# Pericardial Tamponade

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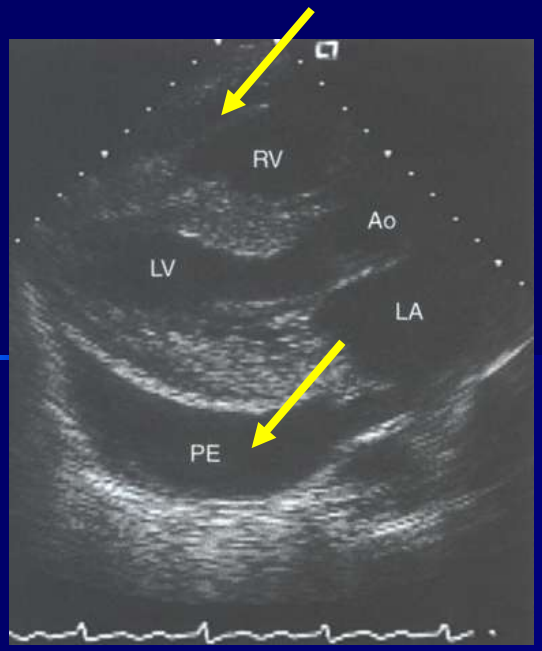
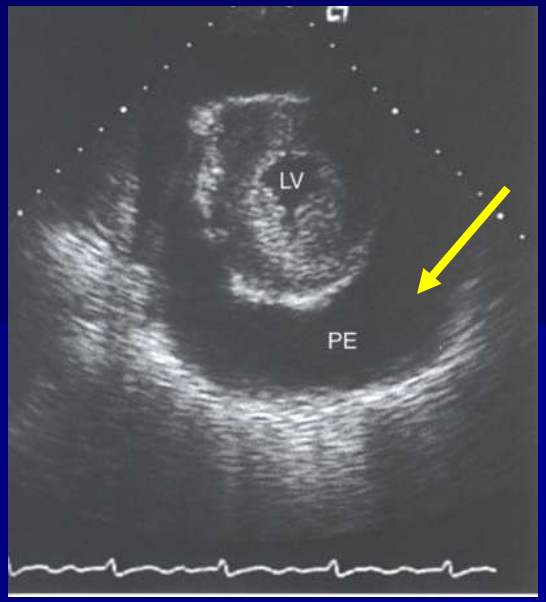
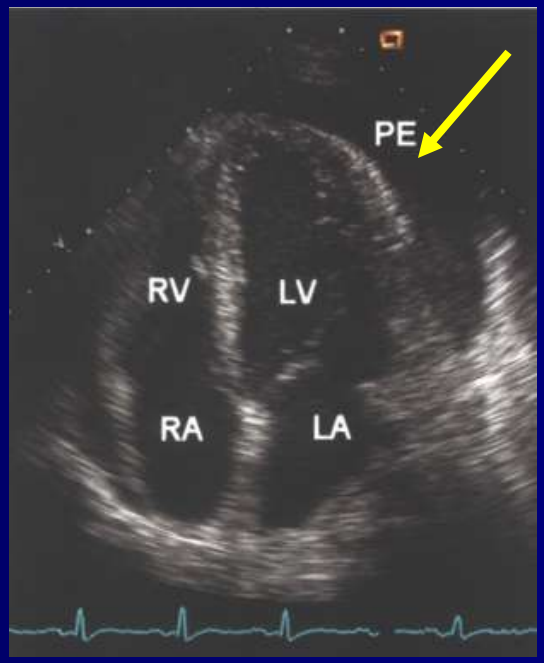
# Diagnosis of pericardial effusion

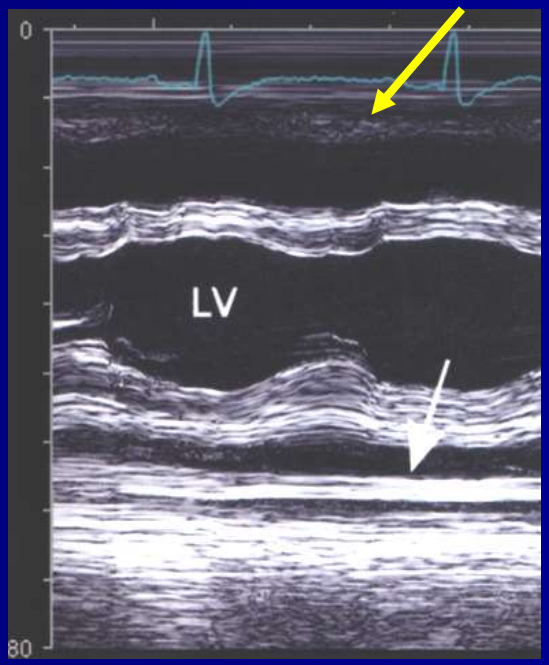
# Diagnosis of pericardial effusion

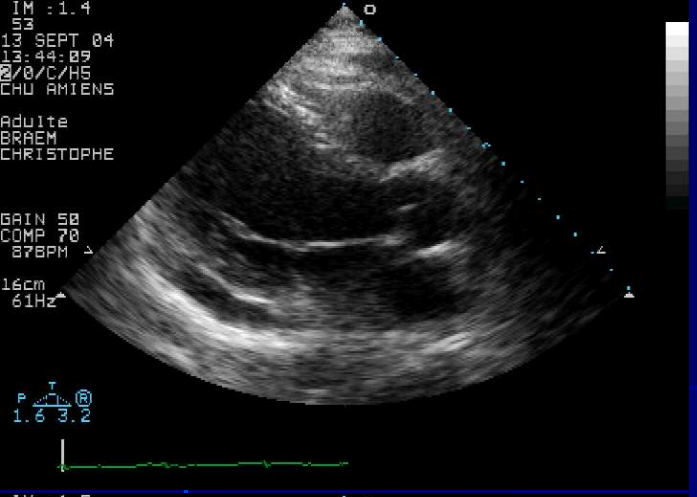
- Echolucent space adjacent to cardiac structures.
- Diffuse and symmetric in absence of pericardial disease or surgery (posterior and anterior)
- Swinging heart
- M-mode : flat posterior pericardial echo reflection and moving epicardial echo with separation between the two in both systole and diastole

