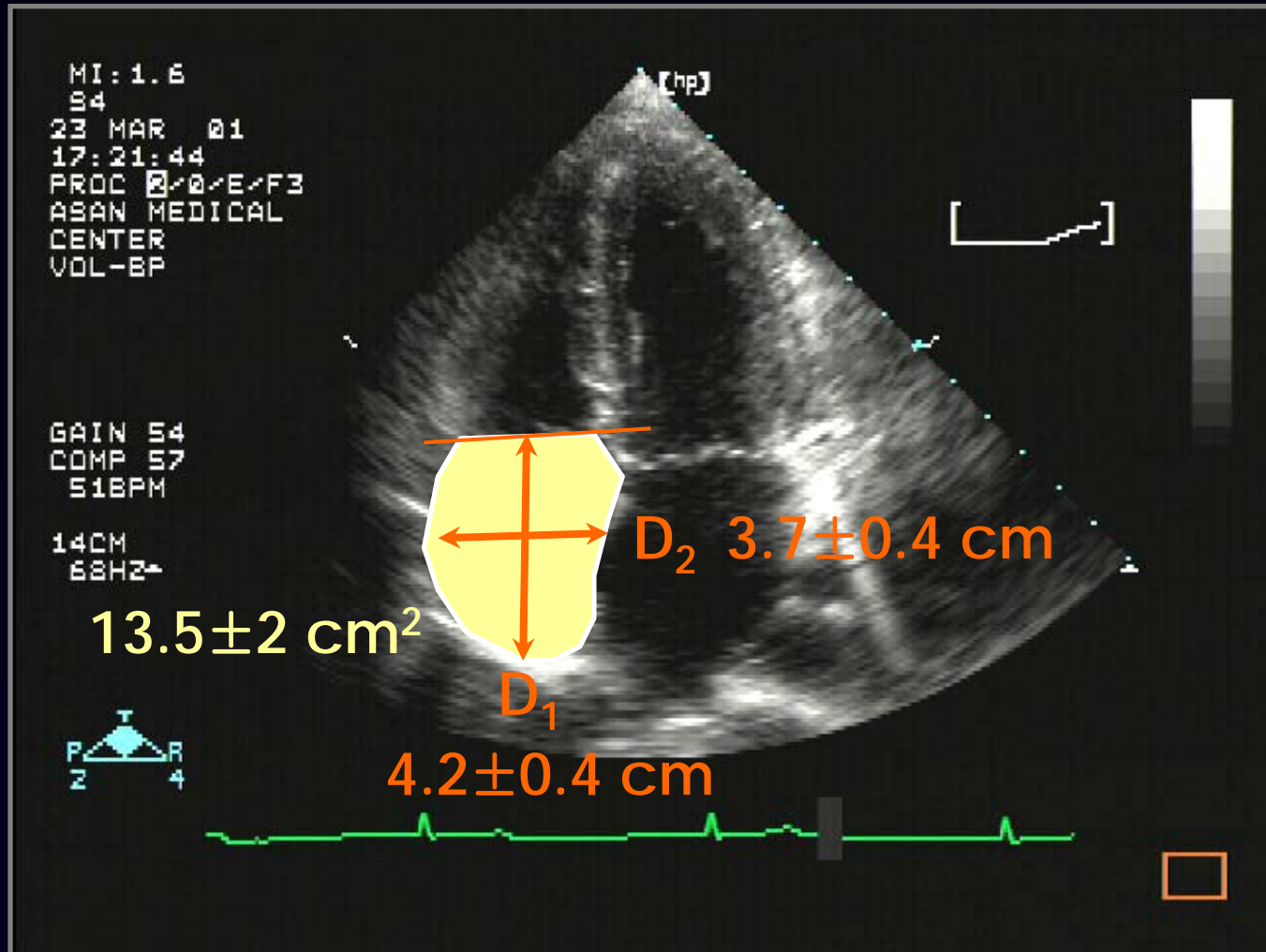
Connections of Right Atrium



Connections of Right Atrium



RA Dimensions



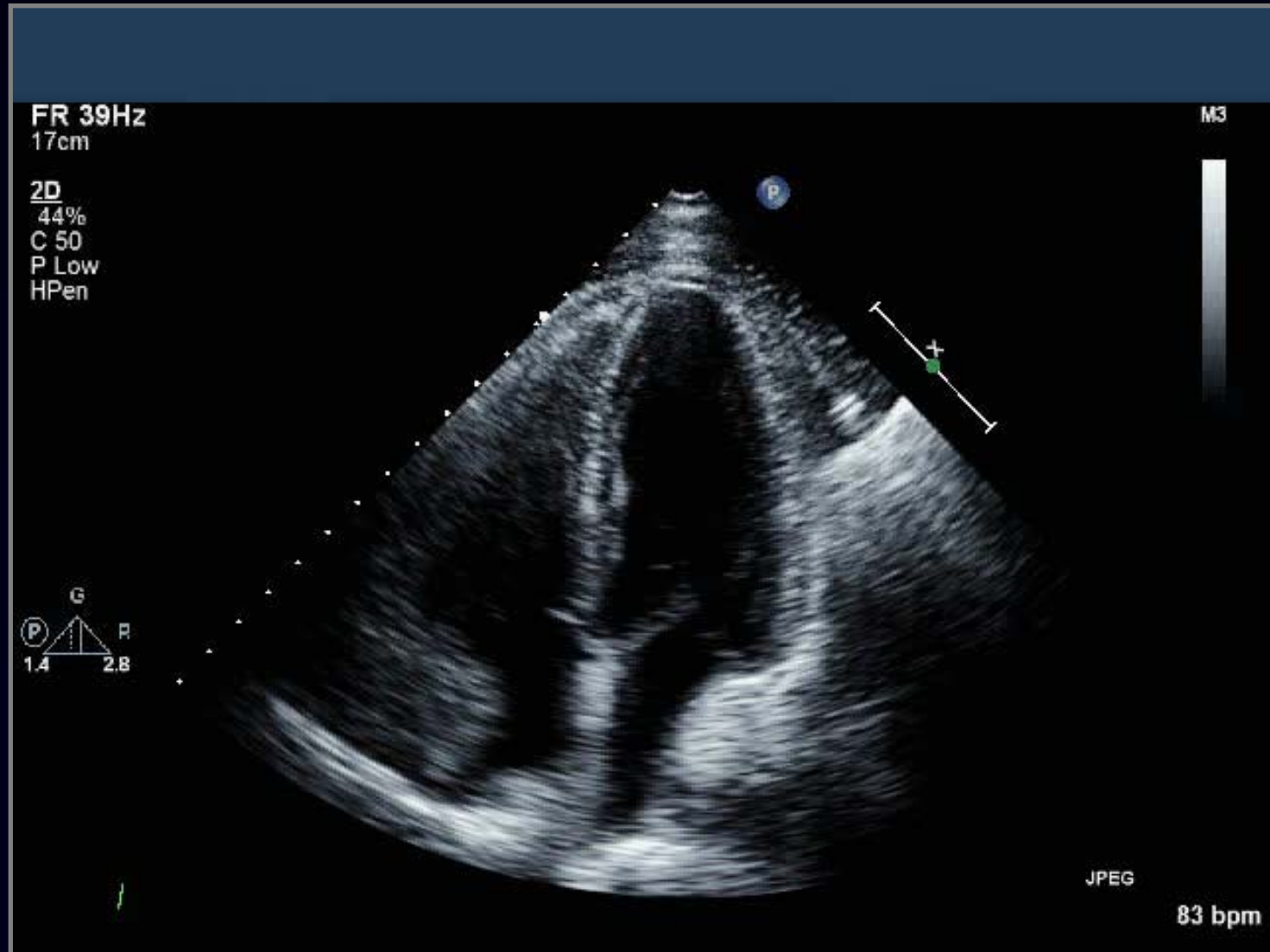
Right Atrial Size

- Apical 4-chamber view
- **Volume measurement**
 - Single plane
 - Area-length or Simpson methods

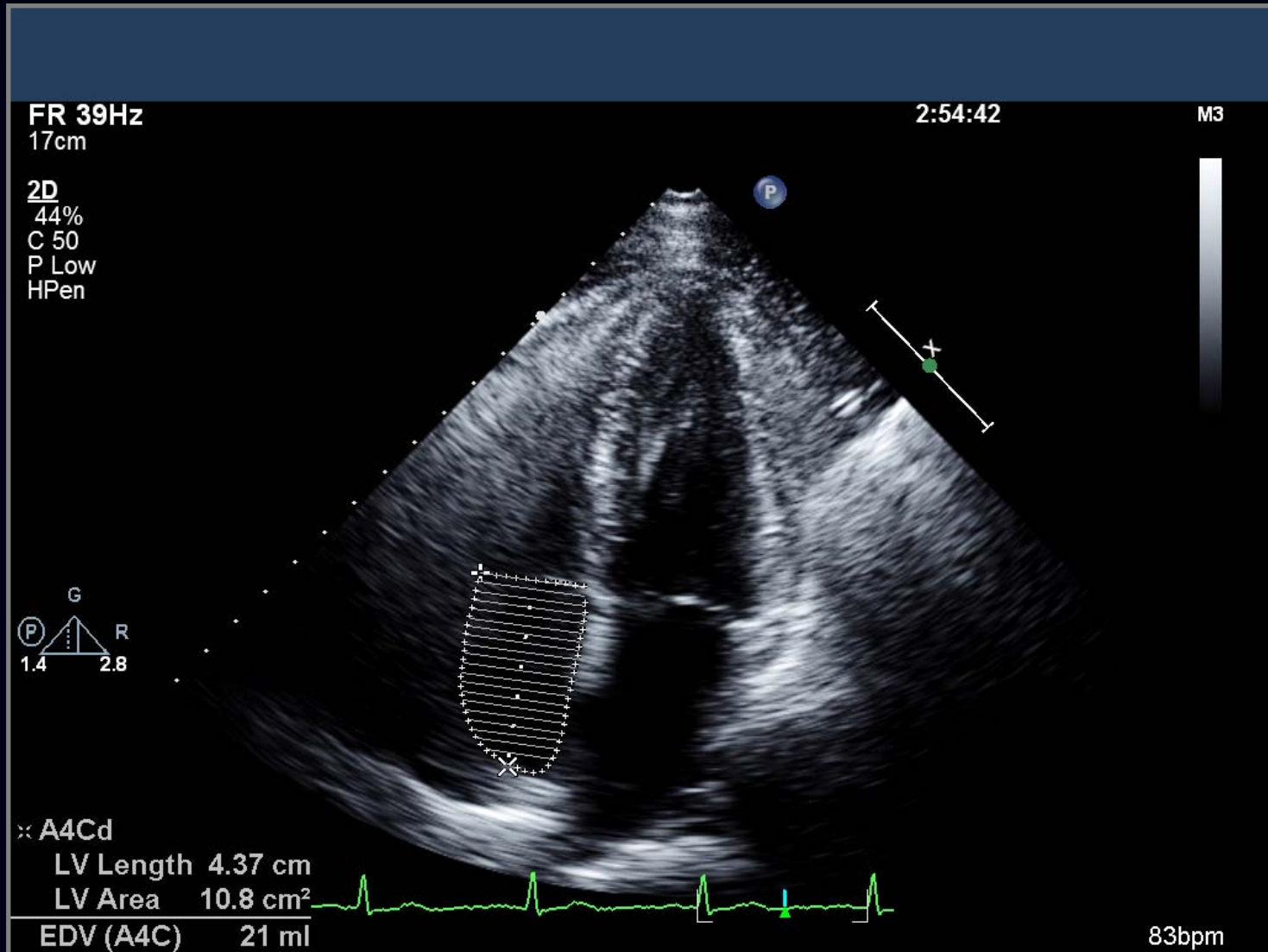
$$\pi/4 (h) \sum (D_n)^2$$

- 21 mL/m²

Right Atrial Volume



Right Atrial Volume



Inferior Vena Cava

- **Size evaluation**
 - Subcostal view
 - 1.0 – 2.0 cm from the junction with RA
 - Perpendicular to the IVC long axis
 - Inspiratory response by a brief sniff

