



# Pericardial Diseases: Etiologies and Treatments

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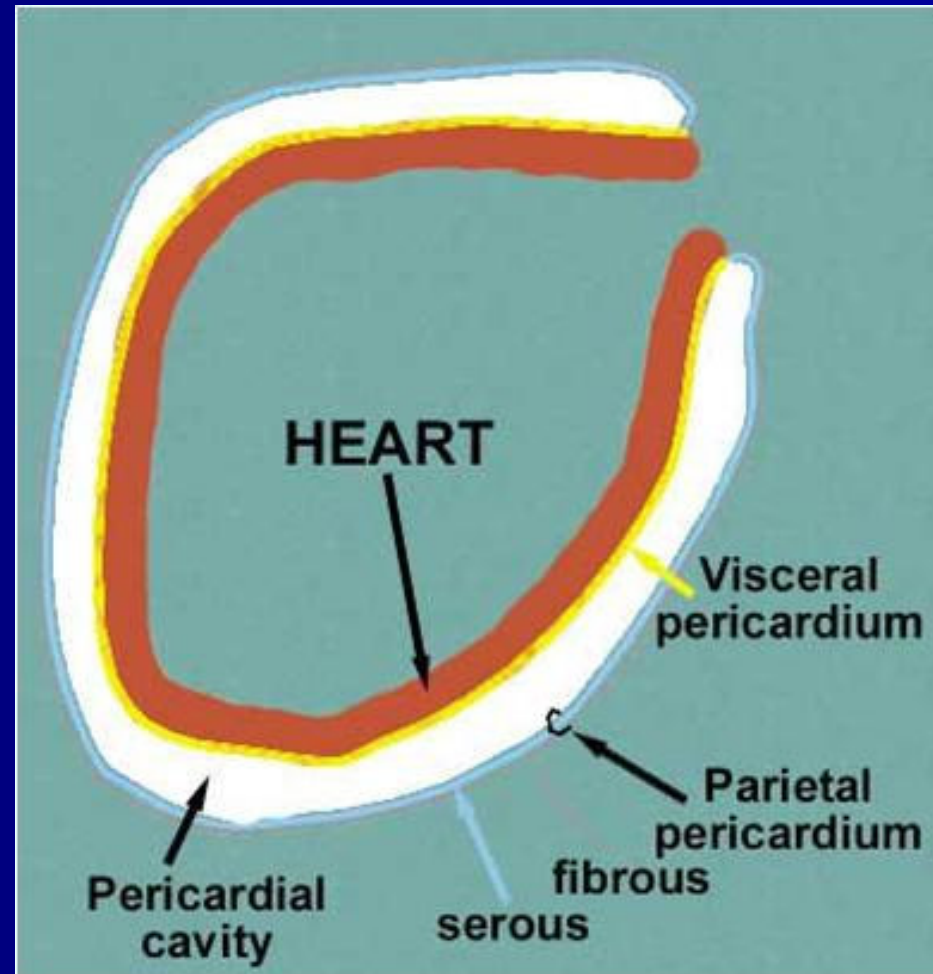


# Introduction

- Diverse and often subtle signs may lead to misdiagnosis
- Represents 1% - 8% of canine cardiac disease
- Found in  $\sim$  6% feline cases
  - Usually incidental manifestation of another disease
- Prevalence is underestimated