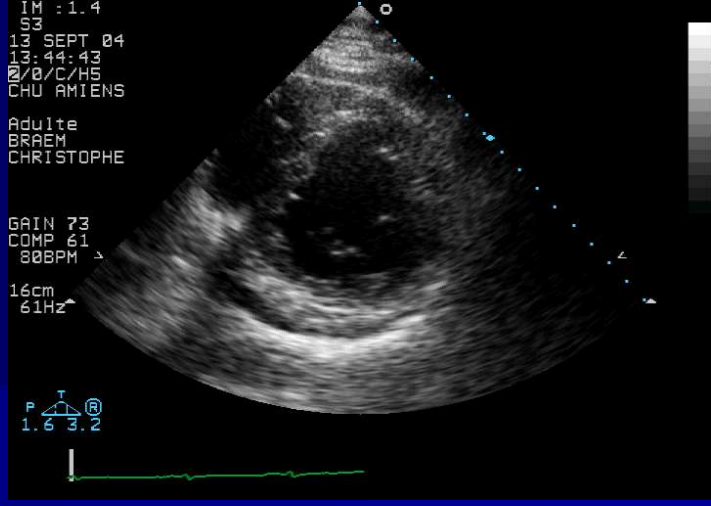

RV
Ao
LV
LA
PE

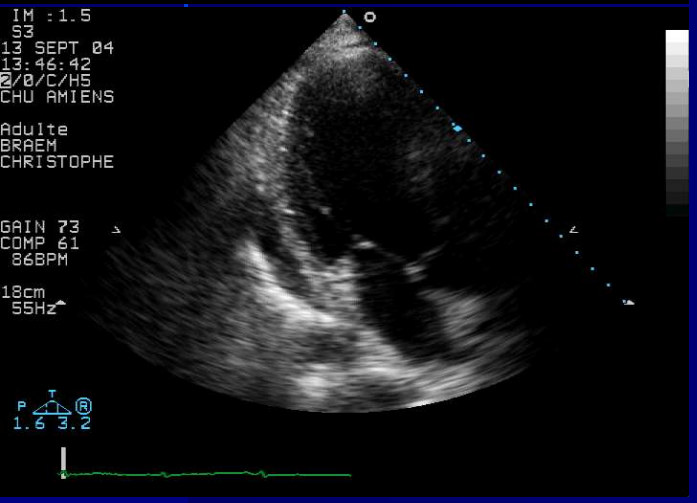

LV
PE

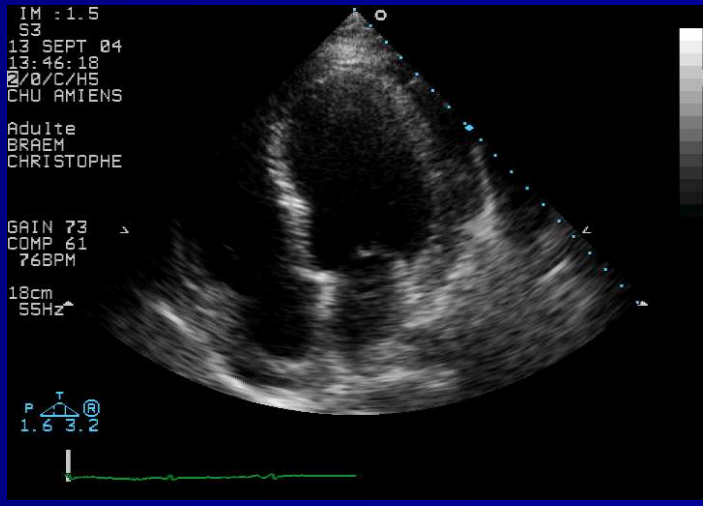

PE
RV
LV
RA
LA


0
LV
80



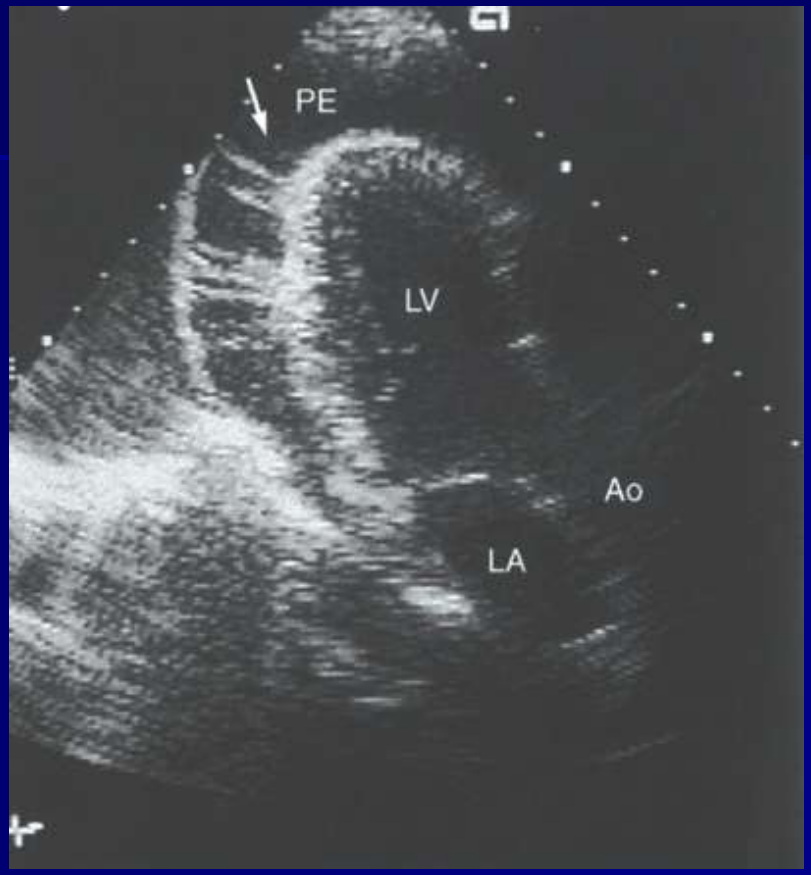




# Diagnosis of pericardial effusion

**TABLE 10–1**

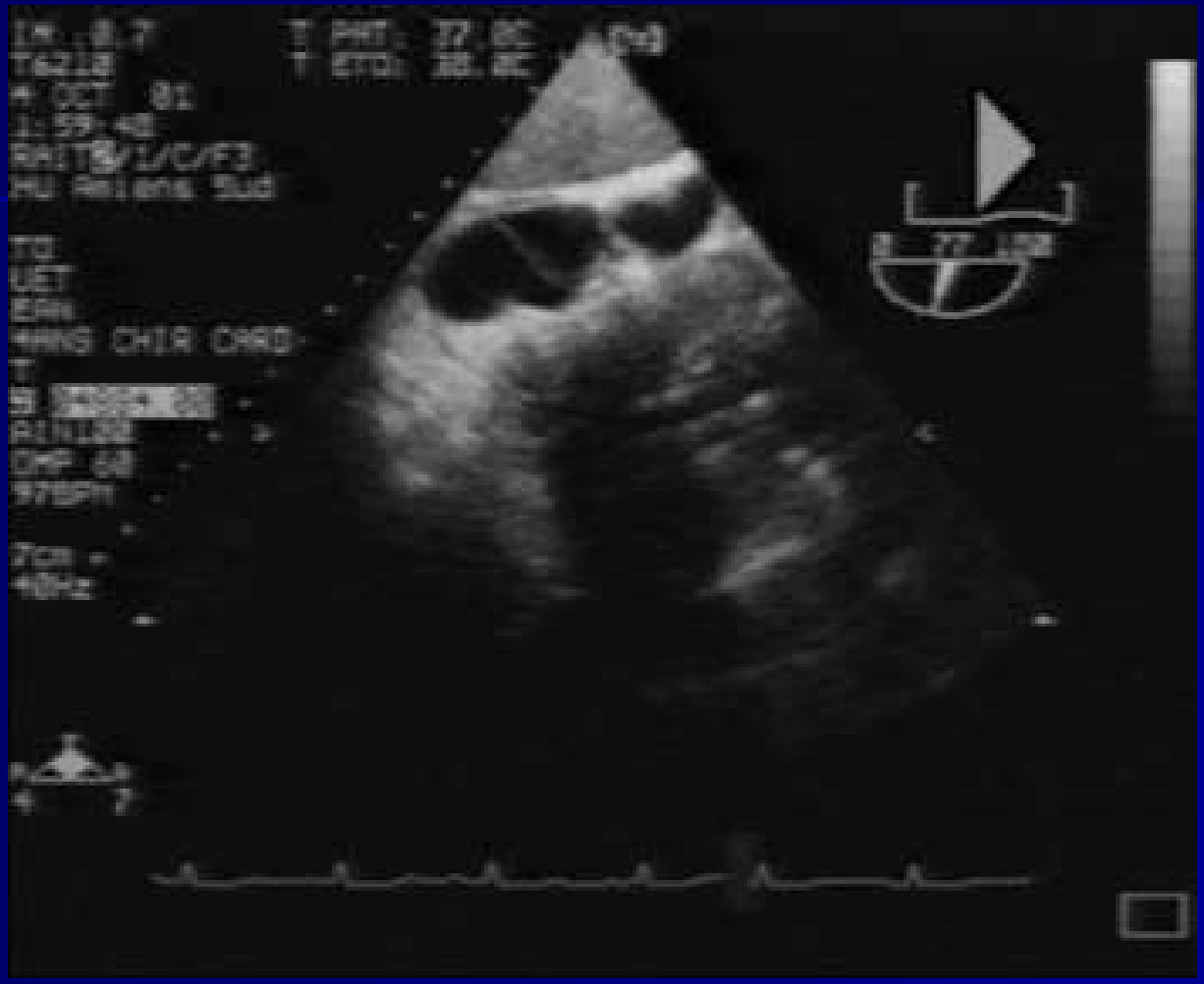
## Differential Diagnosis of Pericardial Effusion/Pericarditis

I. Infections
   A. Postviral pericarditis
   B. Bacterial
   C. Tuberculosis
II. Malignant
   A. Metastatic disease (e.g., lymphoma, melanoma)
   B. Direct extension (lung carcinoma, breast carcinoma)
   C. Primary cardiac malignancy
III. "Inflammatory"
   A. Post-myocardial infarction (Dressler's syndrome)
   B. Uremia
   C. Collagen-vascular disease
   D. Postcardiac surgery
IV. Intracardiac-pericardial communications
   A. Blunt or penetrating chest trauma
   B. Postcatheter procedures (electrophysiology studies, percutaneous coronary intervention, valvuloplasty)
   C. Left ventricular rupture post-myocardial infarction




Fibrinous strandings with adhesions between visceral and parietal pericardia in chronic effusion

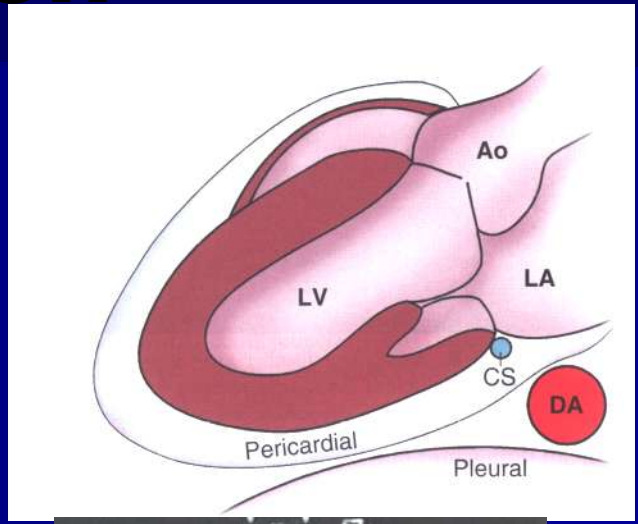

DISTANCE

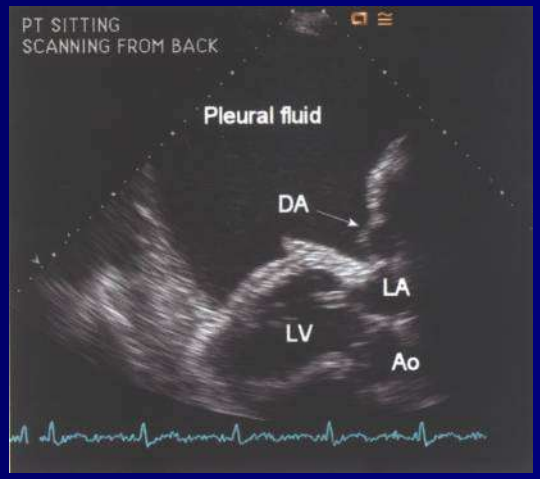


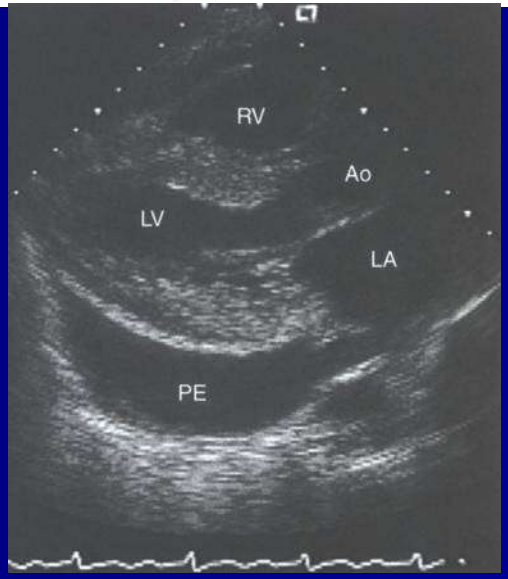
# Pleural effusion and pericardial effusion