Inferior Vena Cava Physiology

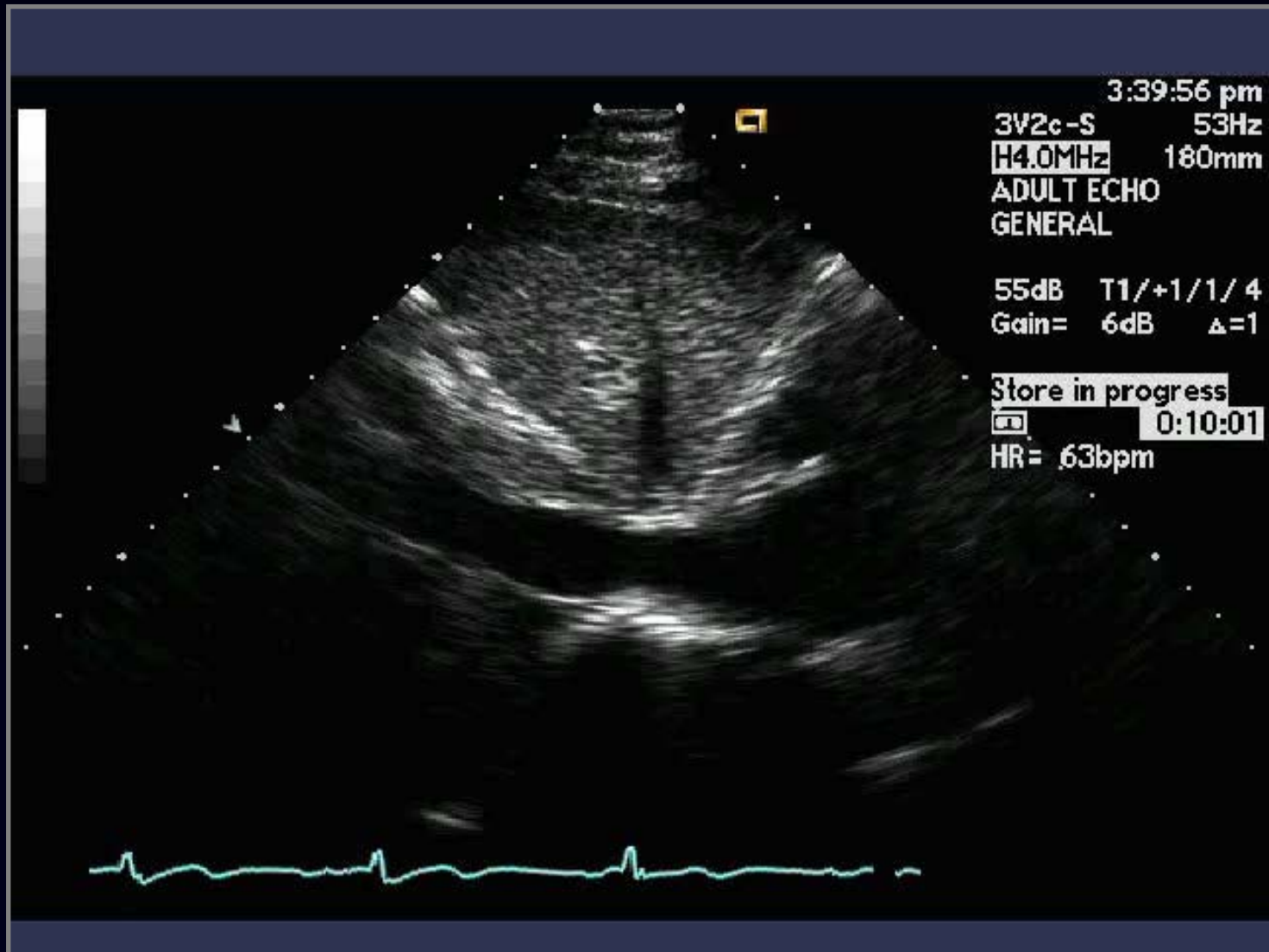
- Inspiration
 - ↓ intrathoracic pressure
 - ↓ RA pressure
 - ↑ return of blood to RA
 - Caval emptying
 - Mean right atrial pressure
 - Chamber/vessel compliance

Inferior Vena Cava

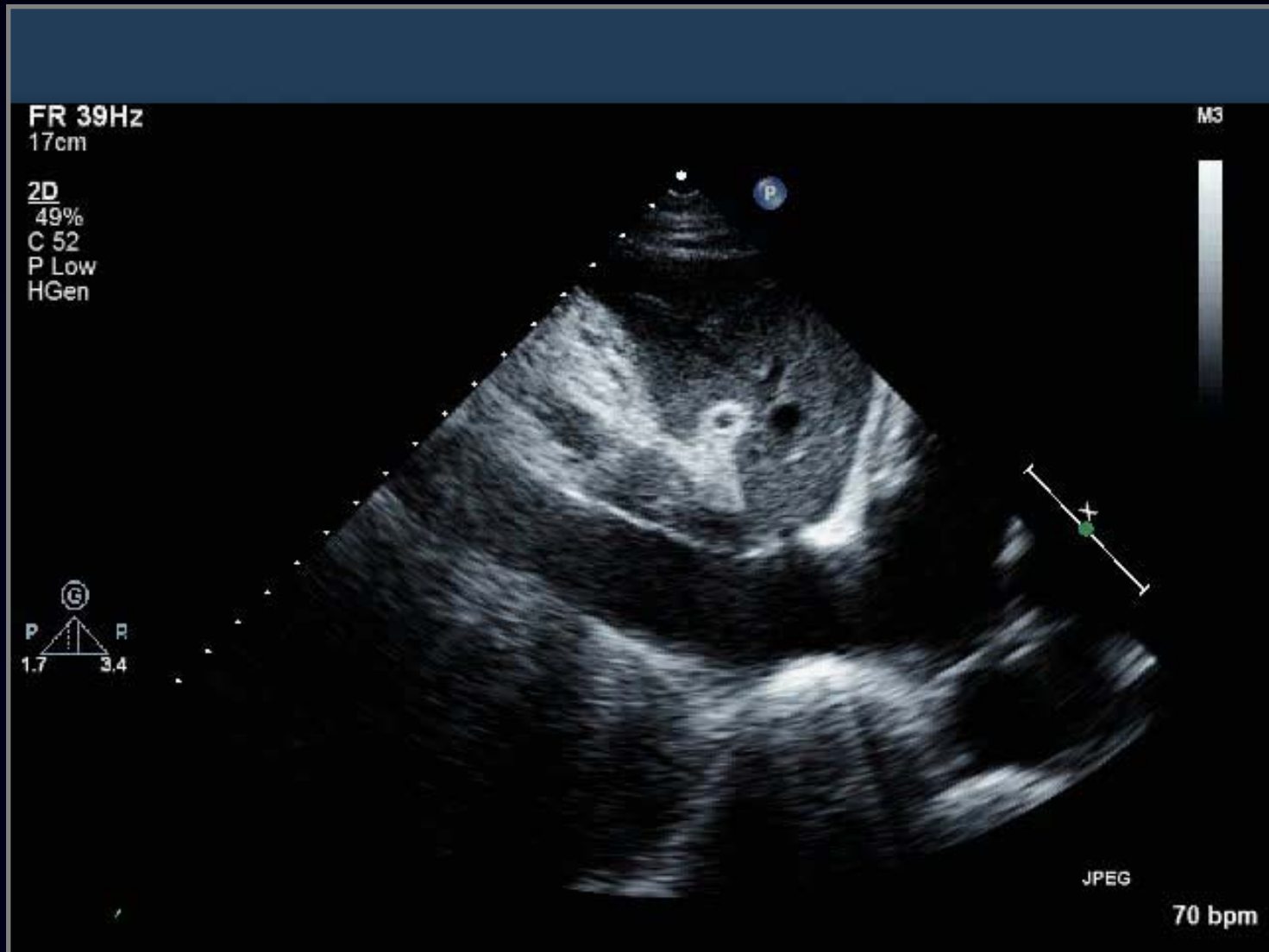
- Inspiratory response & RA pressure

Diameter	Inspiratory collapse	RA pressure
< 1.7 cm	$\geq 50\%$	0-5 mm Hg
≥ 1.7 cm	$\geq 50\%$	6-10 mm Hg
≥ 1.7 cm	< 50 %	10-15 mm Hg
≥ 1.7 cm	0 %	> 15 mm Hg

Normal Respiratory Response of IVC



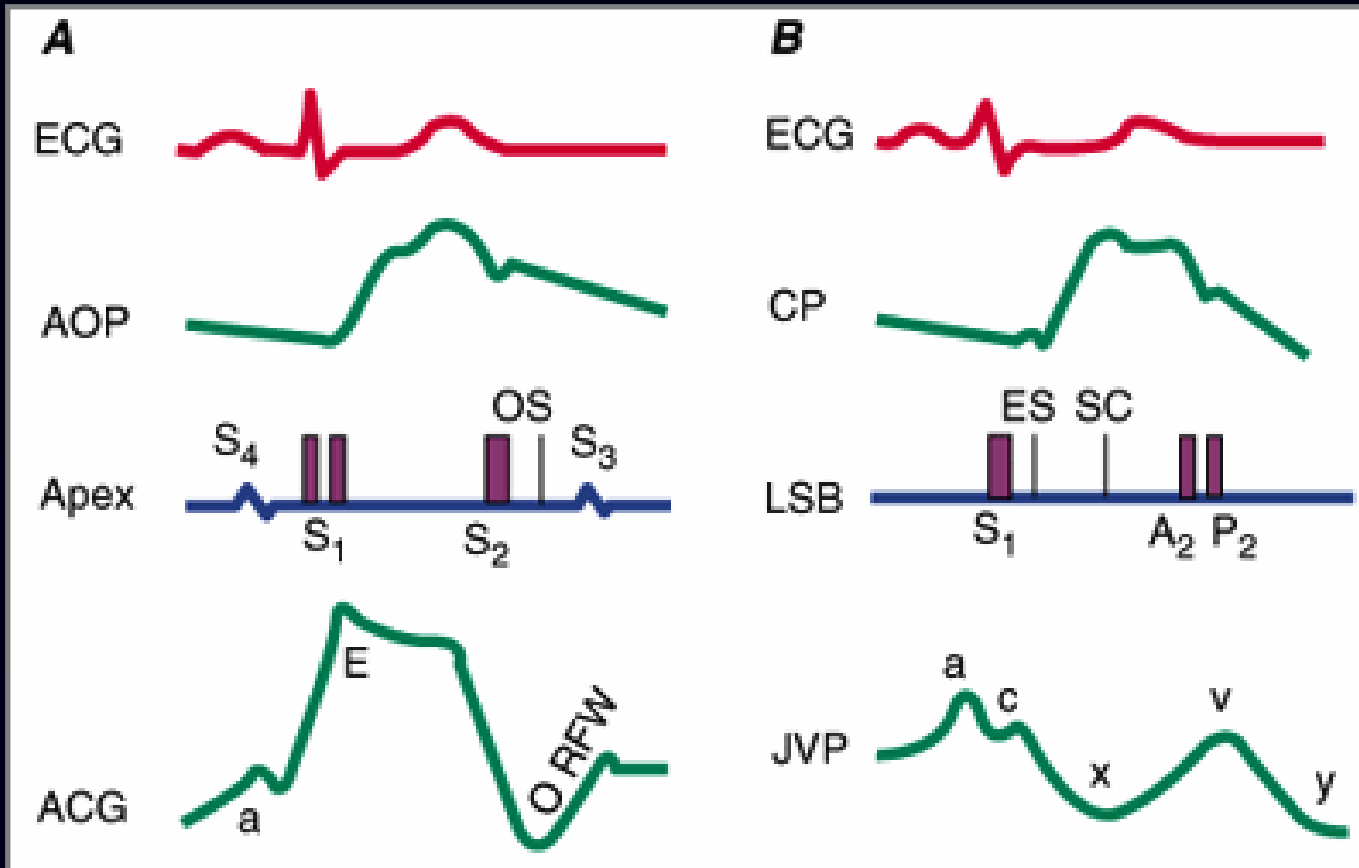
IVC Plethora



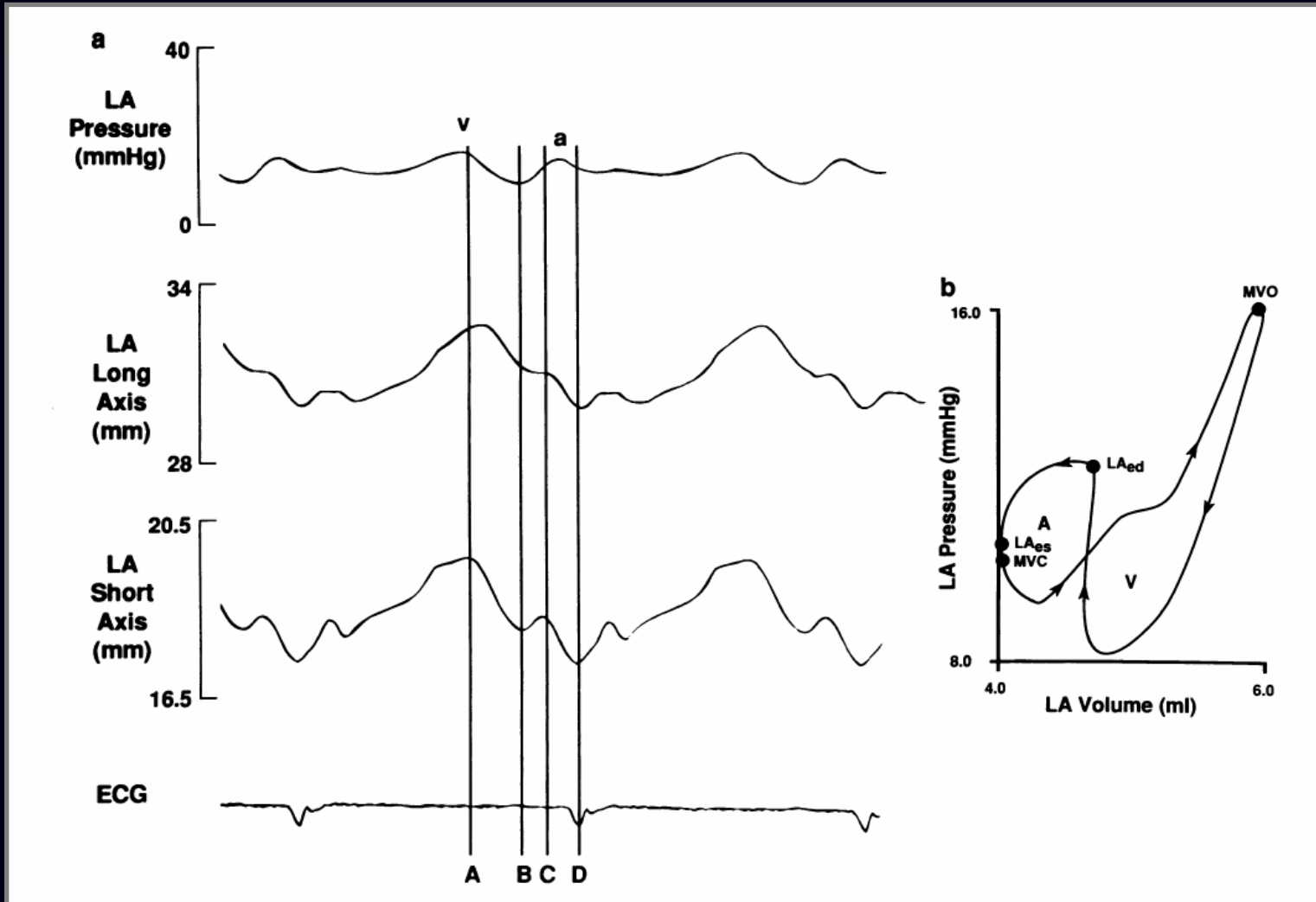
Right Atrial Pressure

- **A wave** : atrial contraction
- **X descent** : atrial relaxation & downward apical movement of annulus
- **C wave** : ventricular contraction & closure of AV valve
- **V wave** : blood influx from systemic veins
- **Y descent** : blood efflux to ventricle