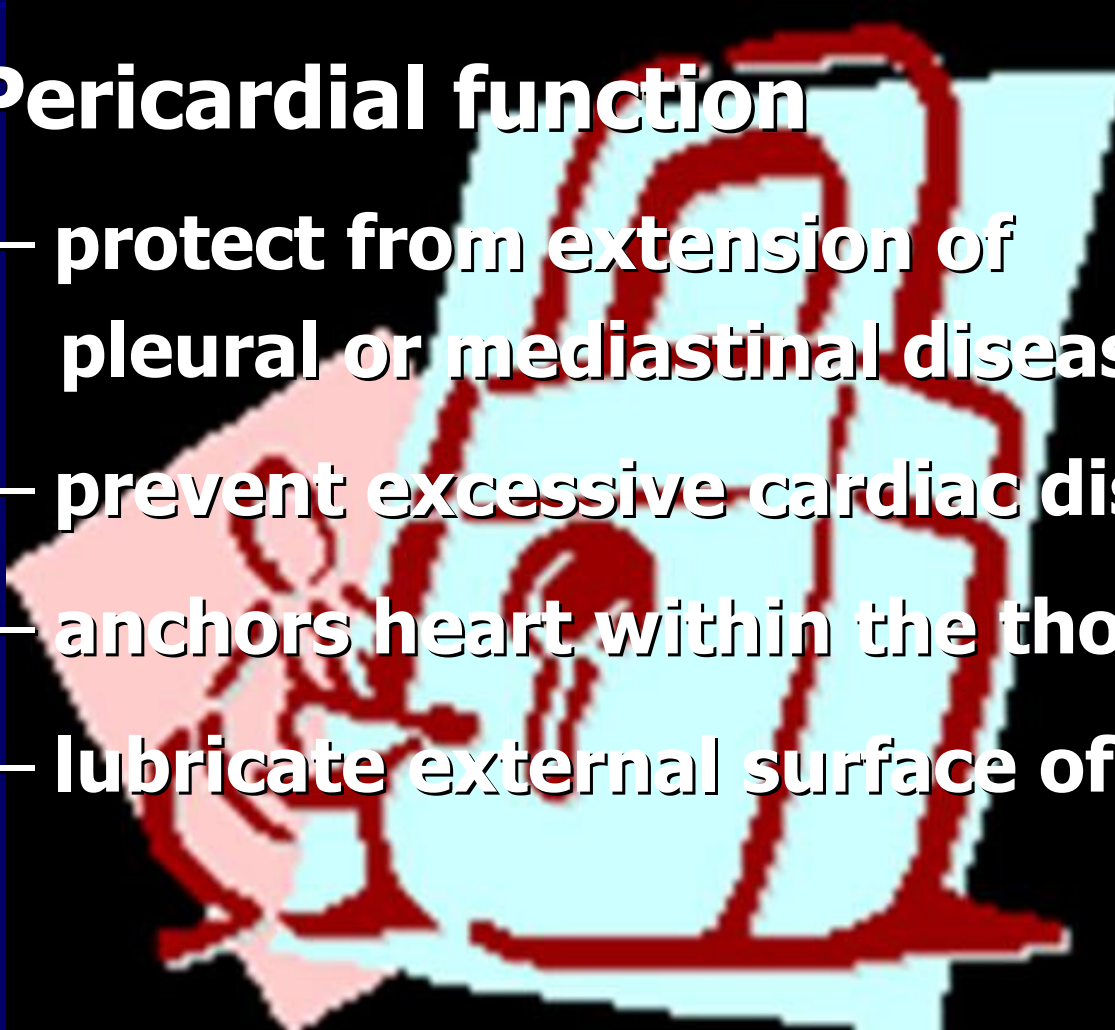
# Pericardial Structure

- **Fibrous pericardium**
  - Great vessel
  - Sternopericardial ligament
- **Serous pericardium**
  - parietal pericardium
  - visceral pericardium
- **Nerves**
  - Phrenic
  - Recurrent laryngeal
  - Vagus



# Pericardium Significance

- **Pericardial function**
  - **protect from extension of pleural or mediastinal disease**
  - **prevent excessive cardiac distension**
  - **anchors heart within the thorax**
  - **lubricate external surface of heart**