Pleural effusion extend posterolateral to the descending aorta

Pericardial effusion track anterior to the descending aorta

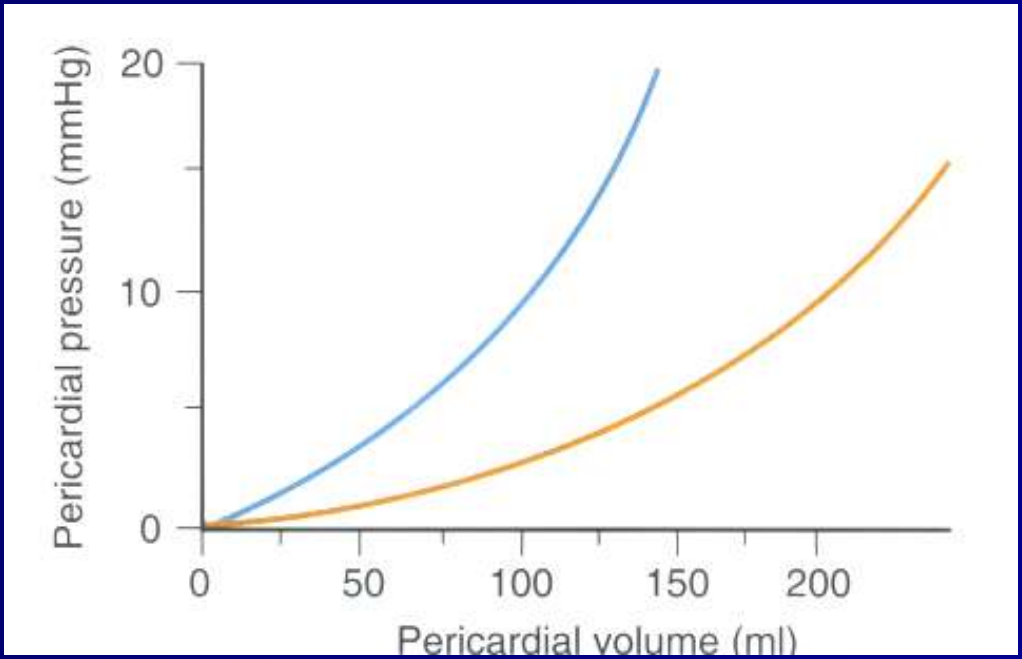


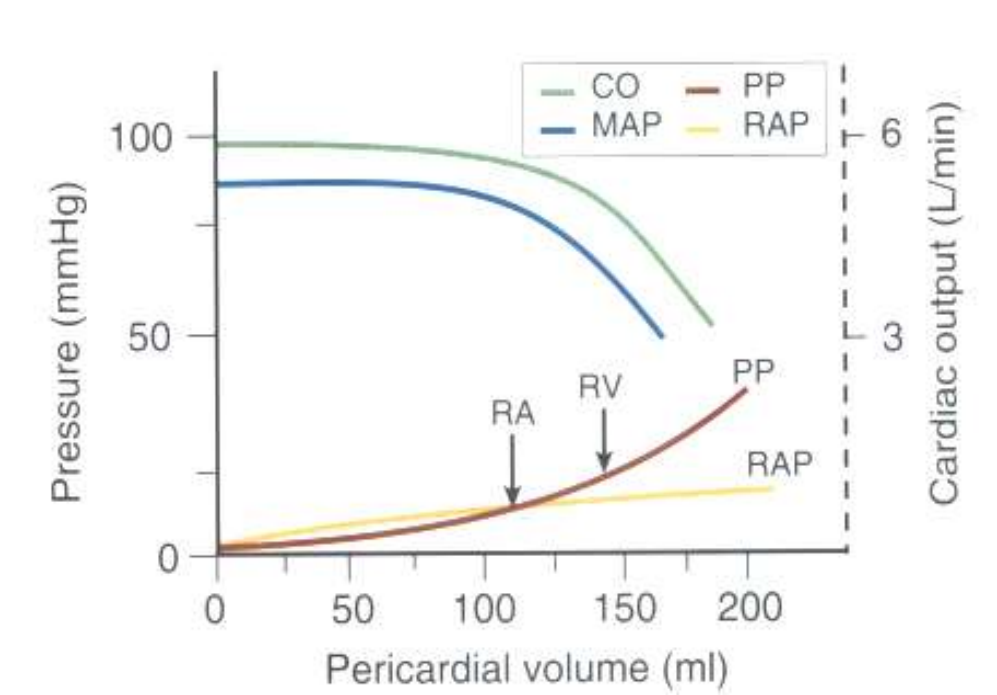



# Tamponade : diagnosis

# Acute and chronic pericardial effusion



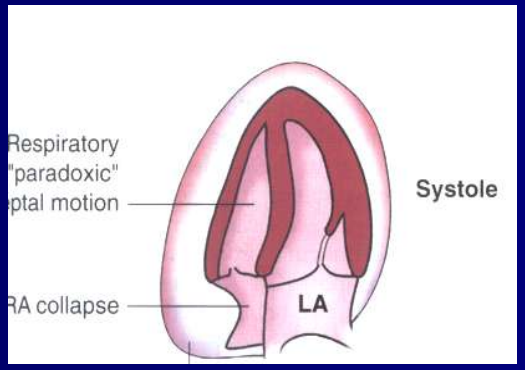
# Pathophysiology

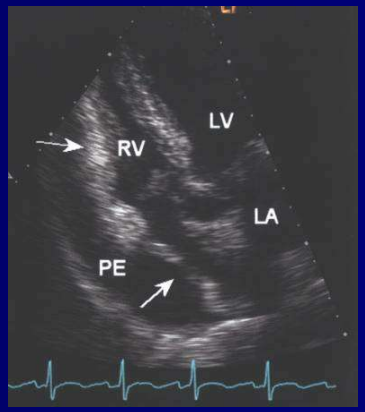


# Pericardial Tamponade

- Right atrial late diastolic and systolic collapse
- Right ventricular early diastolic collapse
- Left atrial collapse (25%)
- Left ventricular collapse
- Reciprocal respiratory changes in RV and LV volumes
- Reciprocal respiratory changes in RV and LV filling
- Inferior vena cava plethora

# Right atrial systolic collapse



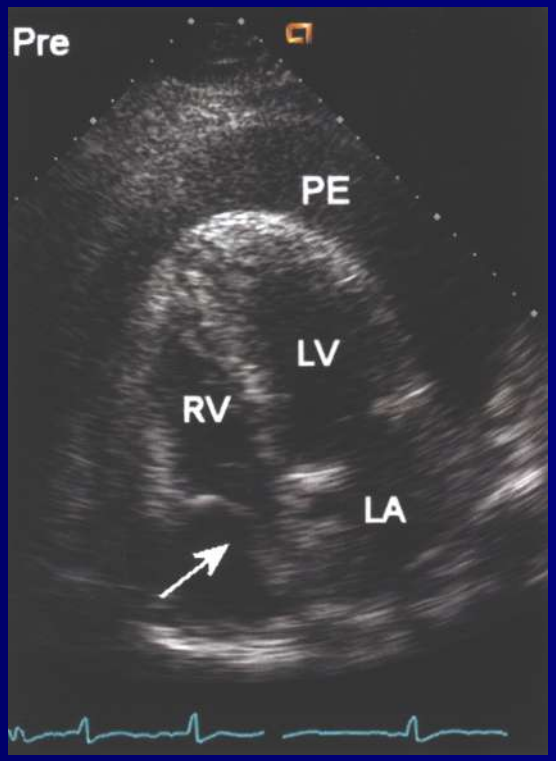



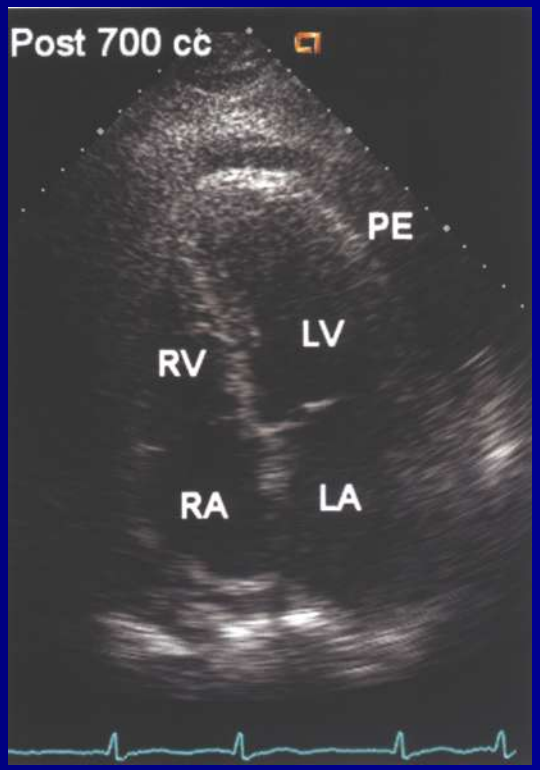

Tamponade : inversion for greater than 1/3 of systole :