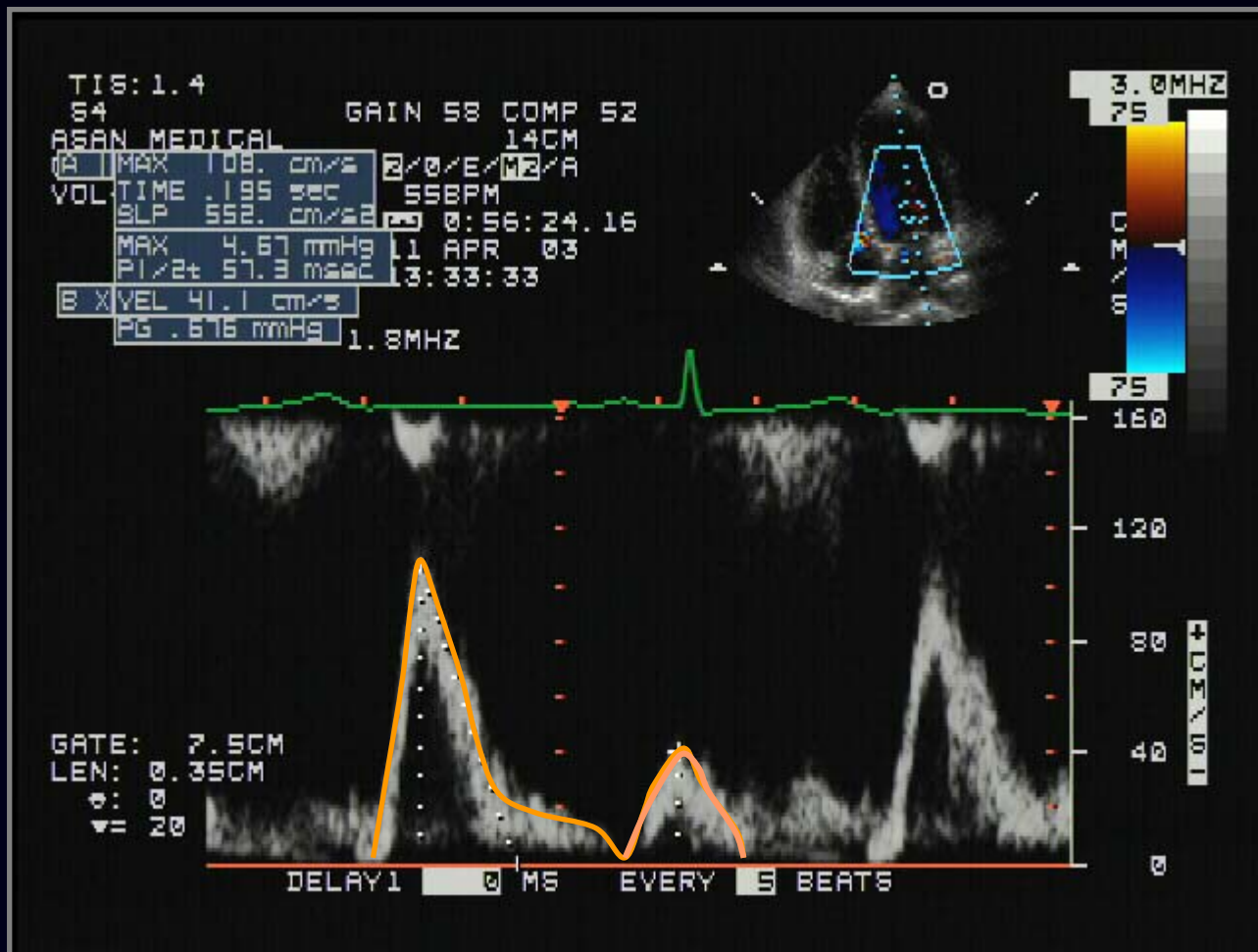
Right Atrial Pressure



Atrial Pressure-Volume Loop

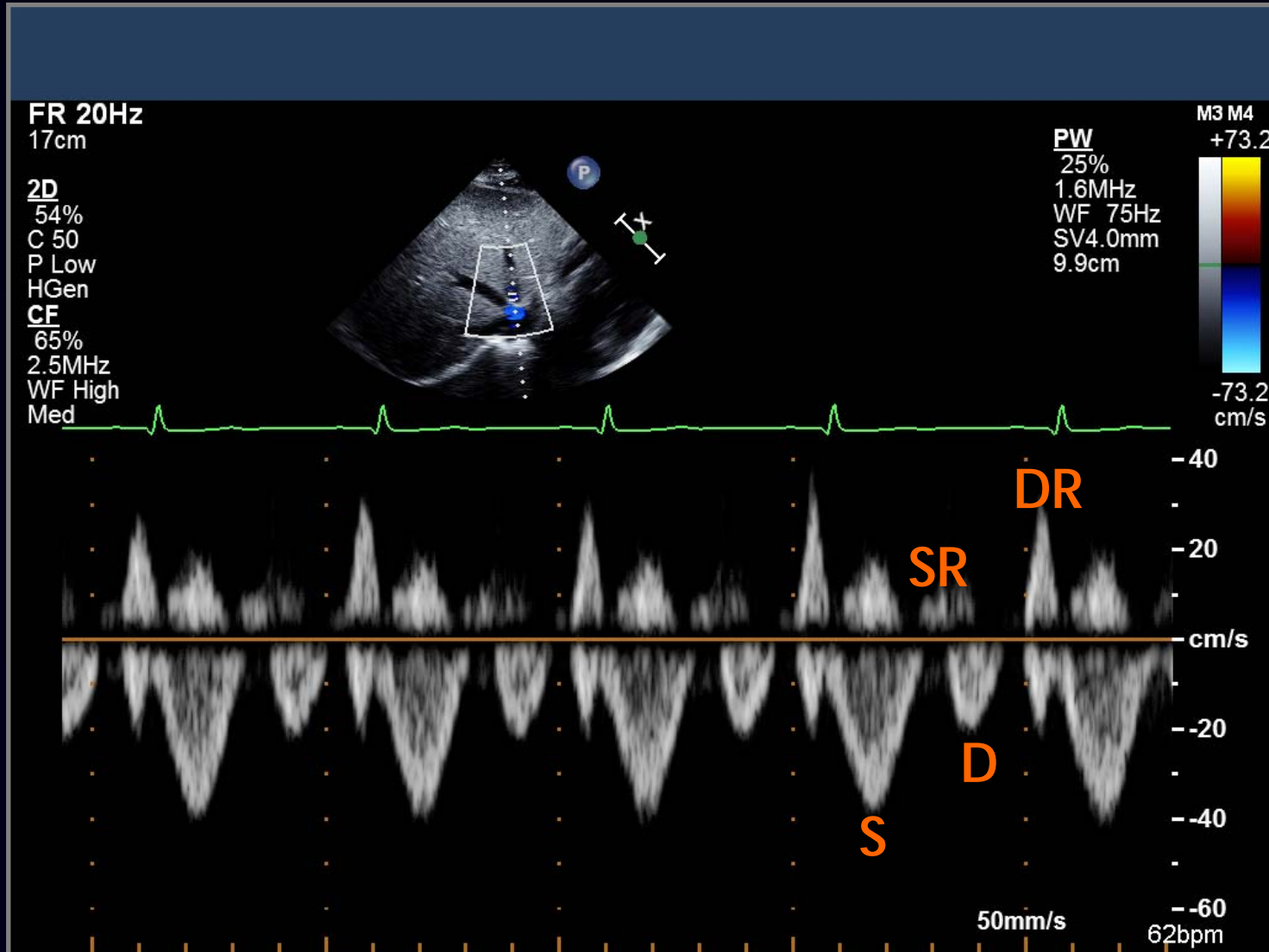


Atrial Contribution to Ventricular Filling



Kuo et al. Am J Cardiol 1987;59:1174-78

Normal Hepatic Vein Flow



Abnormal Right Atrial Pressure

A Tricuspid stenosis



B Constrictive pericarditis



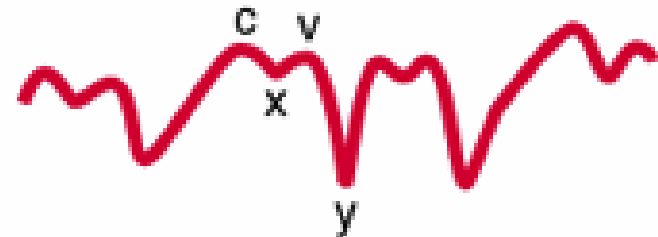
C Tricuspid regurgitation



D Complete AV block



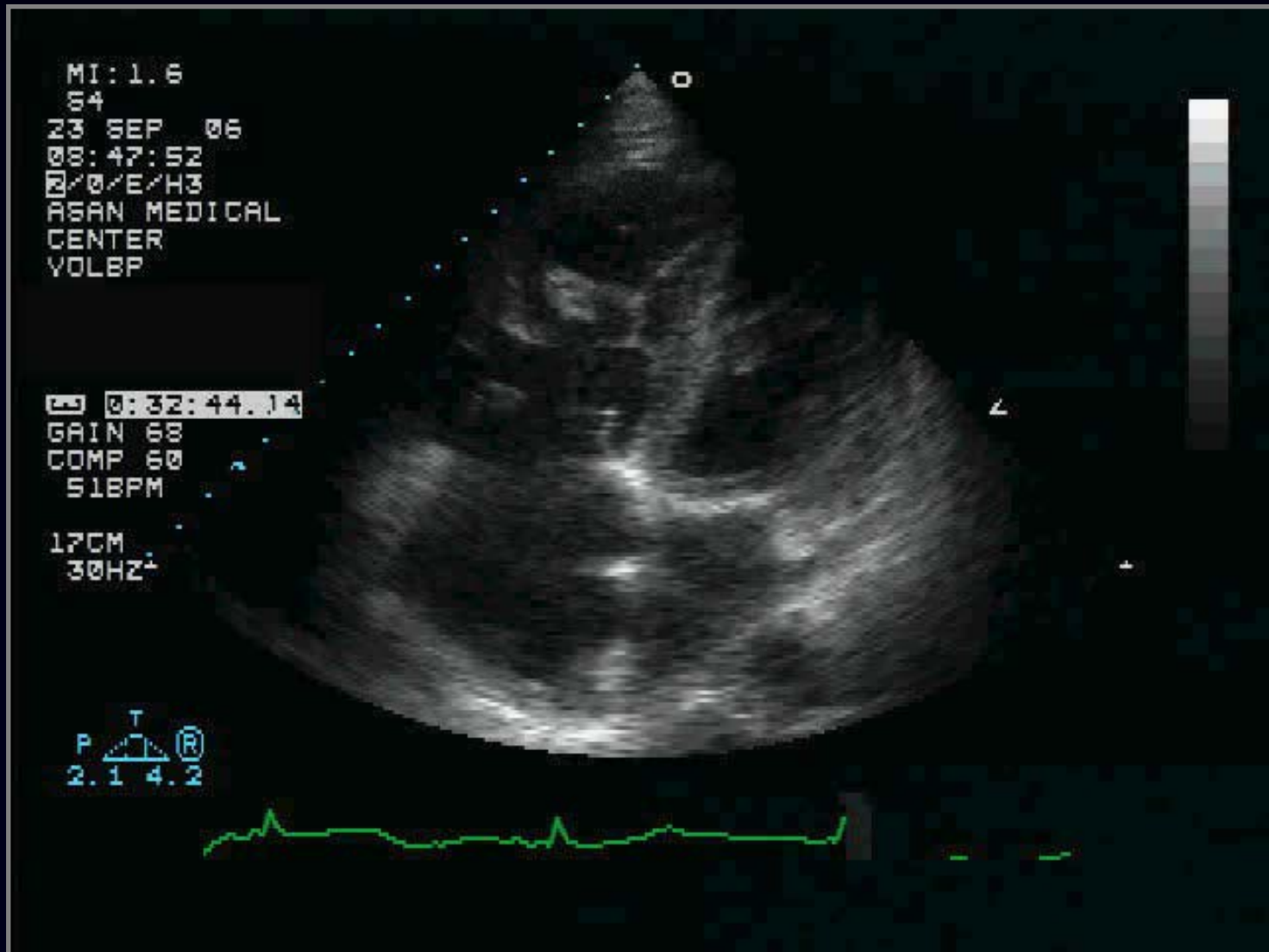
E Atrial fibrillation



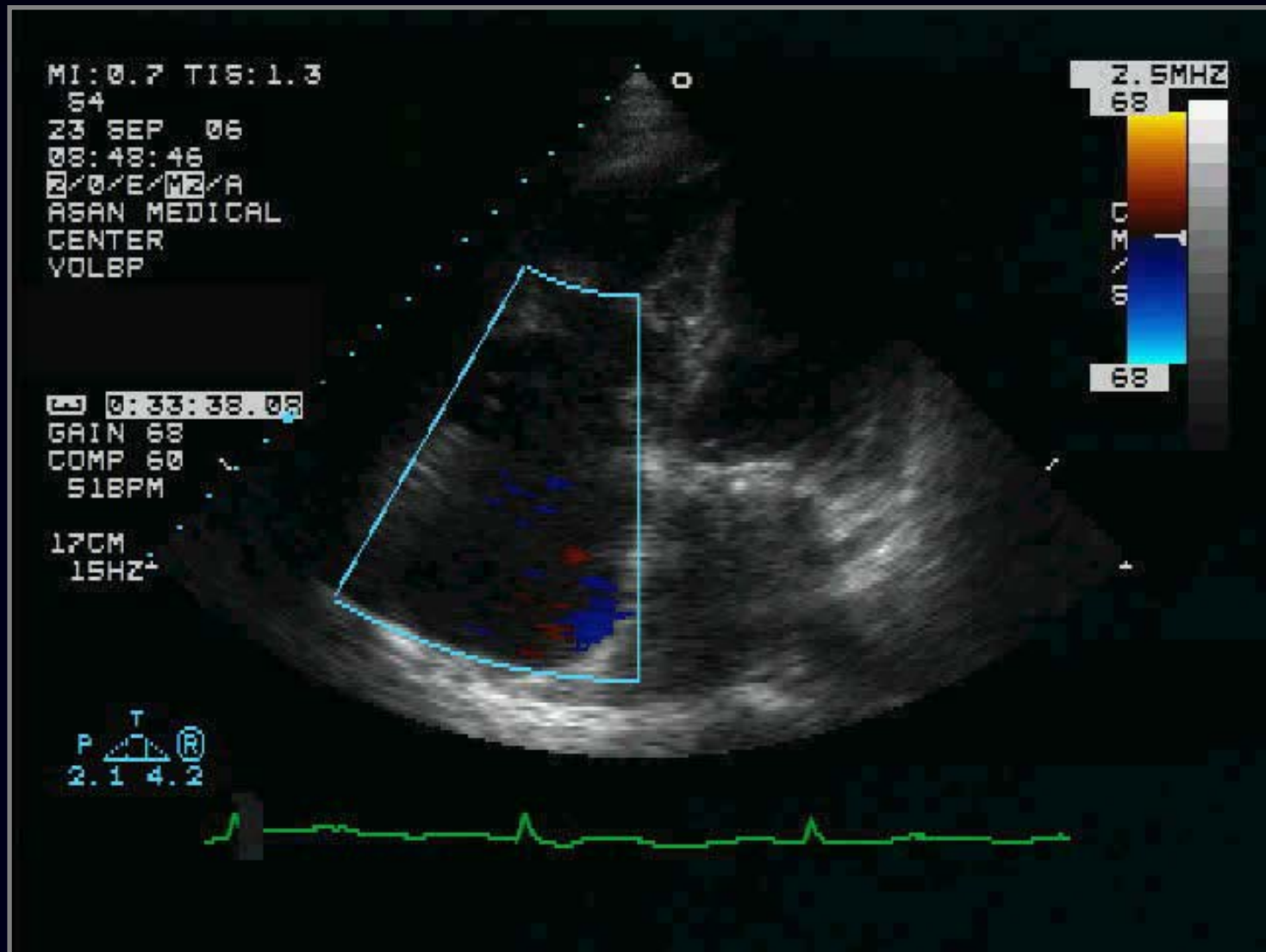
Abnormal Hepatic Venous Flow

- **Diminished systolic forward flow**
 - Tricuspid regurgitation
 - Atrial fibrillation
- **Decreased diastolic forward flow**
 - Relaxation abnormality of RV
- **Systolic reversal flow**
 - Severe tricuspid regurgitation

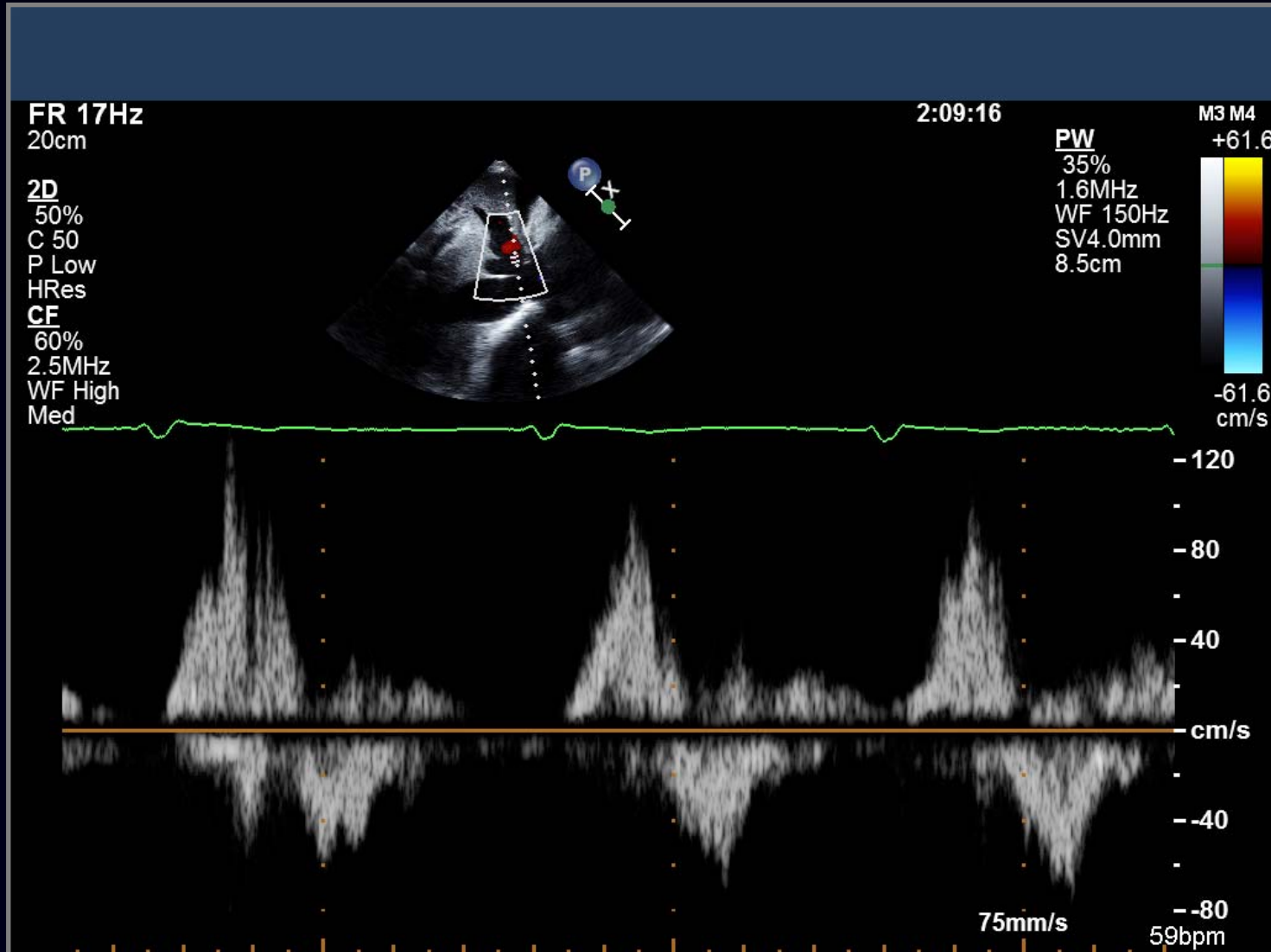
Severe Tricuspid Regurgitation



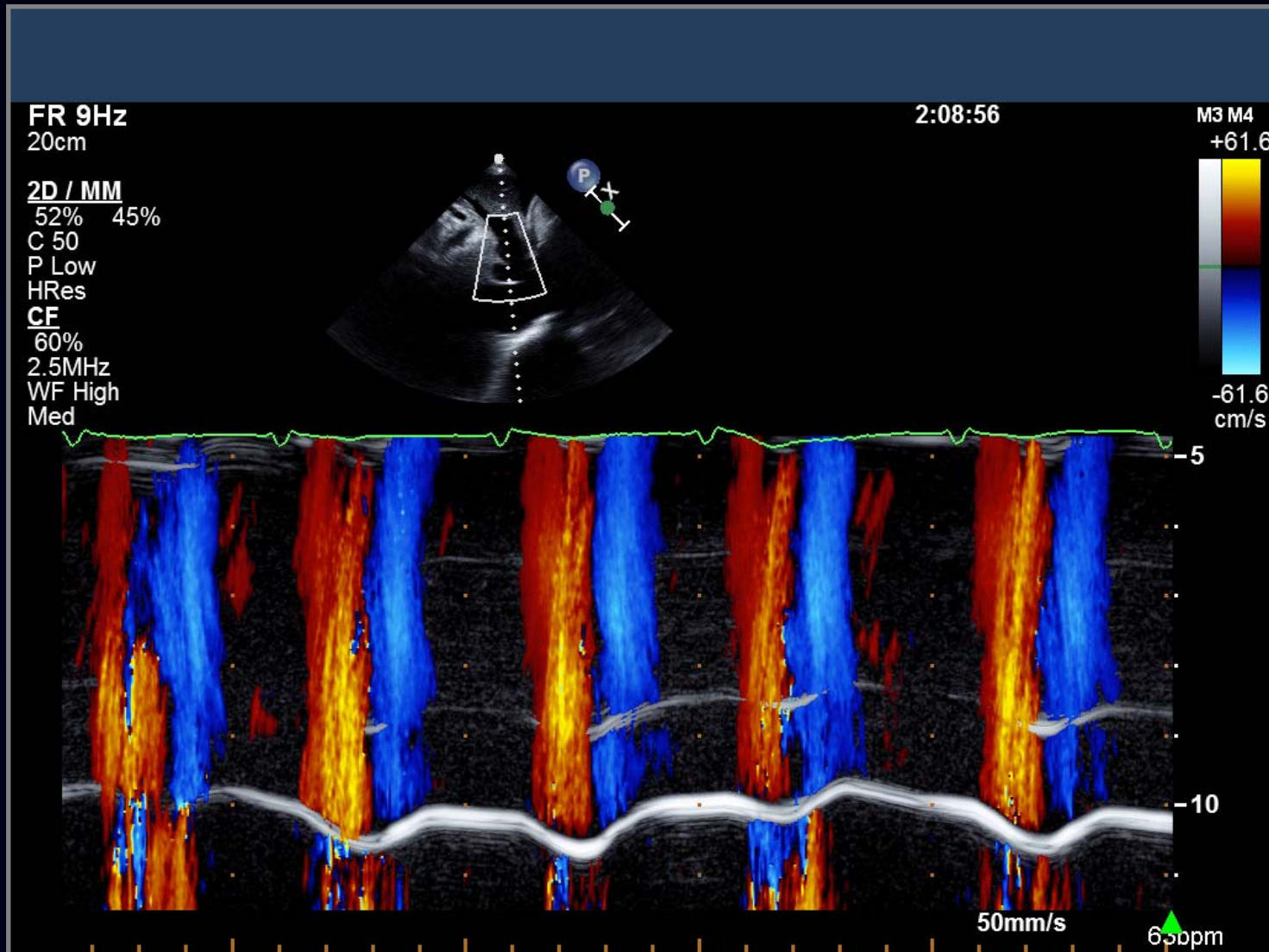
Severe Tricuspid Regurgitation



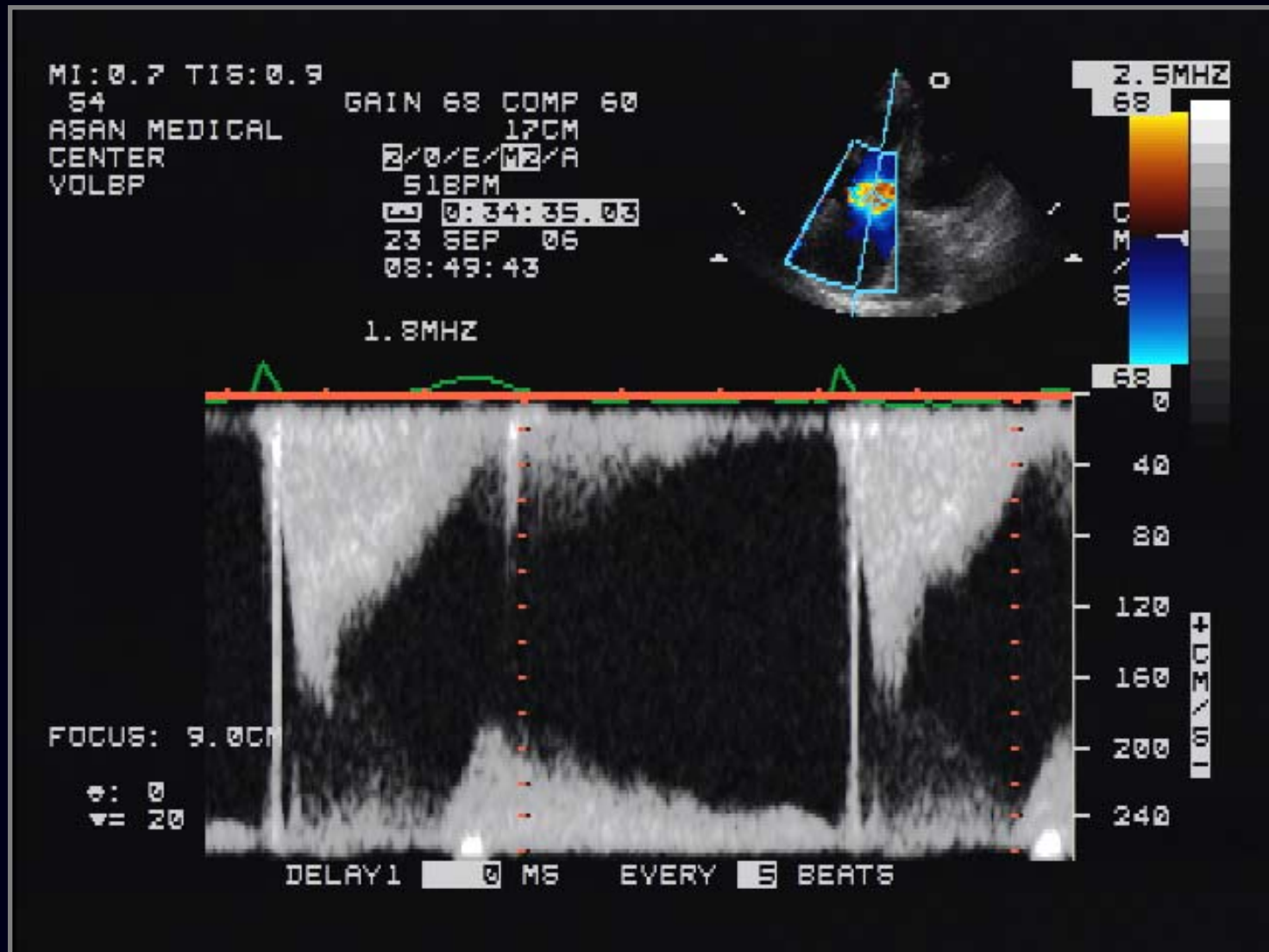
Severe Tricuspid Regurgitation



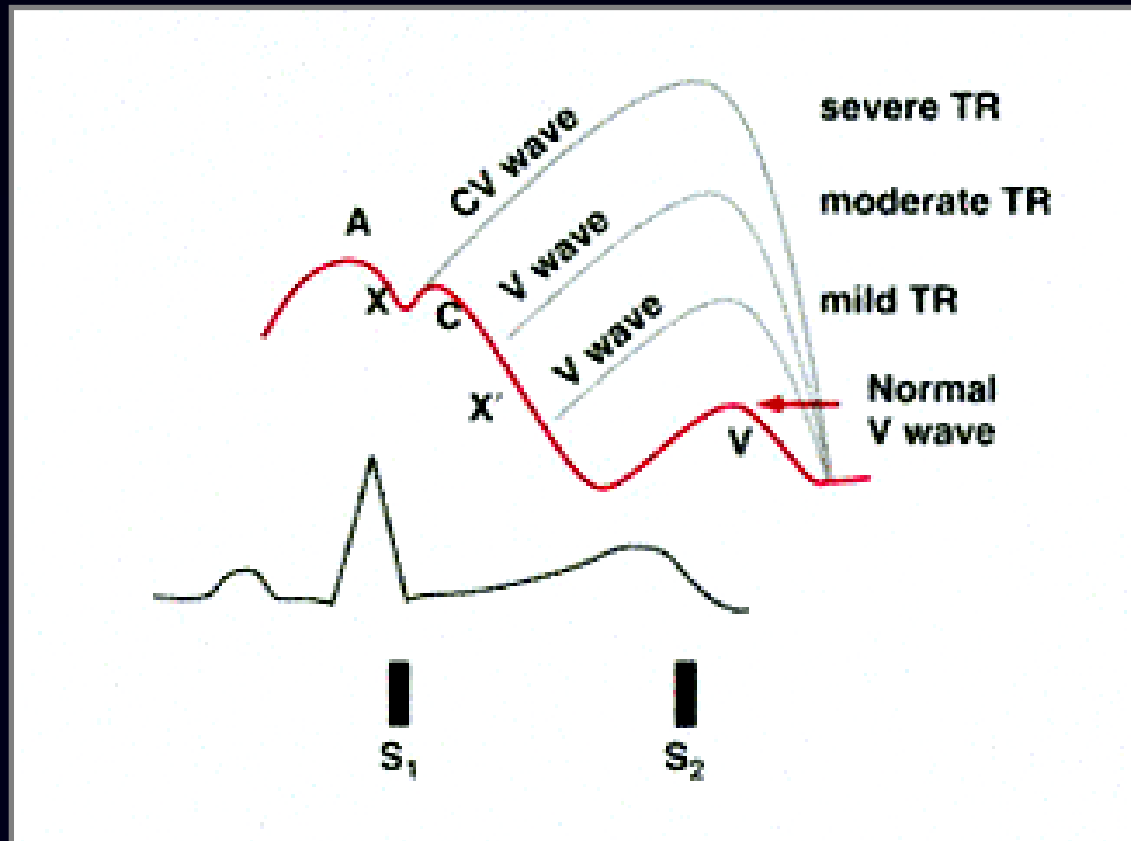