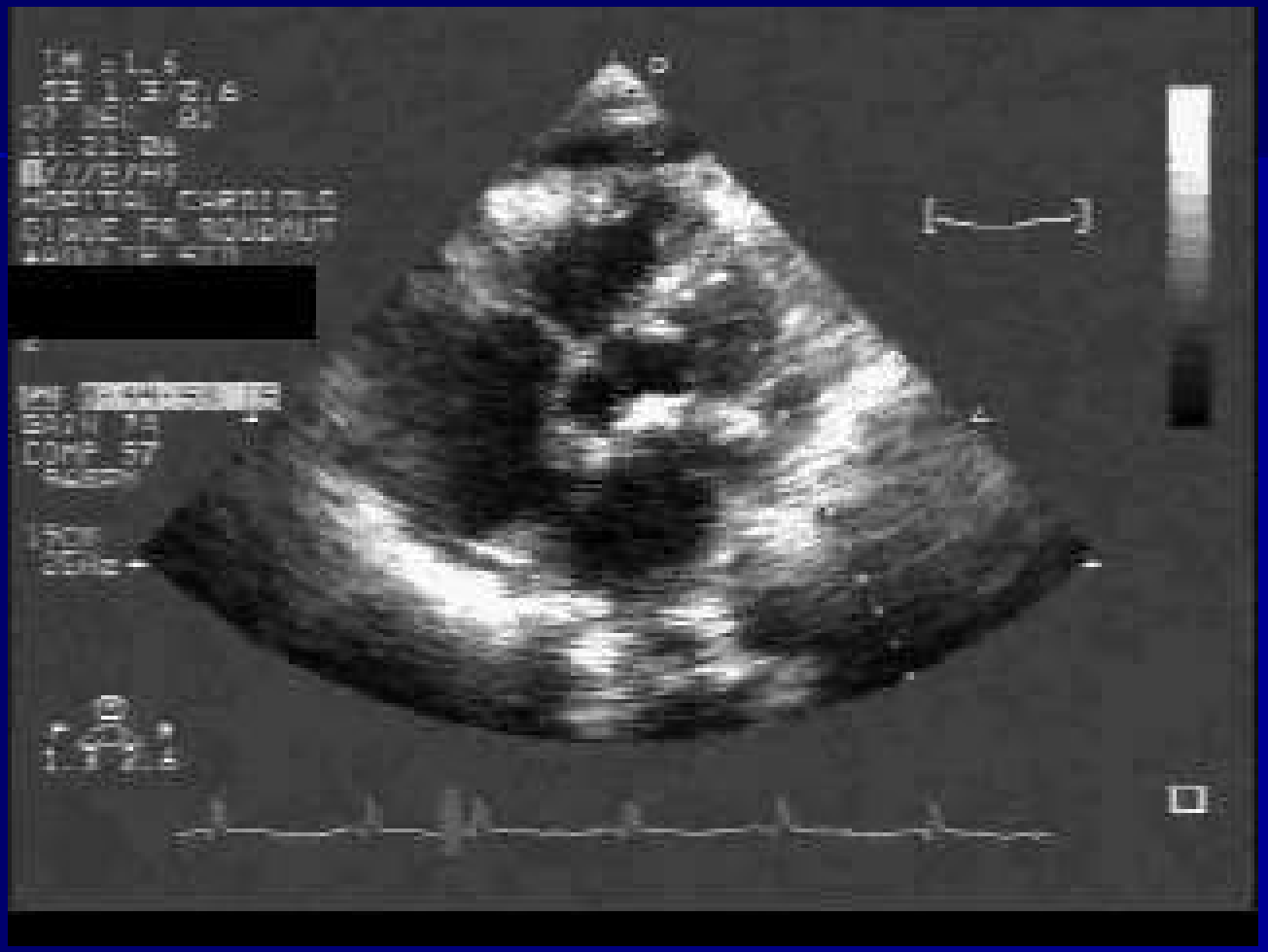
Sensitivity 94%

Spécificity 100%

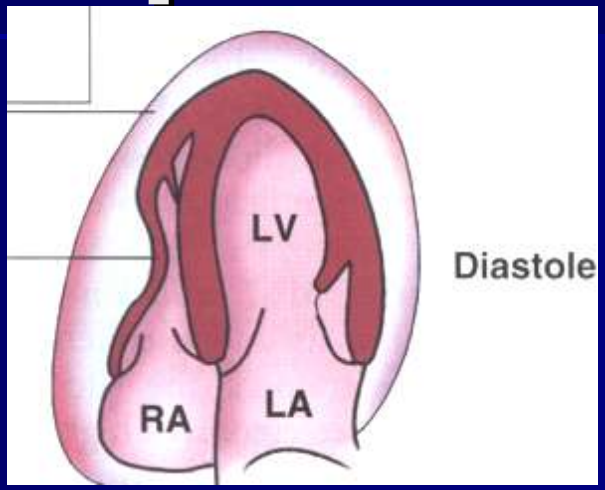
# Right atrial systolic collapse

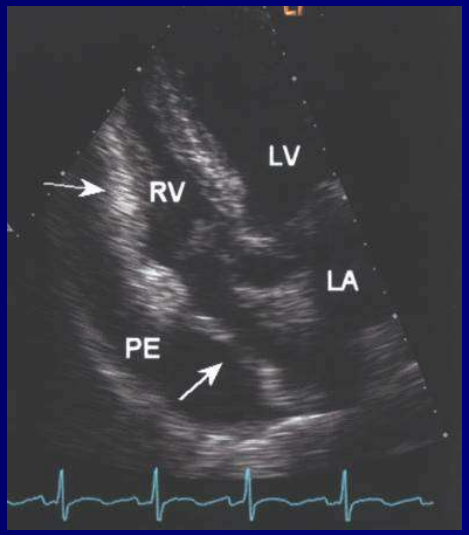




# Right ventricular diastolic collapse

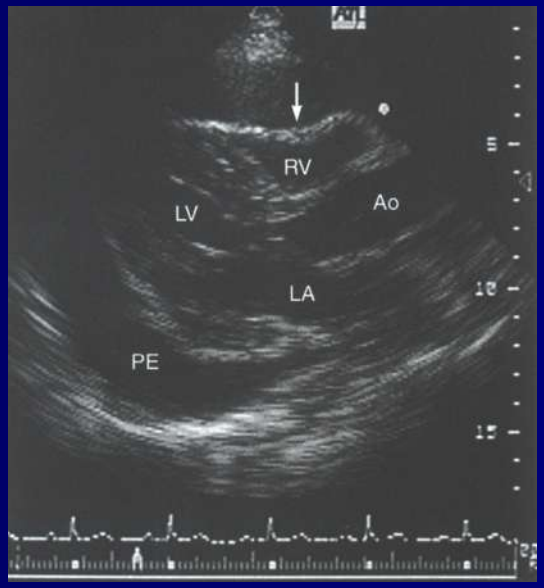


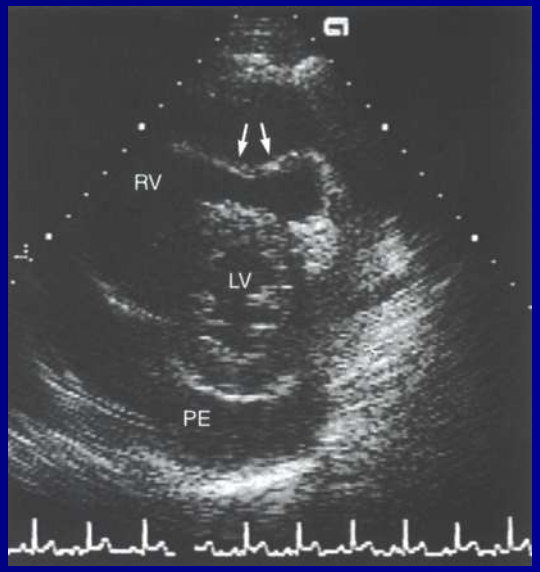



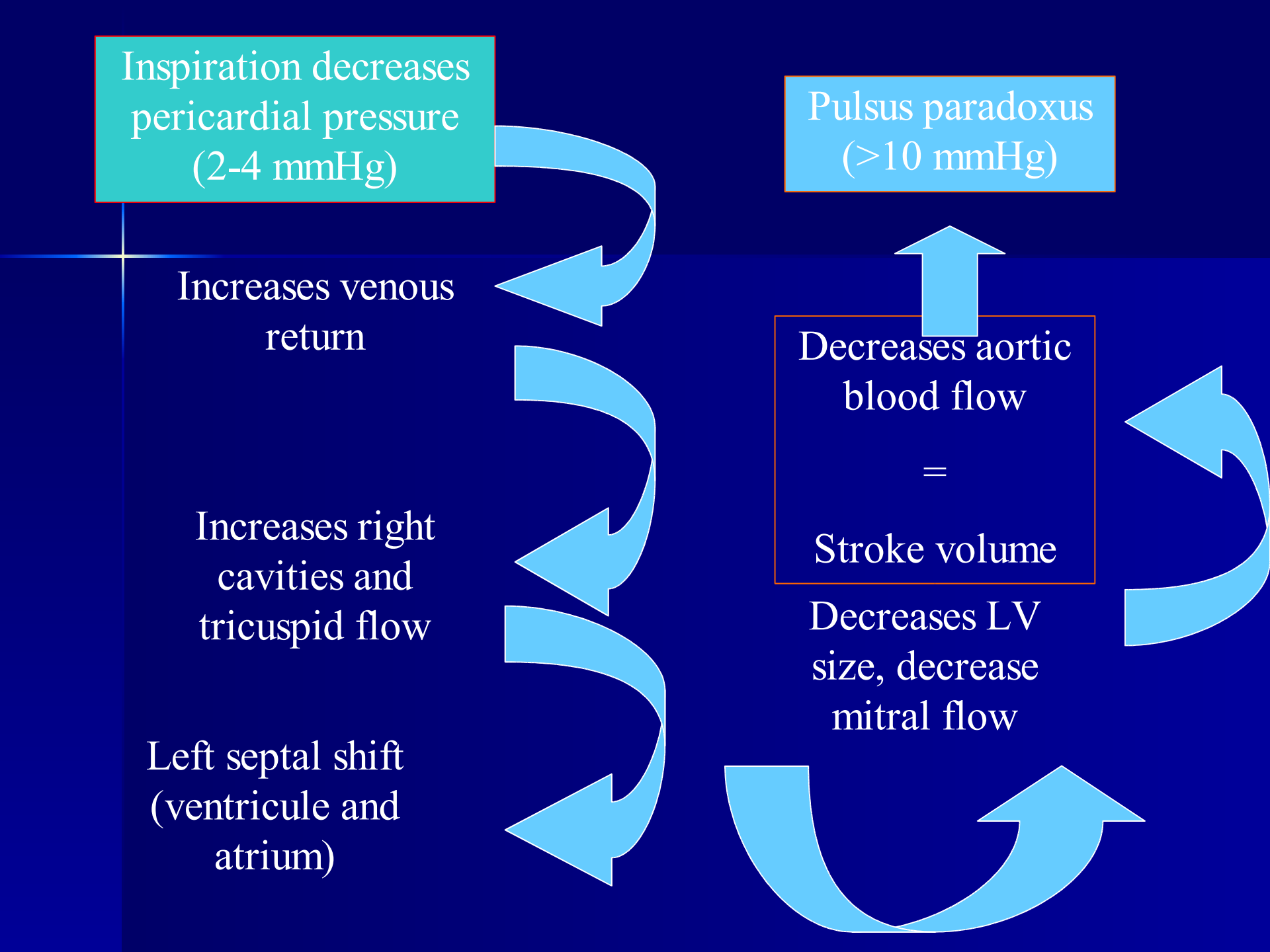

Sensitivity 60-90%

Specificity 85-100%

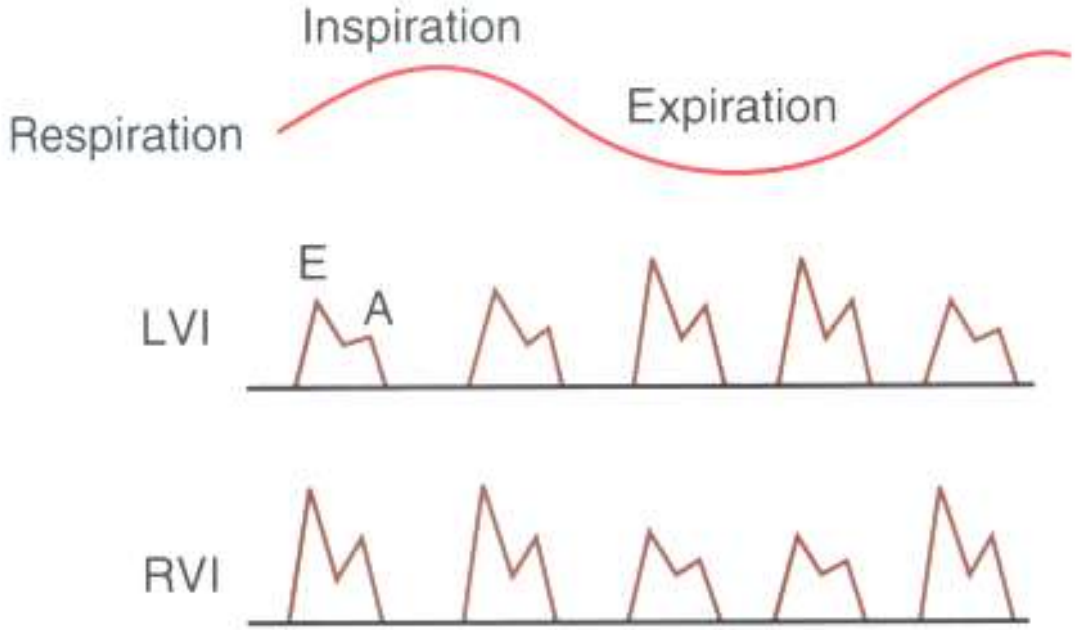
# Right ventricular diastolic collapse




Inspiration decreases pericardial pressure (2-4 mmHg)