Severe Tricuspid Regurgitation



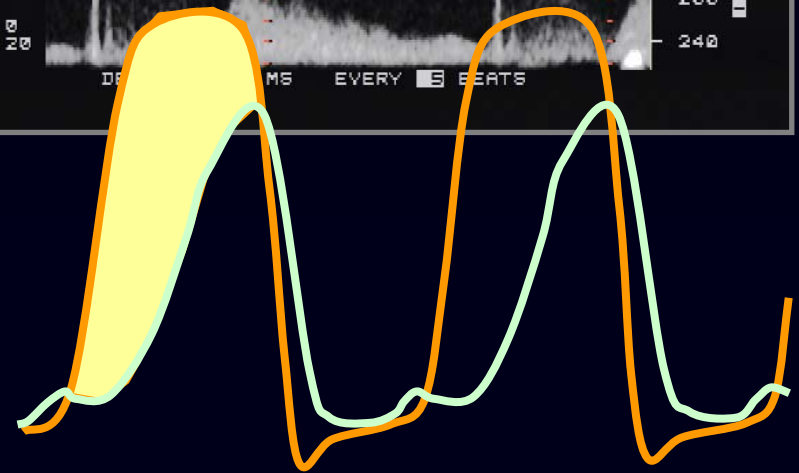
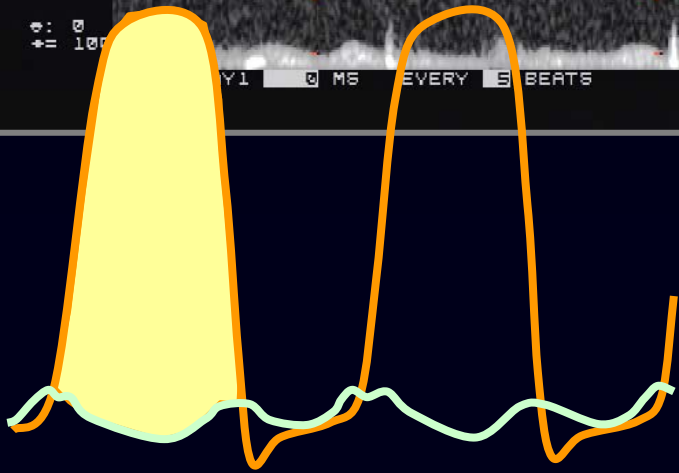
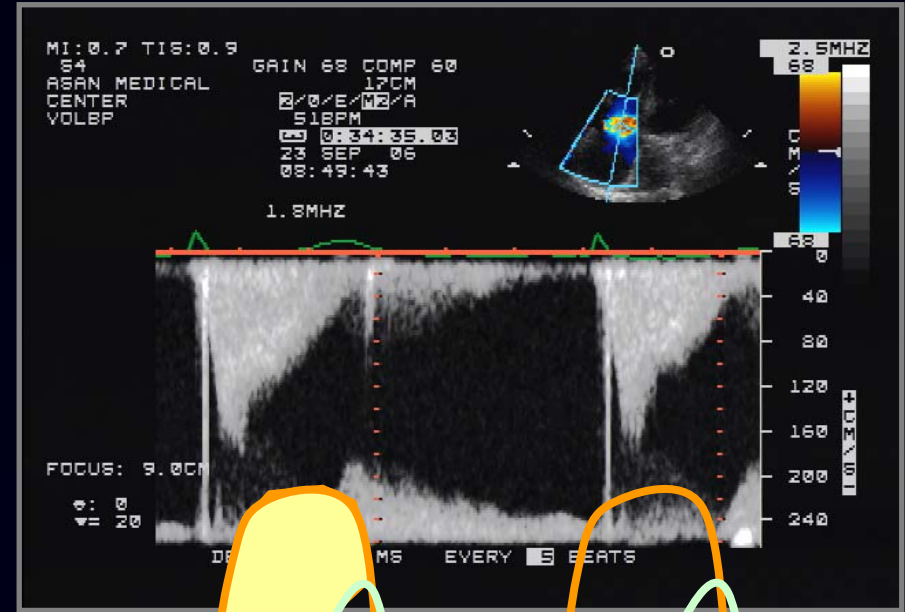
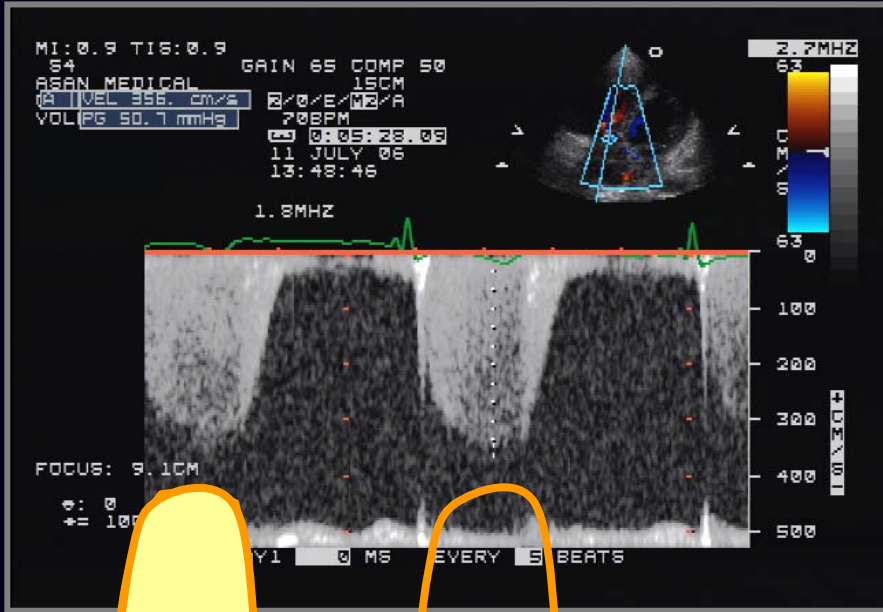
Severe Tricuspid Regurgitation



Severe Tricuspid Regurgitation

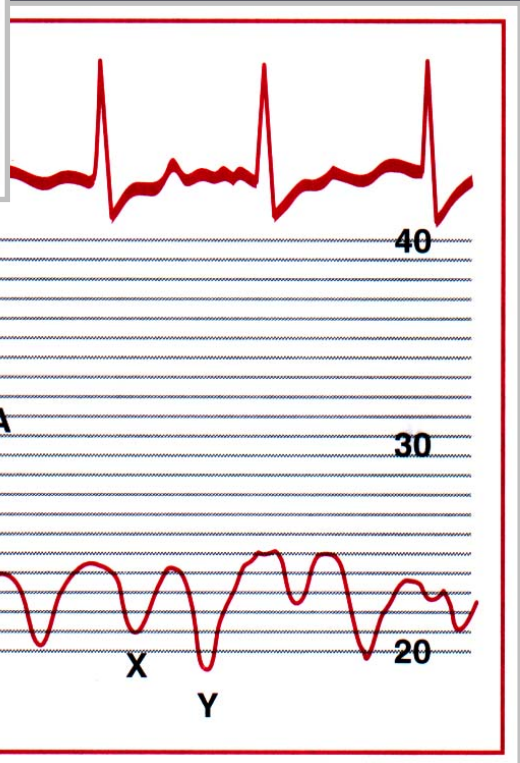


Severe Tricuspid Regurgitation

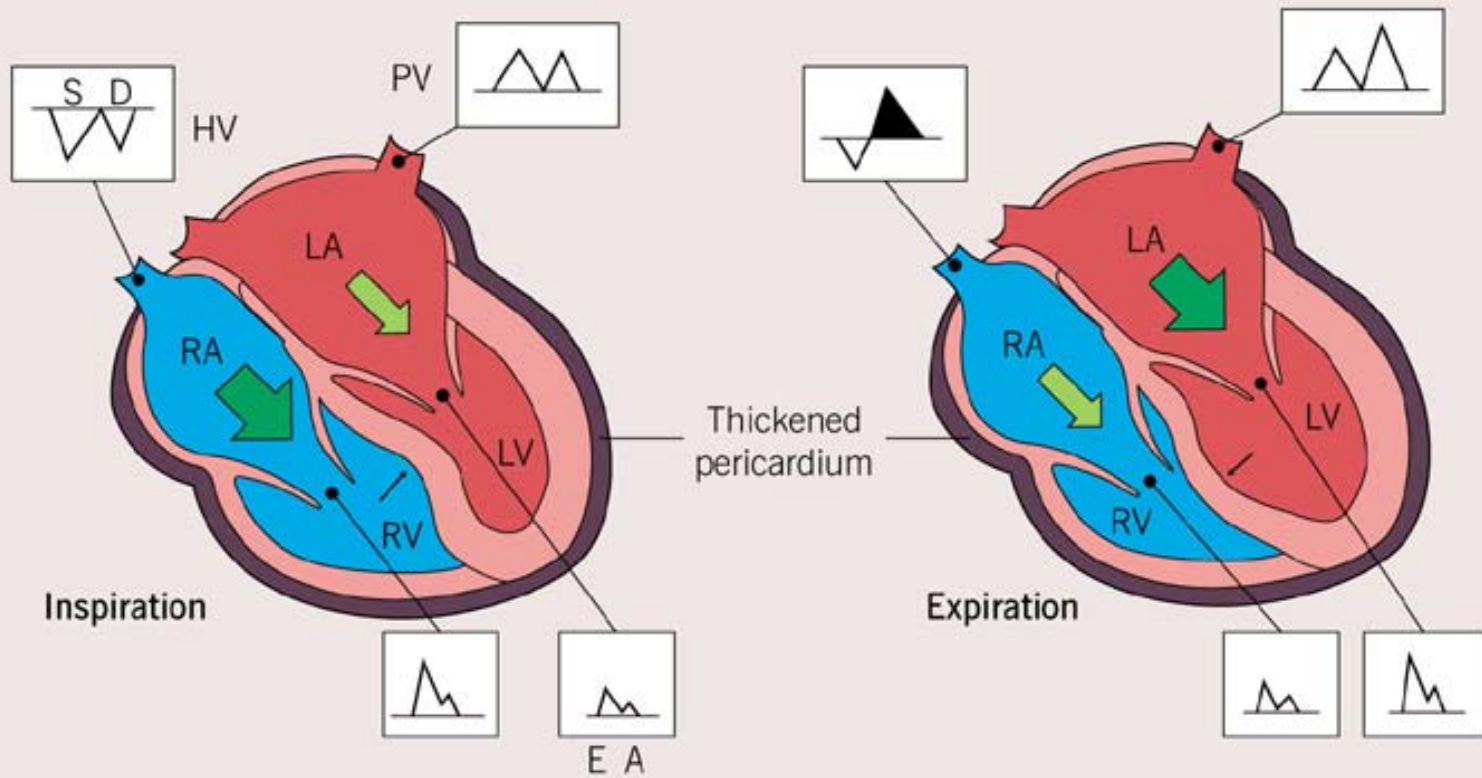


Respiratory Variation of Hepatic Venous Flow

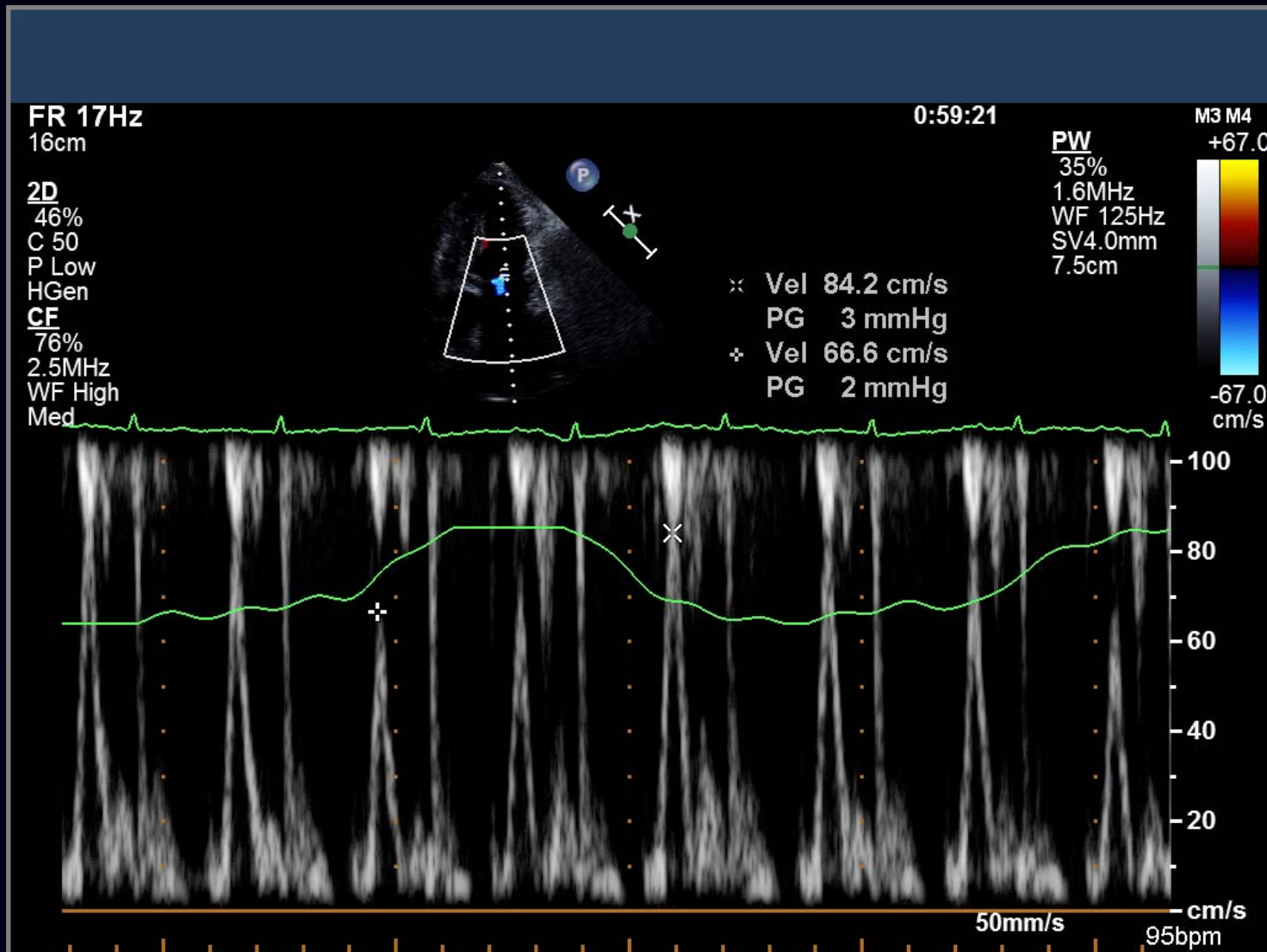
- Increase in diastolic flow reversals with expiration
 - Constrictive pericarditis
- Increase in systolic and diastolic flow reversals with inspiration
 - Restrictive cardiomyopathy