Pulsus paradoxus (>10 mmHg)
Increases venous return
Decreases aortic blood flow
=
Stroke volume
Increases right cavities and tricuspid flow
Decreases LV size, decrease mitral flow
Left septal shift (ventricule and atrium)

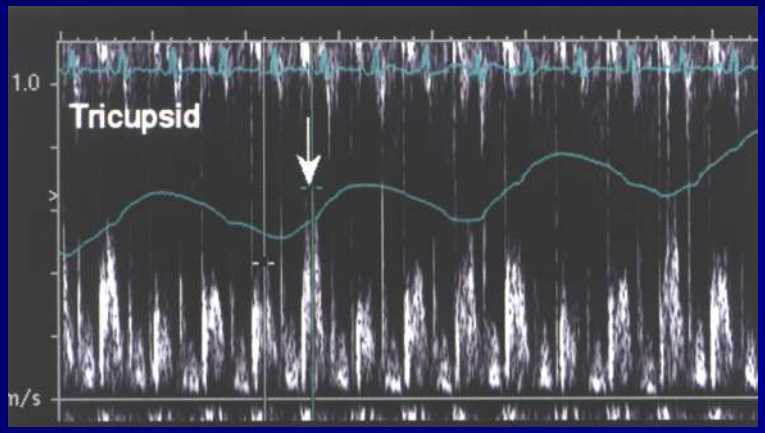
# Reciprocal respiratory changes in RV and LV filling

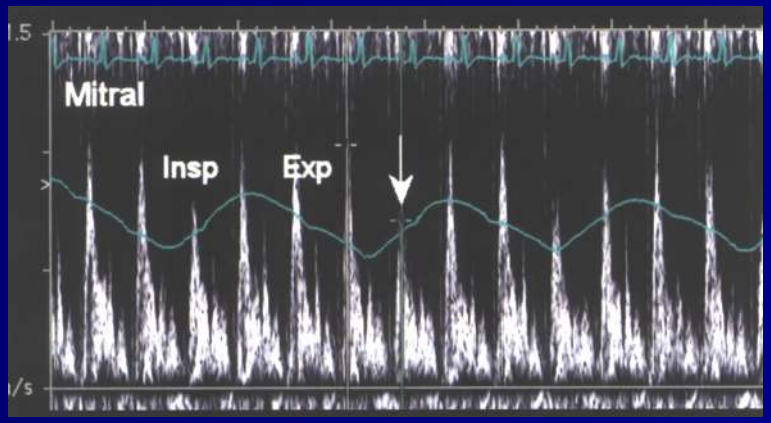



Negative pressure during inspiration increase venous return

Excessive respiratory Variations of tricuspid And mitral flow (>25%)

# Reciprocal respiratory changes in RV and LV filling

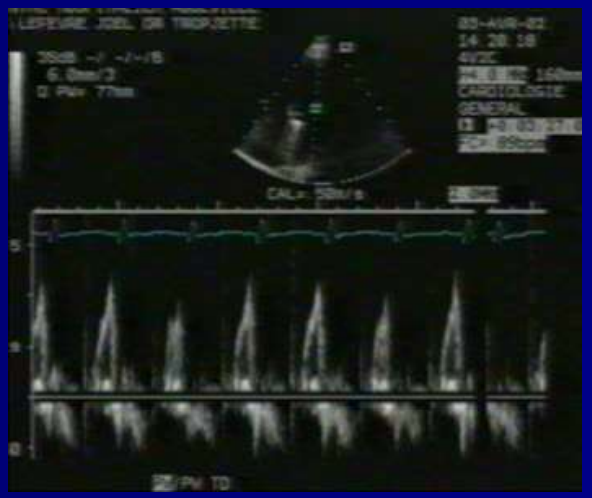


# Reciprocal respiratory changes in RV and LV volumes

# Reciprocal respiratory changes in RV and LV filling

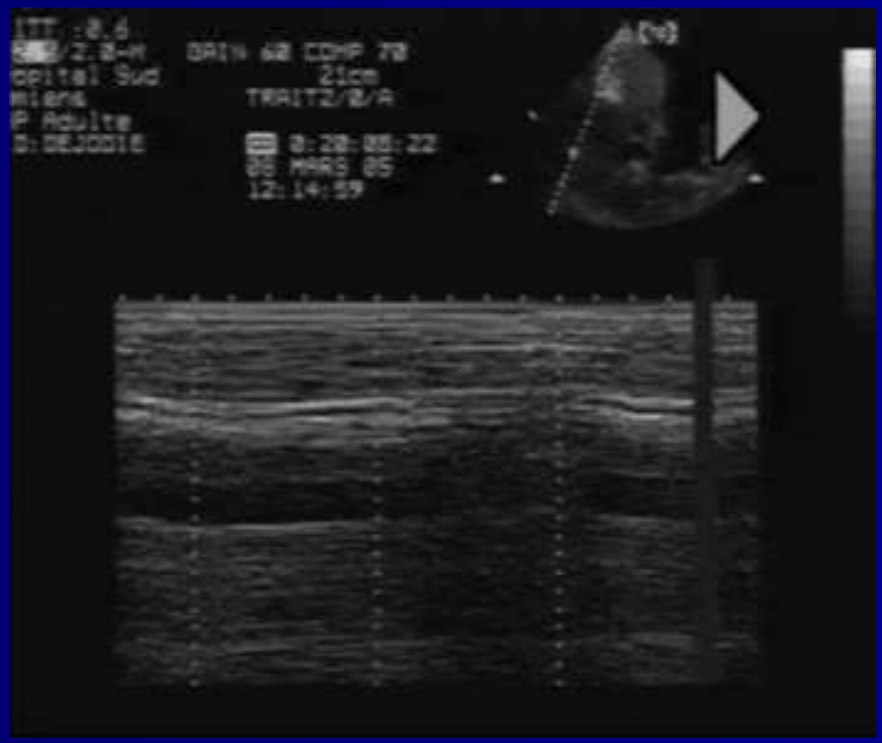
Tricuspid flow



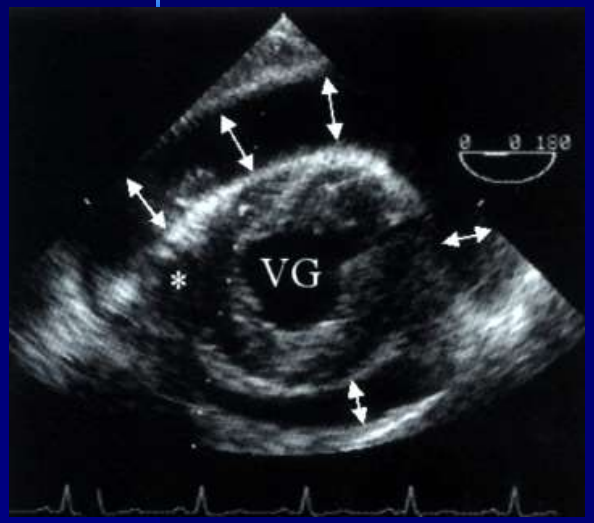
Mitral flow

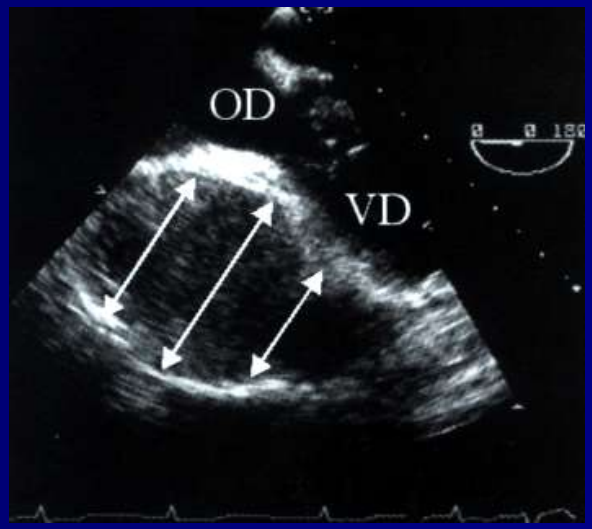
Aortic flow

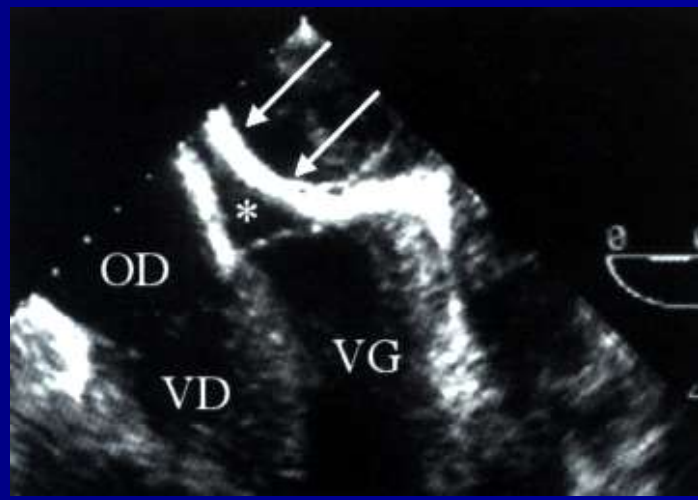
# Inferior vena cava plethora



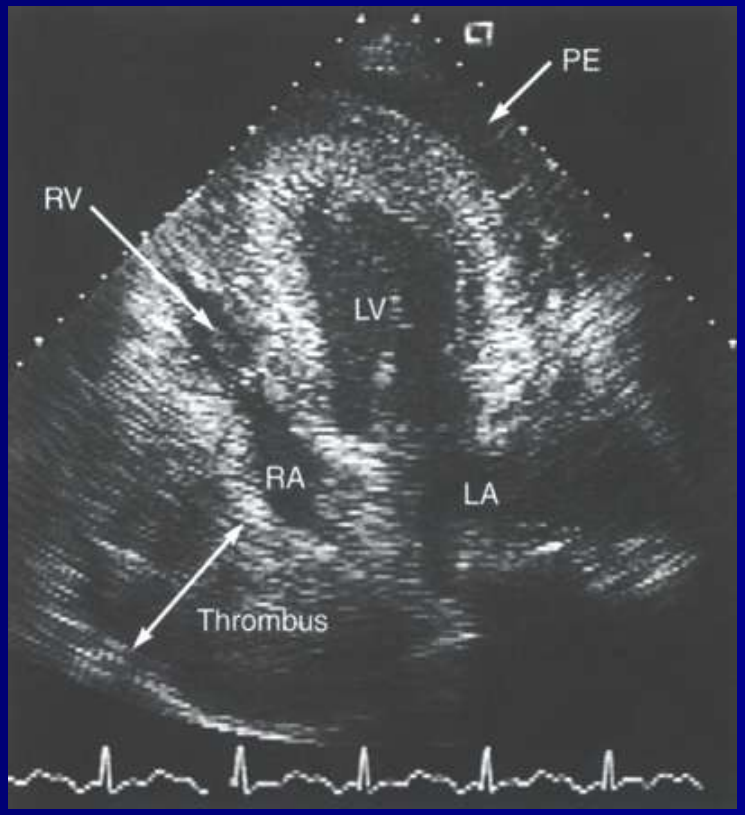
# Loculated effusion



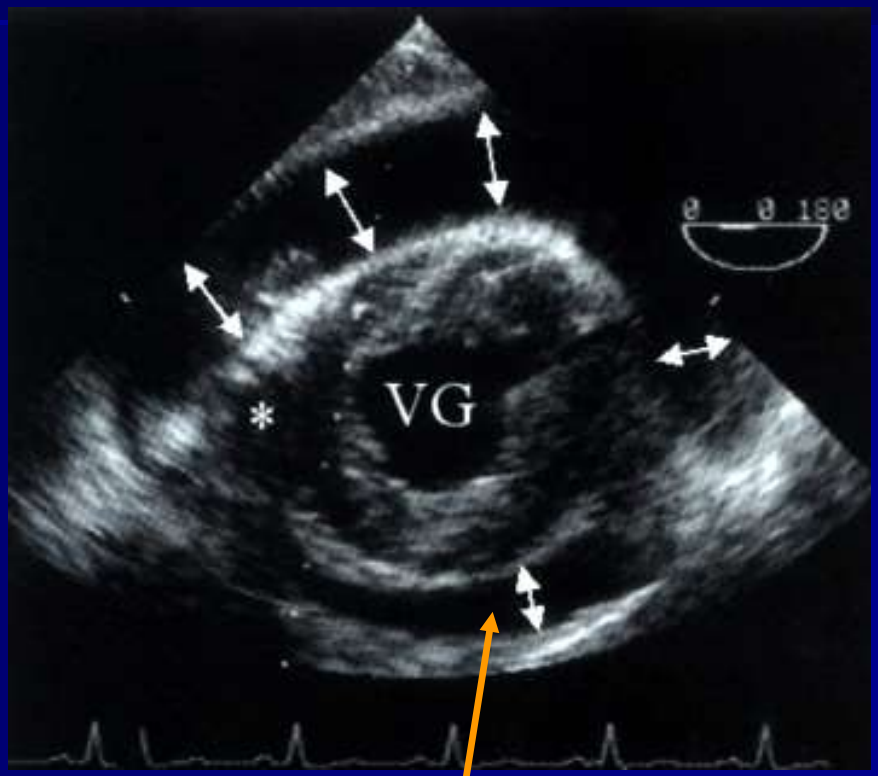



# Loculated effusion

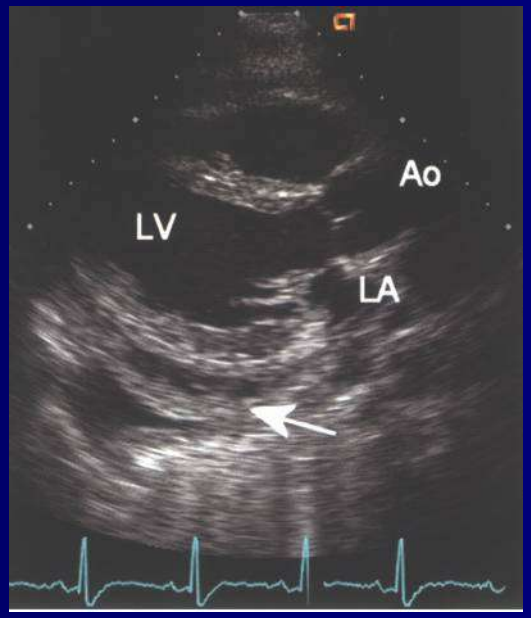


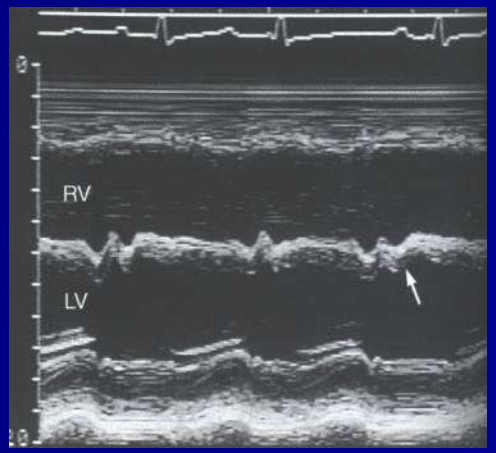
# Loculated Tamponade

# Treatment

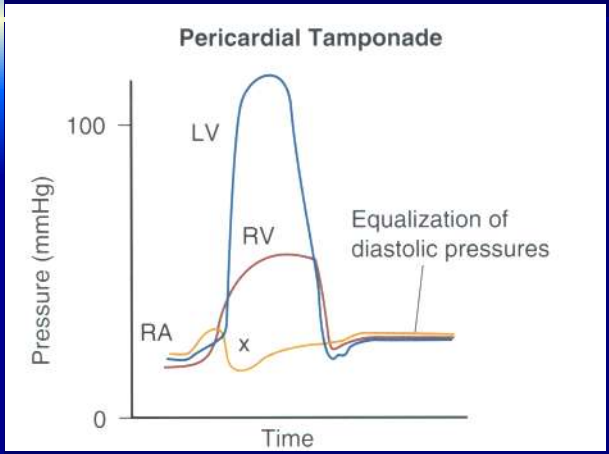


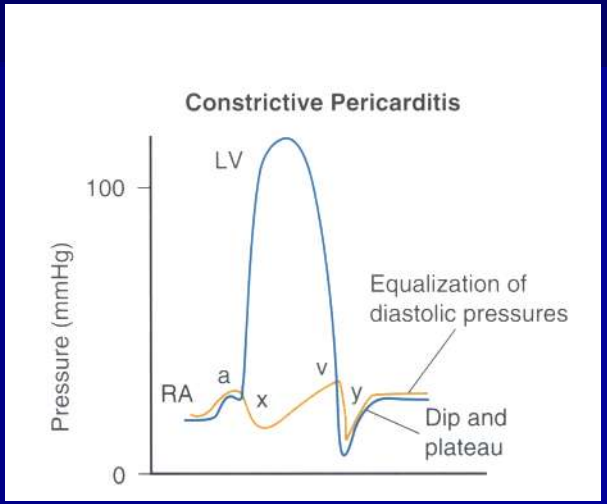
# Contrictive pericarditis

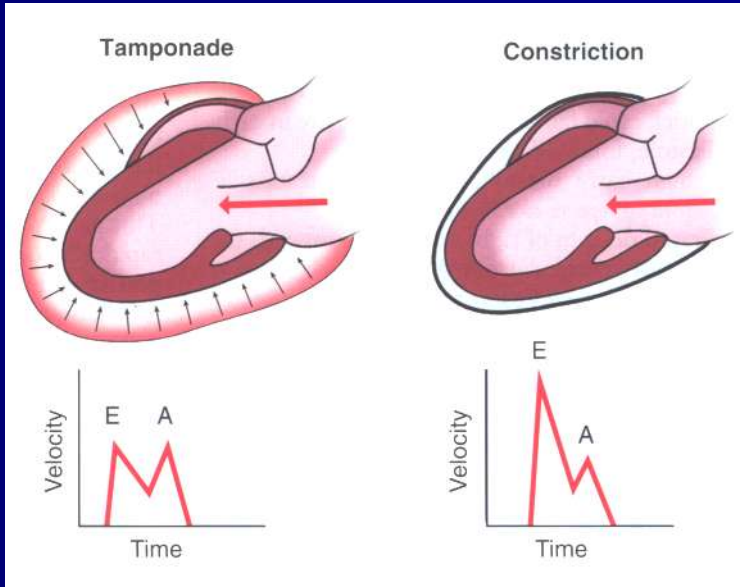


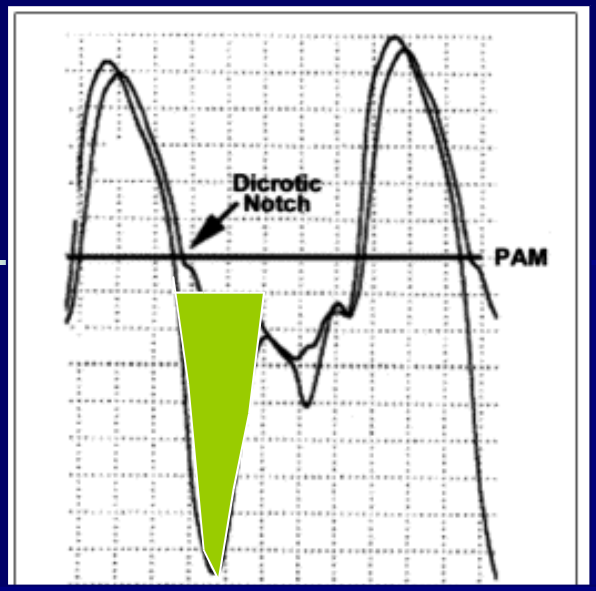



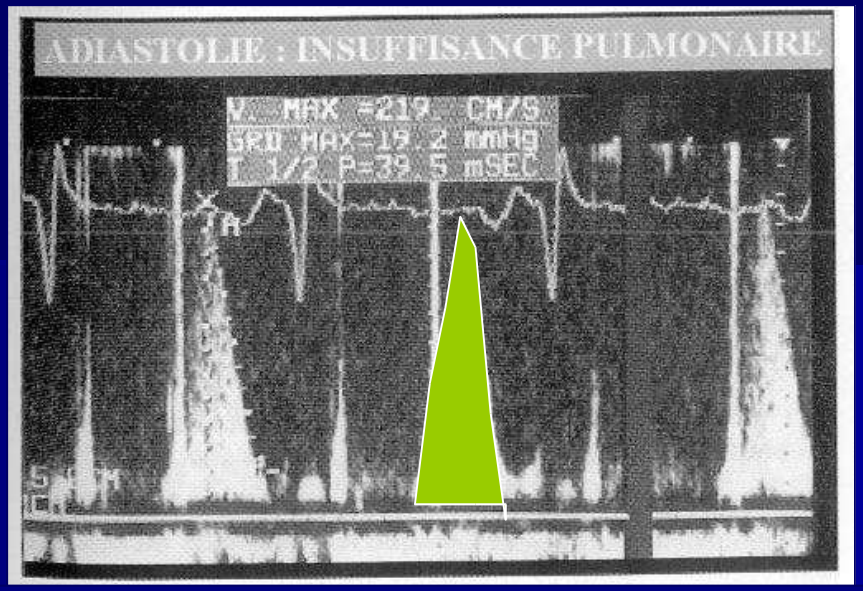
# Contrictive pericarditis



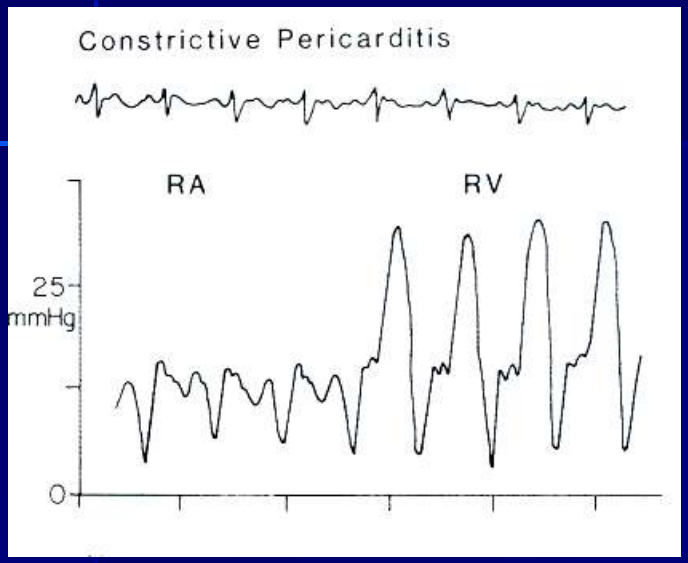



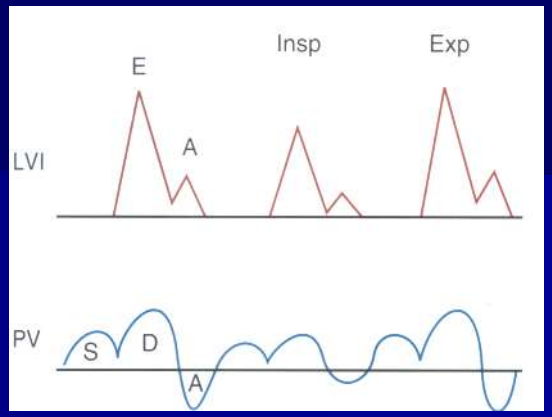


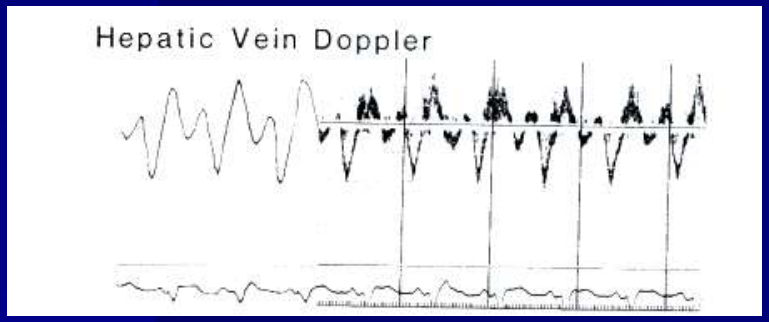



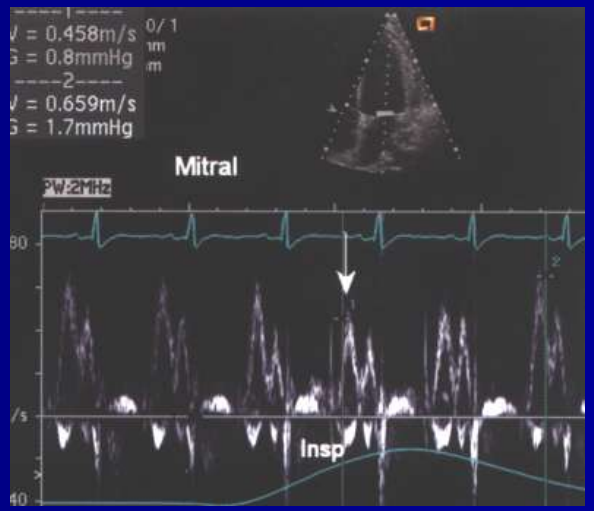

Pulmonary regurgitation

# Contrictive pericarditis



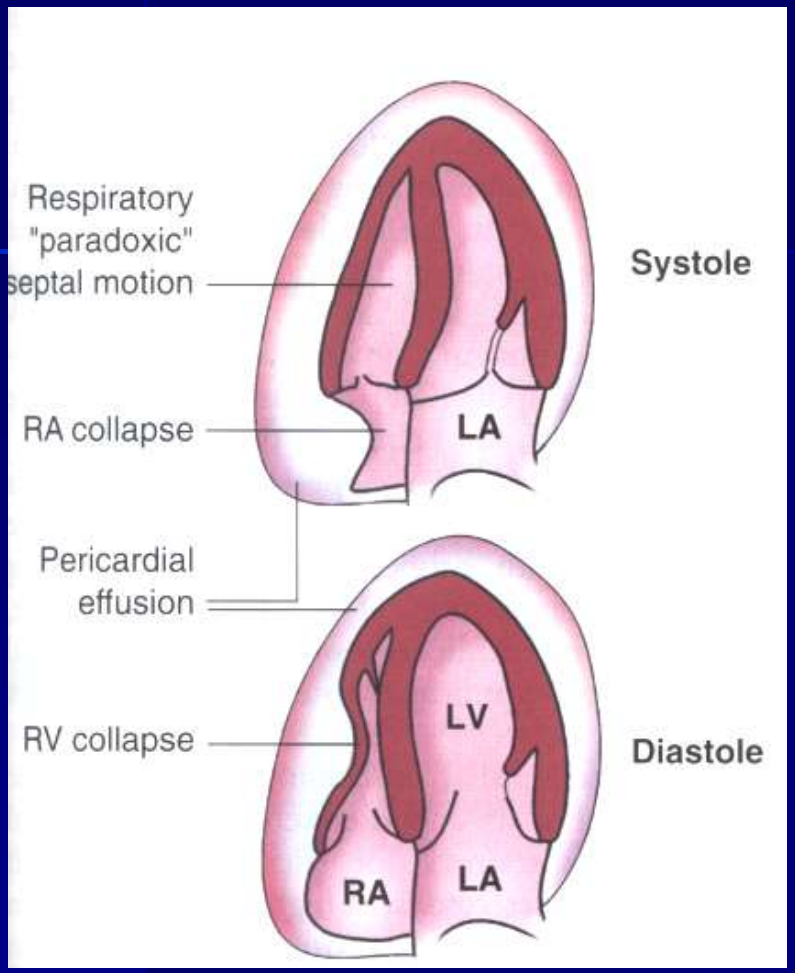



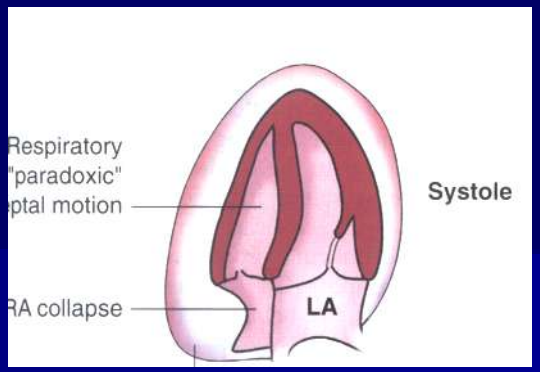