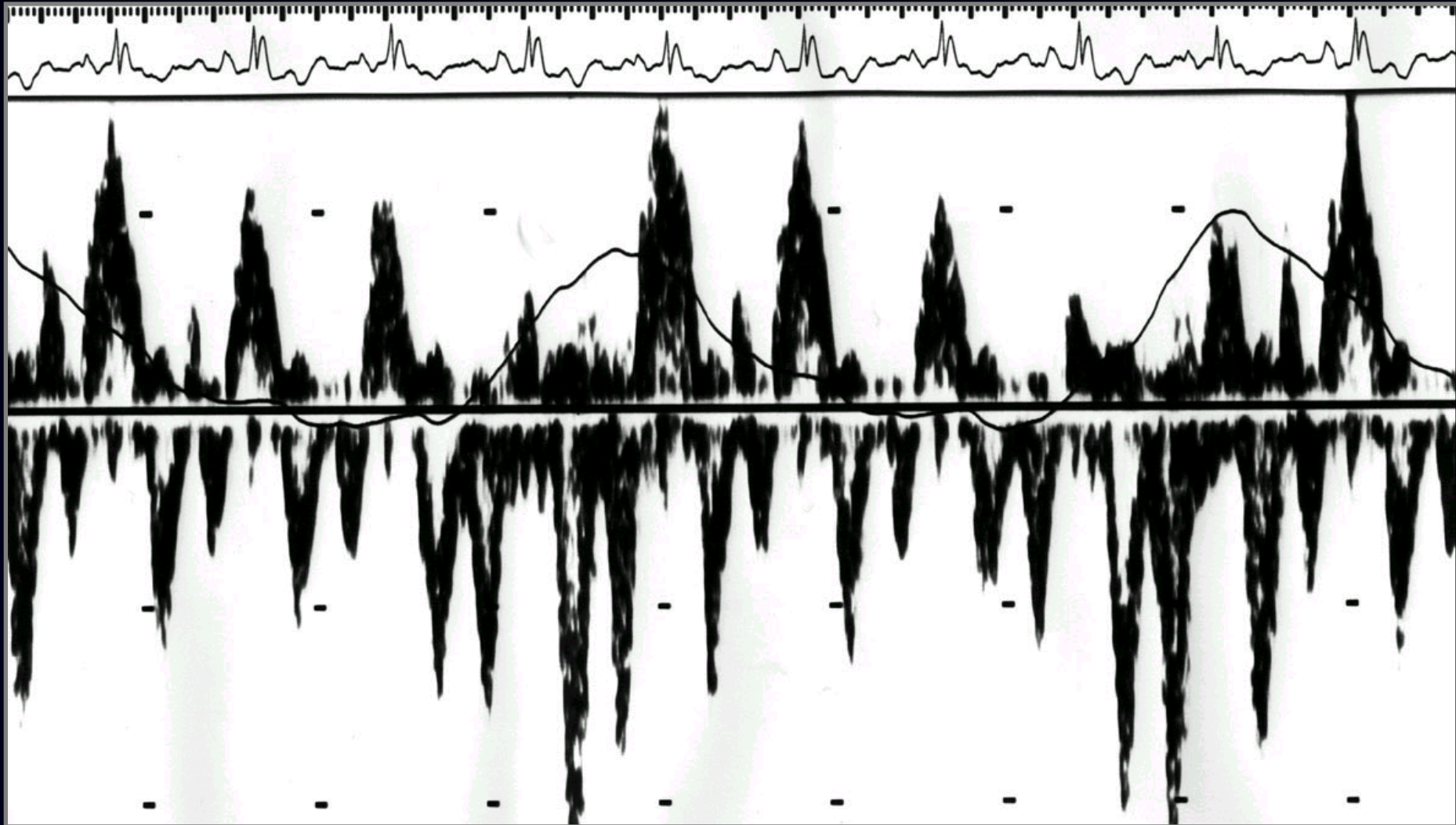
TRANSVALVULAR AND CENTRAL VENOUS FLOW VELOCITIES IN CONSTRICTIVE PERICARDITIS



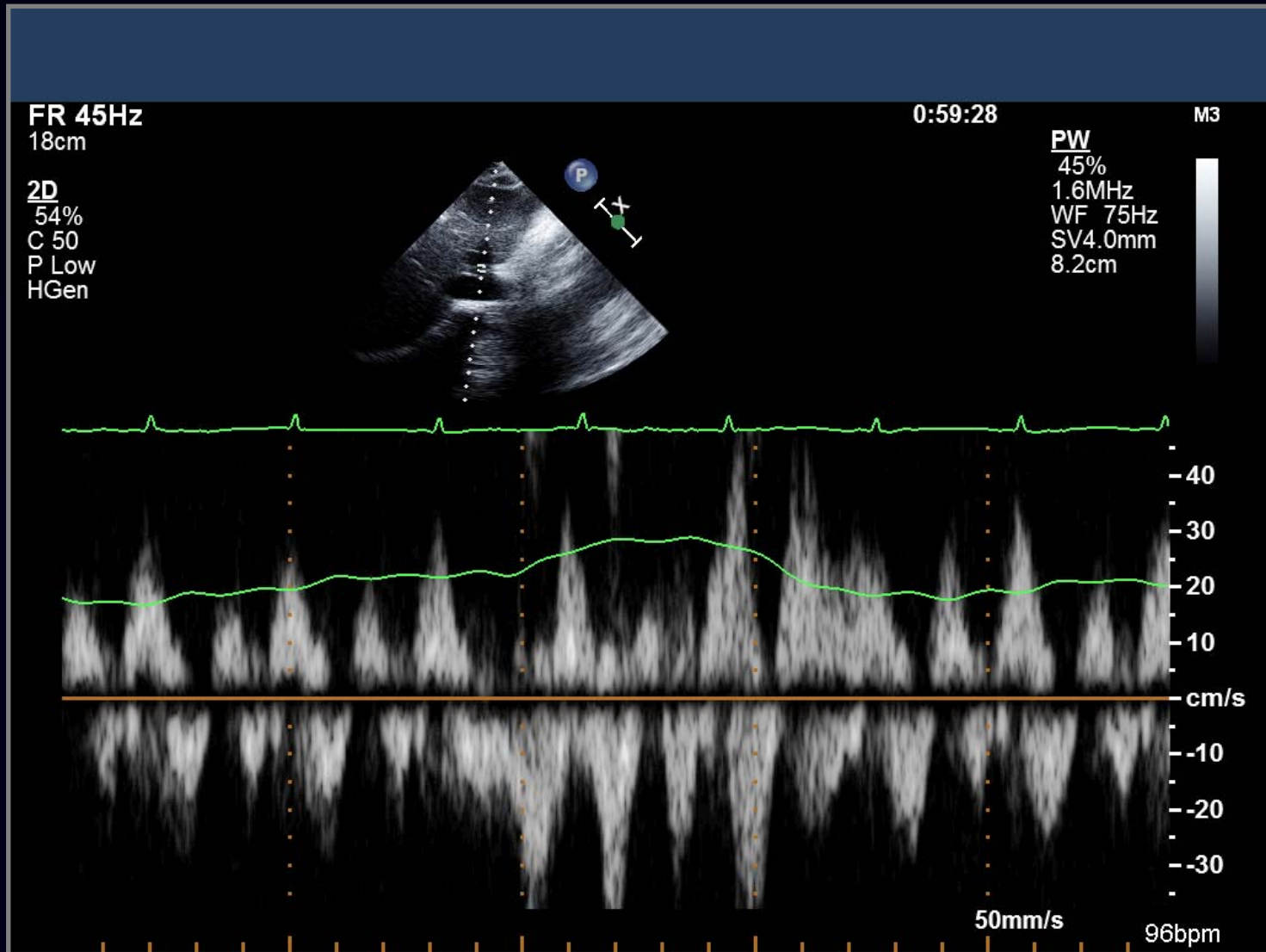
Constrictive Pericarditis



Constrictive Pericarditis



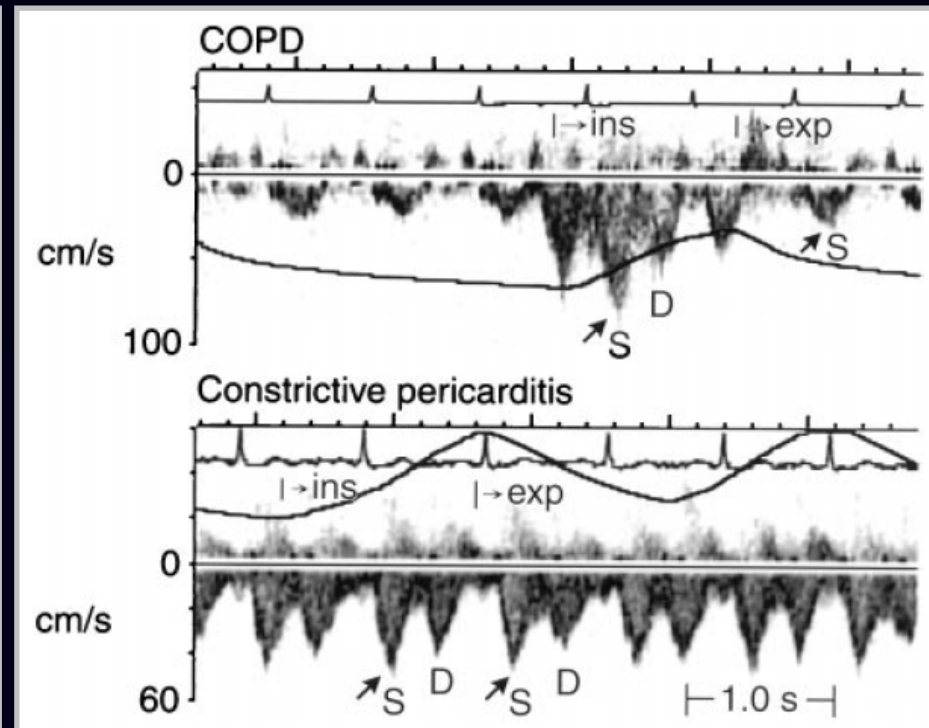
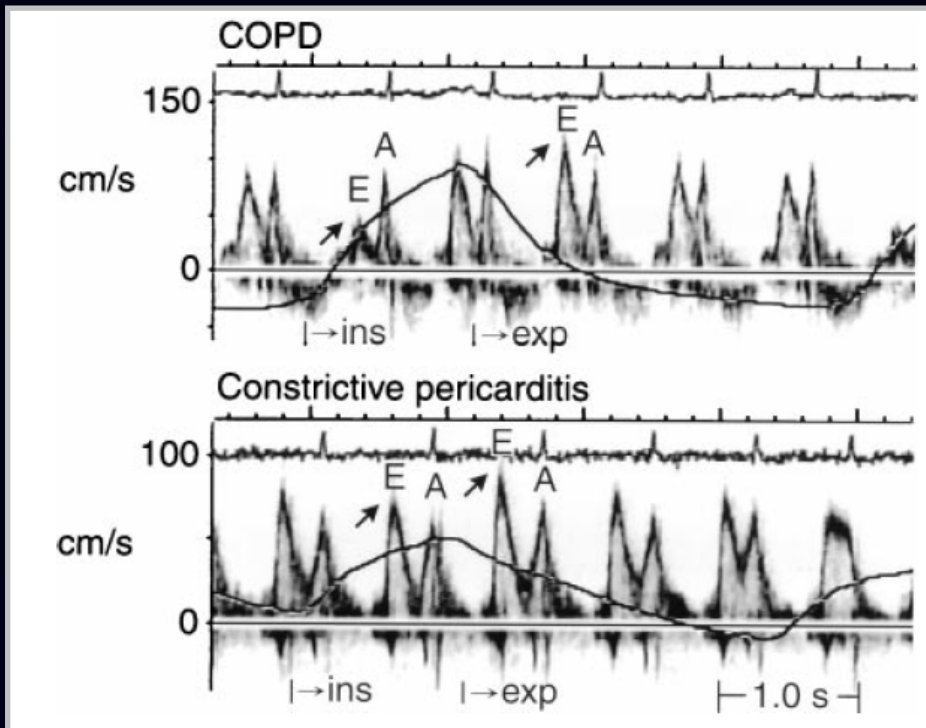
Constrictive Pericarditis



Respiratory Variation of SVC Flow

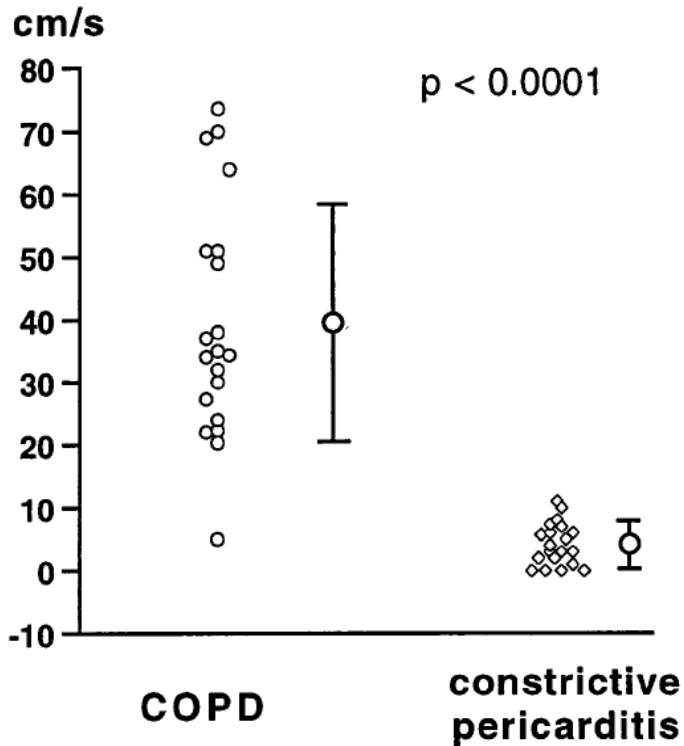
- **Markedly** increase in forward flow with inspiration
 - Chronic obstructive lung disease
- **Minimal** increase in forward flow with inspiration
 - Constrictive pericarditis

Respiratory Variation of SVC Flow

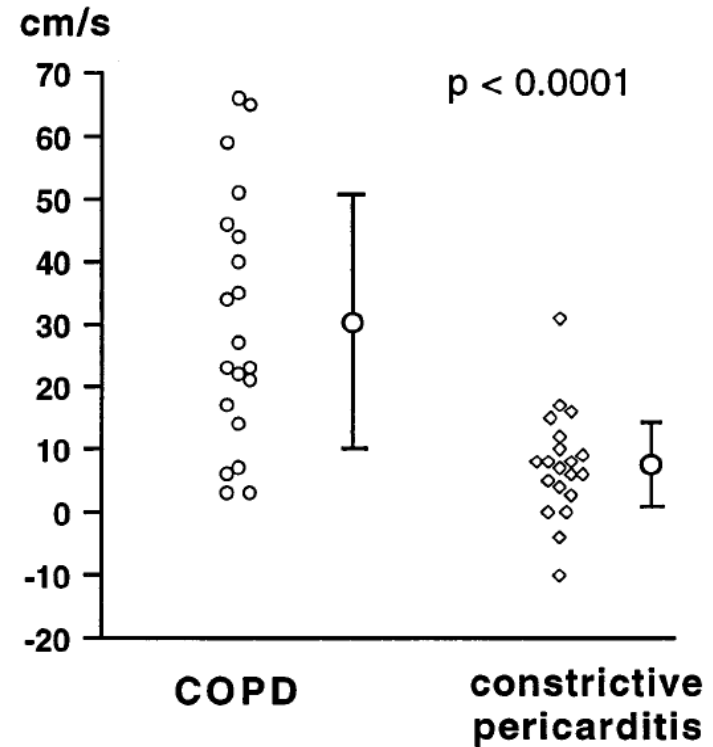


Respiratory Variation of SVC Flow

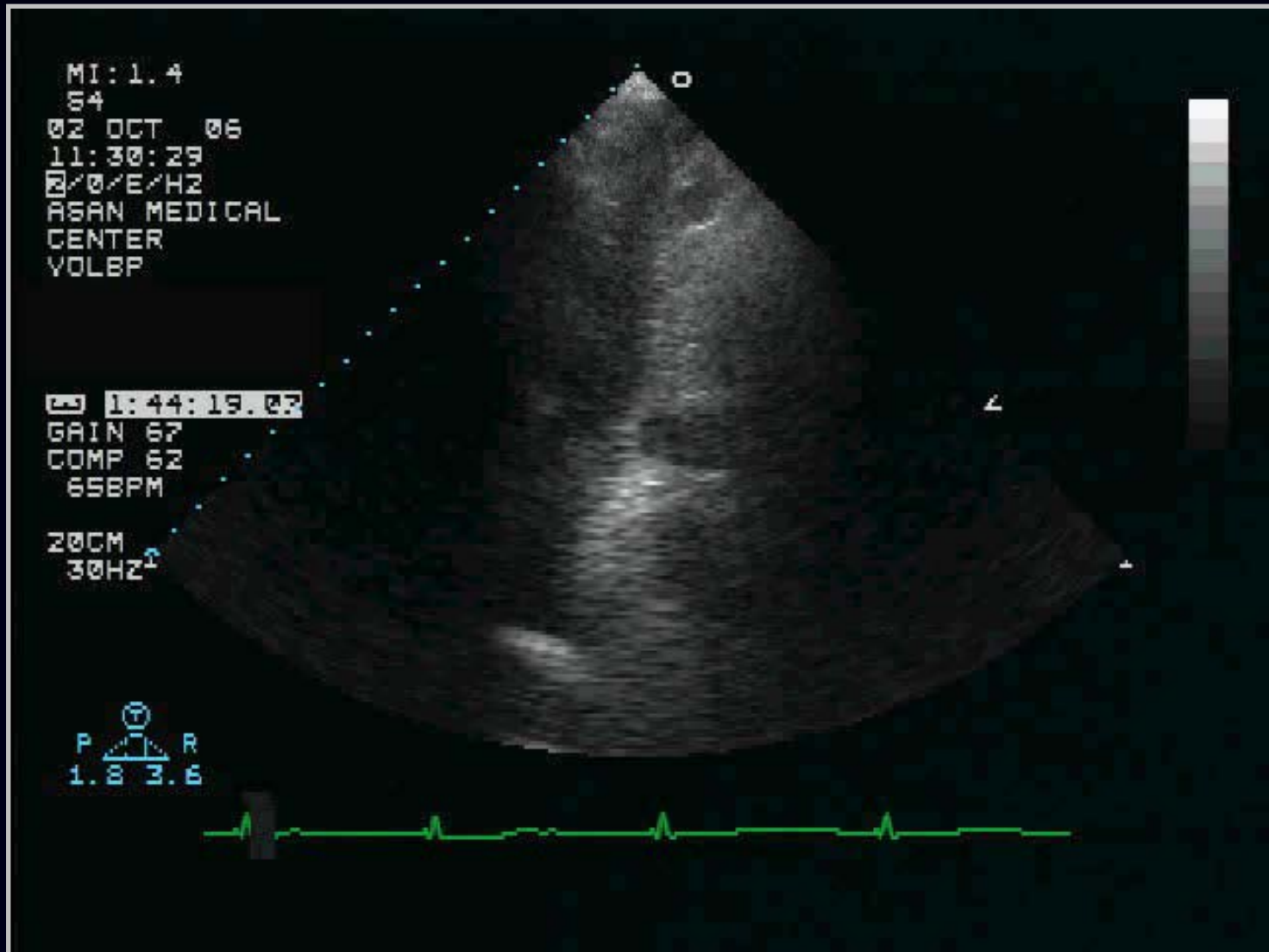
inspiratory - expiratory
SVC systolic forward flow velocity