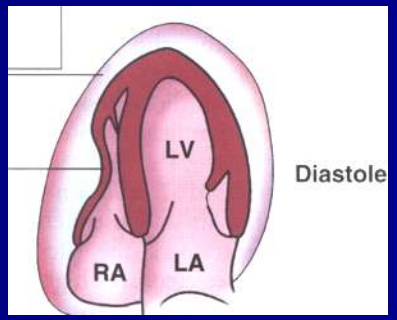

Left ventricular inflow shows reduced early diastolic filling with inspiration while pulmonary vein shows a prominent a wave and blunting of the systolic filling phase

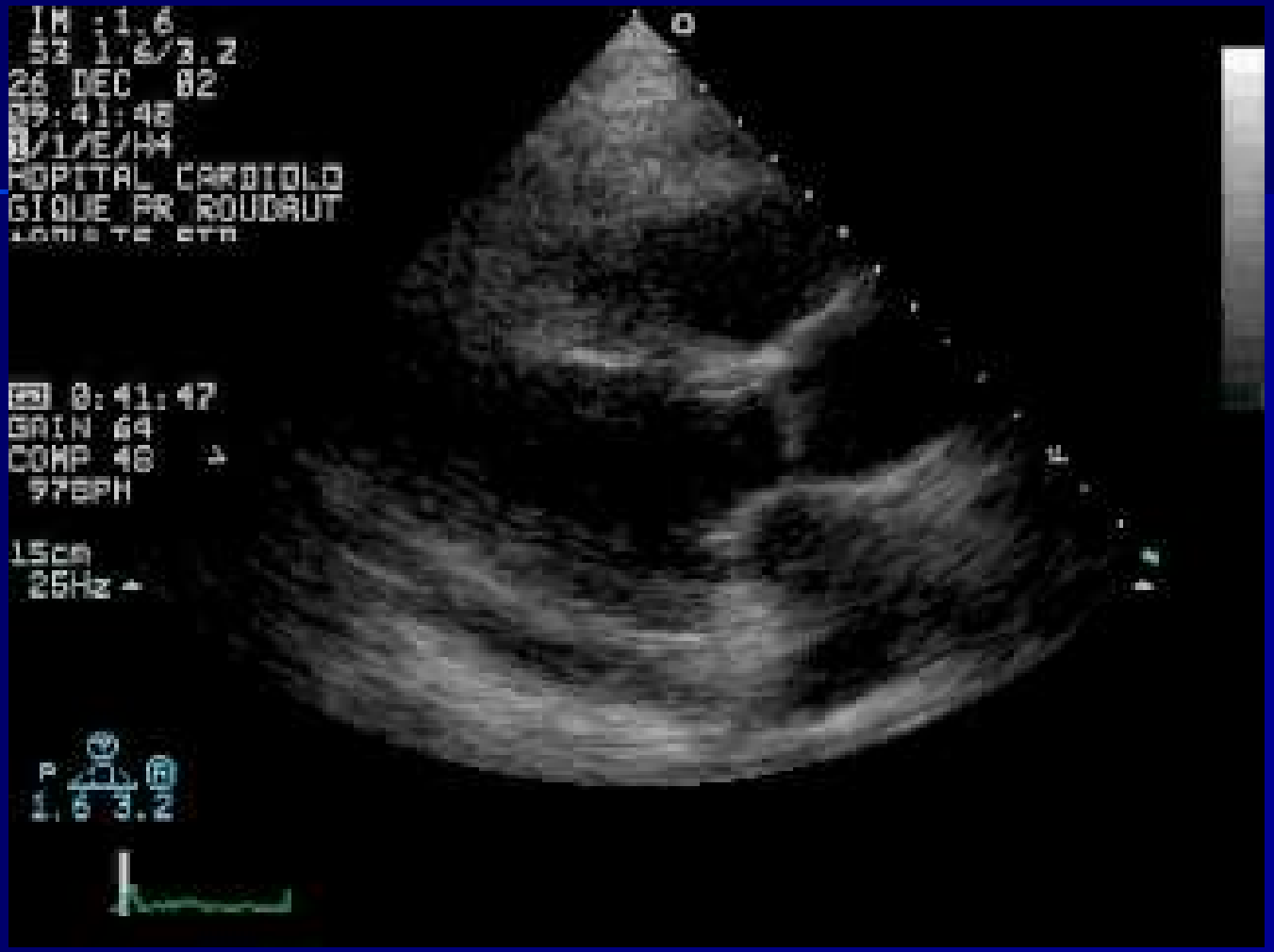
# Conclusion

- Pericardial effusion is easy to diagnose
- Pleural effusion may be distinghish from pericardial effusion
- Acute pericardial effusion may be associated with cardiac tamponade even with a small amont of liquid in acute situation
- Right cavities collapse and > 25% of mitral and tricuspid flow inspiratory variations permit to diagnose tamponade


Respiratory
"paradoxic"
septal motion
Systole
RA collapse
LA
Pericardial
effusion
RV collapse
LV
Diastole
RA
LA


Respiratory
"paradoxic"
ptal motion
Systole
RA collapse
LA


LV
Diastole
RA
LA


IM :1.6
53 1.6/3.2
26 DEC 02
09:41:48
A/1/E/H4
HOPITAL CARDIOLO
GIQUE PR ROUDAUT
0:41:47
GAIN 64
COMP 48
97BPM
15cm
25Hz
P
1.6 3.2


Liver
PE
RV
RA
LV

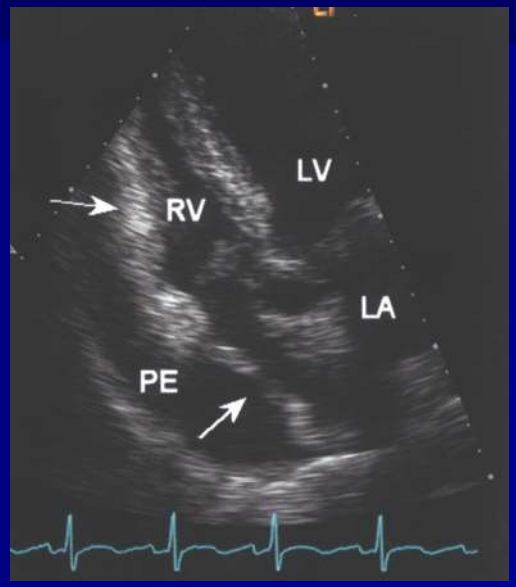

RV
LV
LA
PE

**TABLE 10–2**

## Comparison of Pericardial Tamponade, Constriction, and Restrictive Cardiomyopathy

| | Pericardial Tamponade | Constrictive Pericarditis | Restrictive Cardiomyopathy |
|---|---|---|---|
| **Hemodynamics** | | | |
| Right atrial pressure | ↑ | ↑ | ↑ |