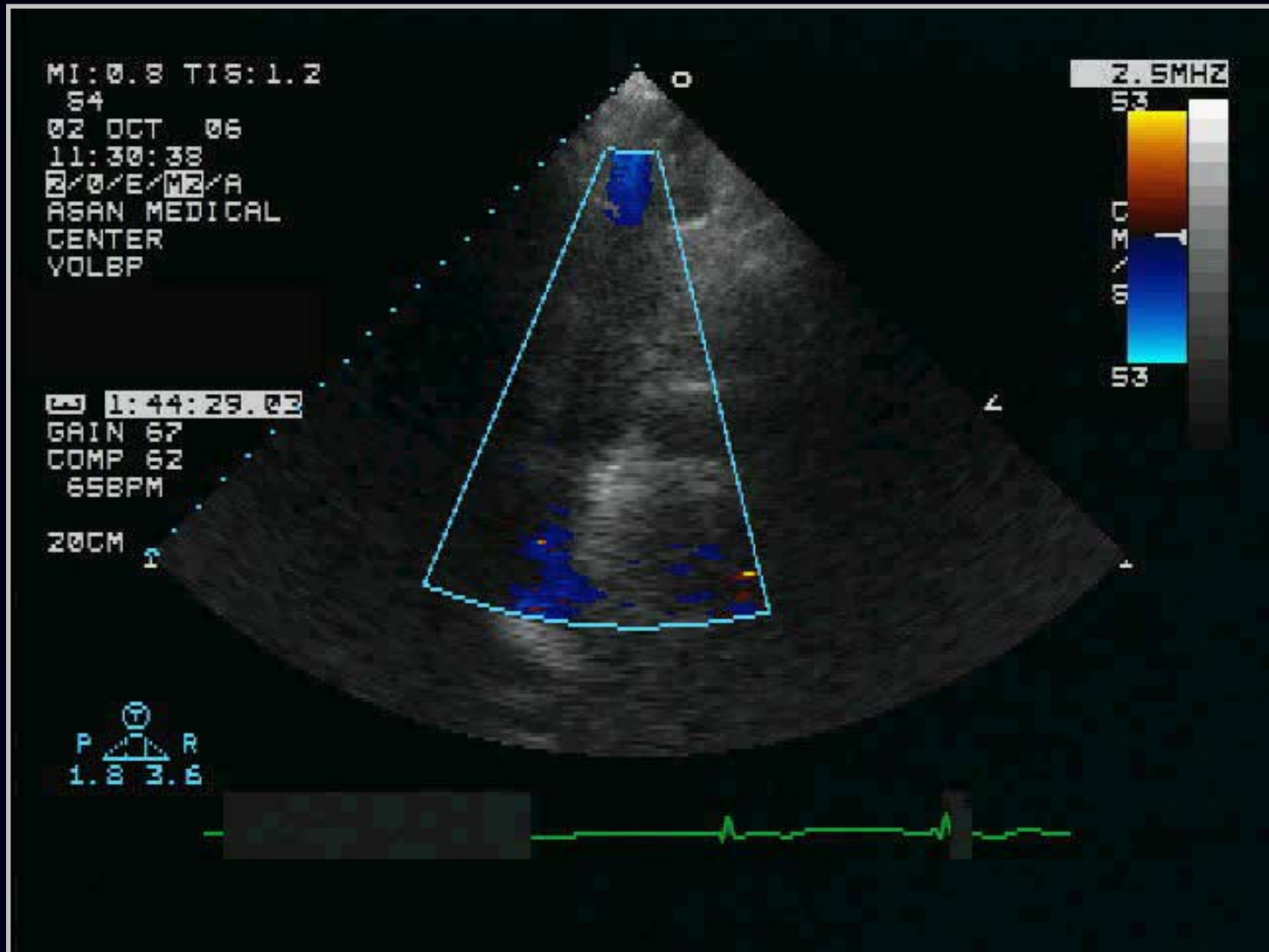
inspiratory - expiratory
SVC diastolic forward flow velocity



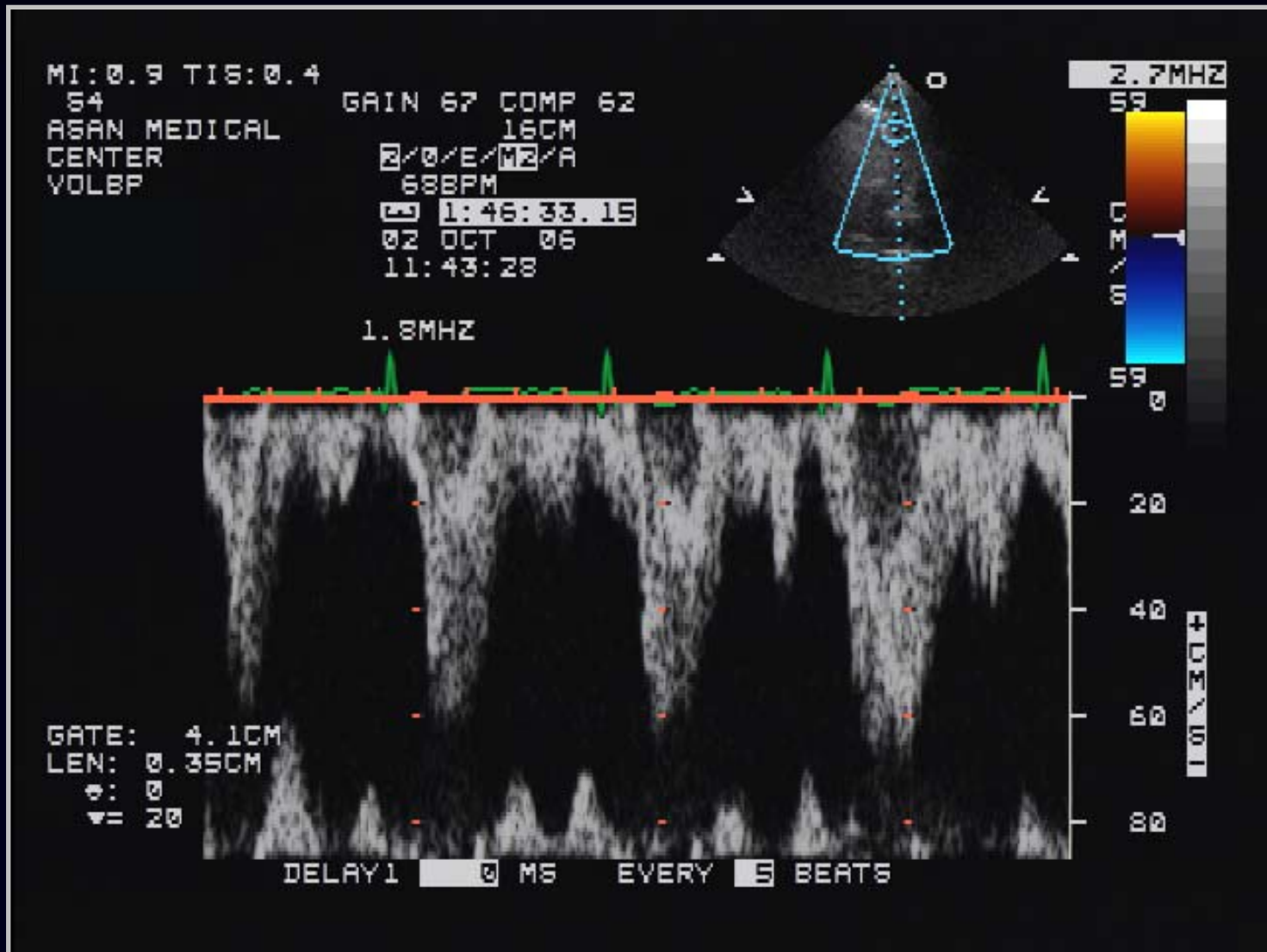
Normal SVC flow



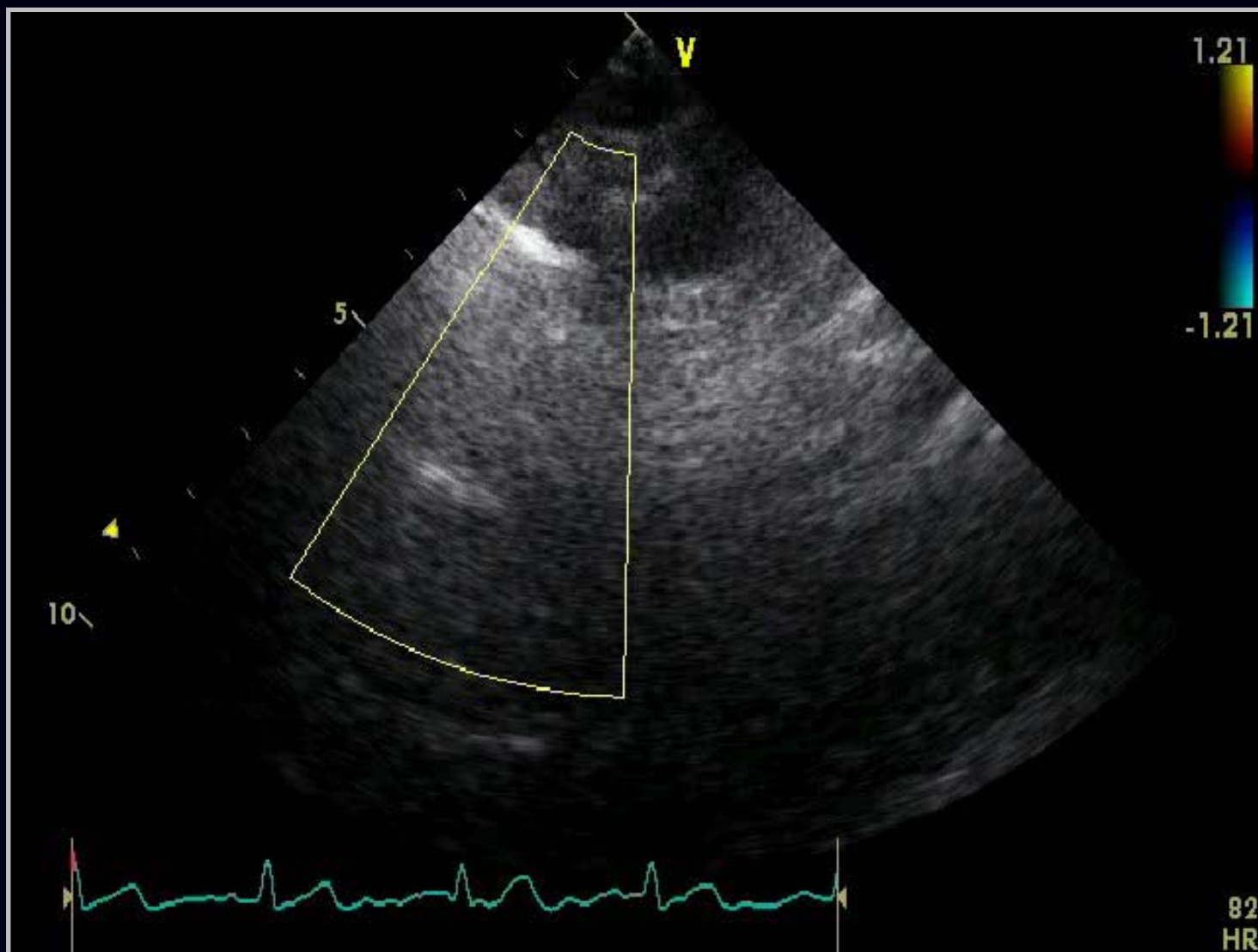
Normal SVC flow



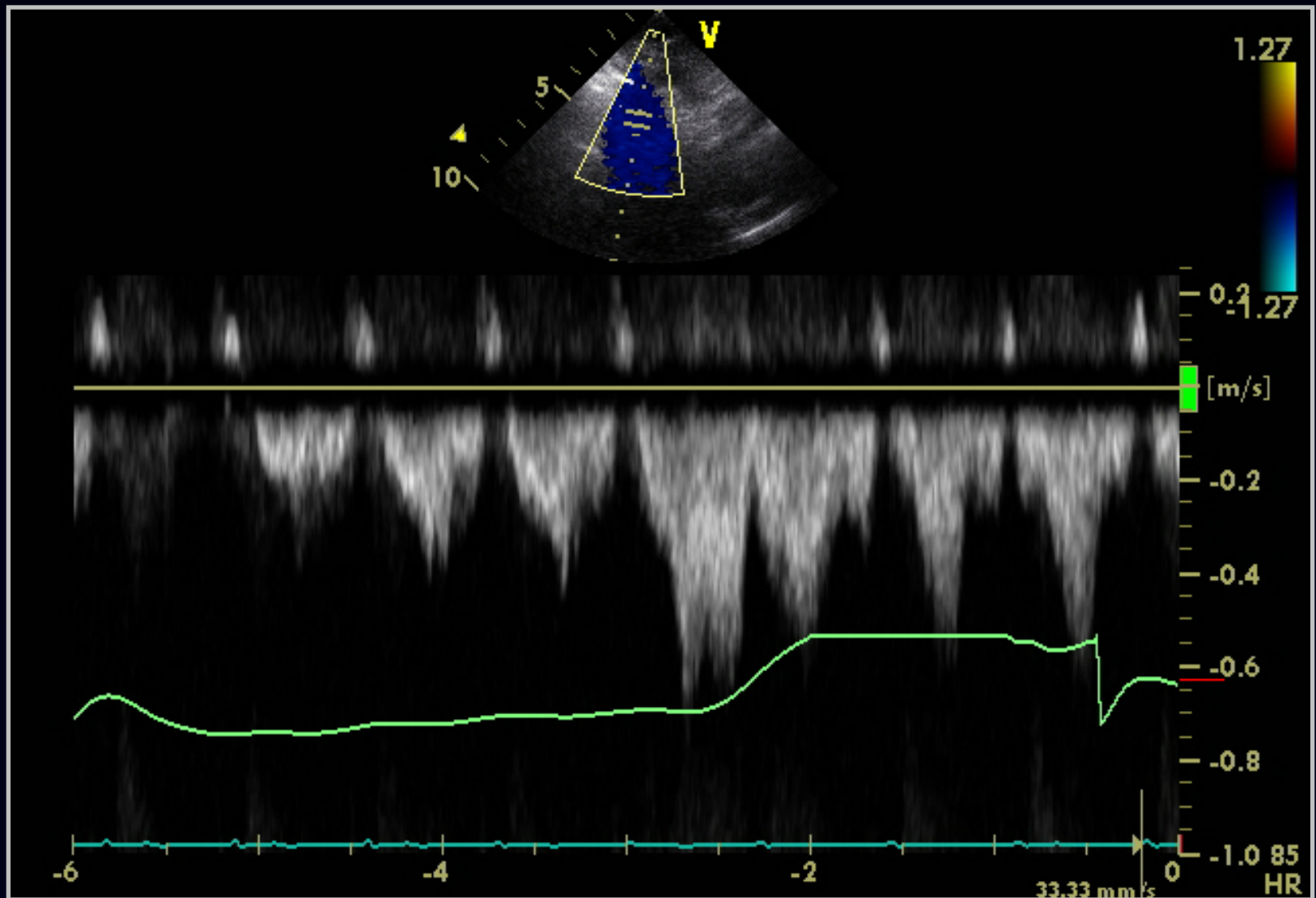
Normal SVC flow



COPD patient



COPD patient



Thank you for your attention.



Mont-Saint-Michel