| RV/LV filling pressures | ↑, RV = LV | ↑, RV = LV | ↑, LV > RV |
| Pulmonary artery pressures | Normal | Mild elevation (35–40 mm Hg systolic) | Moderate-severe elevation (≥60 mm Hg systolic) |
| RV diastolic pressure plateau | | >⅓ peak RV pressure | <⅓ peak RV pressure |
| **Radionuclide diastolic filling** | | Rapid early filling, impaired late filling | Impaired early filling |
| **2D Echo** | Moderate-large PE | Pericardial thickening without effusion | Left ventricular hypertrophy<br>Normal systolic function |
| **Doppler Echo** | Reciprocal respiratory changes in RV and LV filling<br>Inferior vena cava plethora | *E* > *a* on LV inflow<br>Prominent *y* descent in hepatic vein<br>Pulmonary venous flow = prominent *a* wave, reduced systolic phase<br>Respiratory variation in IVRT and in *E* velocity | (1) Early in disease *e* < *A* on LV inflow<br>(2) Late in disease *E* > *a*<br>(3) Constant IVRT<br>(4) Absence of significant respiratory variation |
| **Other diagnostic tests** | Therapeutic/diagnostic pericardiocentesis | CT or MRI for pericardial thickening | Endomyocardial biopsy |

CT, computed tomography; IVRT, isovolumic relaxation time; LV, left ventricle; MRI, magnetic resonance imaging; PE, pericardial effusion; RV, right ventricular.