# Pericardial Disease

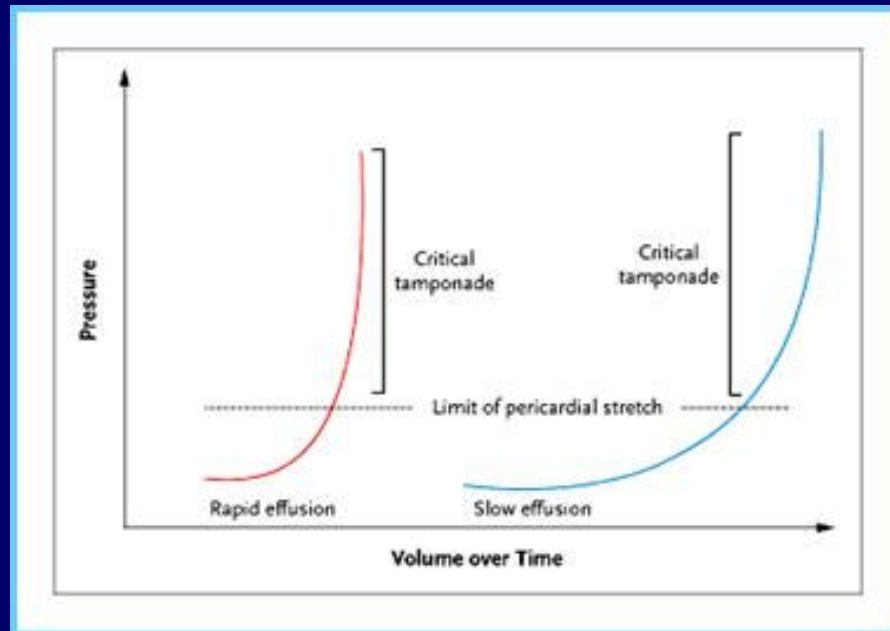
- **Pericardial dysfunction**
  - **Absence of pericardium**
    - no untoward effects
  - **Restraining effect on cardiac filling**
    - impaired diastolic filling
    - pericardial tamponade
    - constrictive pericarditis

# Pericardial Disease

- **Pathophysiology**
  - **Right heart**
    - **low pressure, thin walled**
  - **“Triad” of pericardial disease**
    - **jugular venous distension**
    - **ascites (signs of R-CHF)**
    - **weak femoral pulses**
  - **Timing is EVERYTHING**
    - **Acute vs. Chronic Effusions**

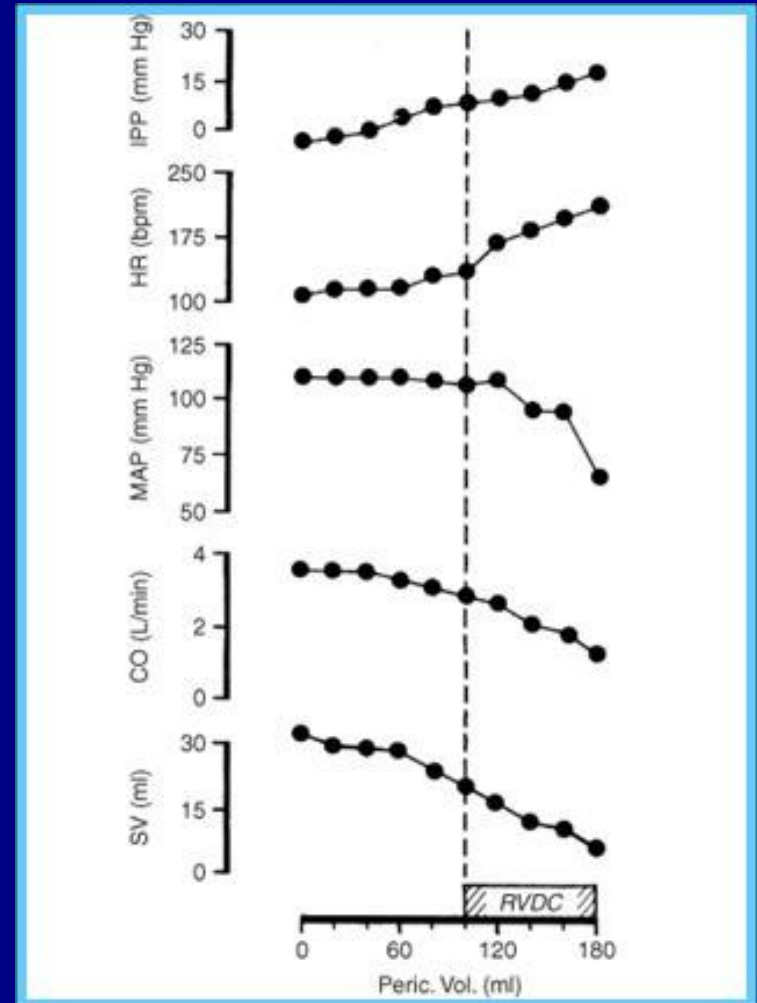
# Pathophysiology

- Onset of signs dependent upon volume and rapidity of development



# Acute Pericardial Effusion

- **Fluid Tamponade**
  - **Low Cardiac Output**
  - **Weakness**
  - **Collapse**
  - **Decreased BP**
  - **Pulsus paradoxus**

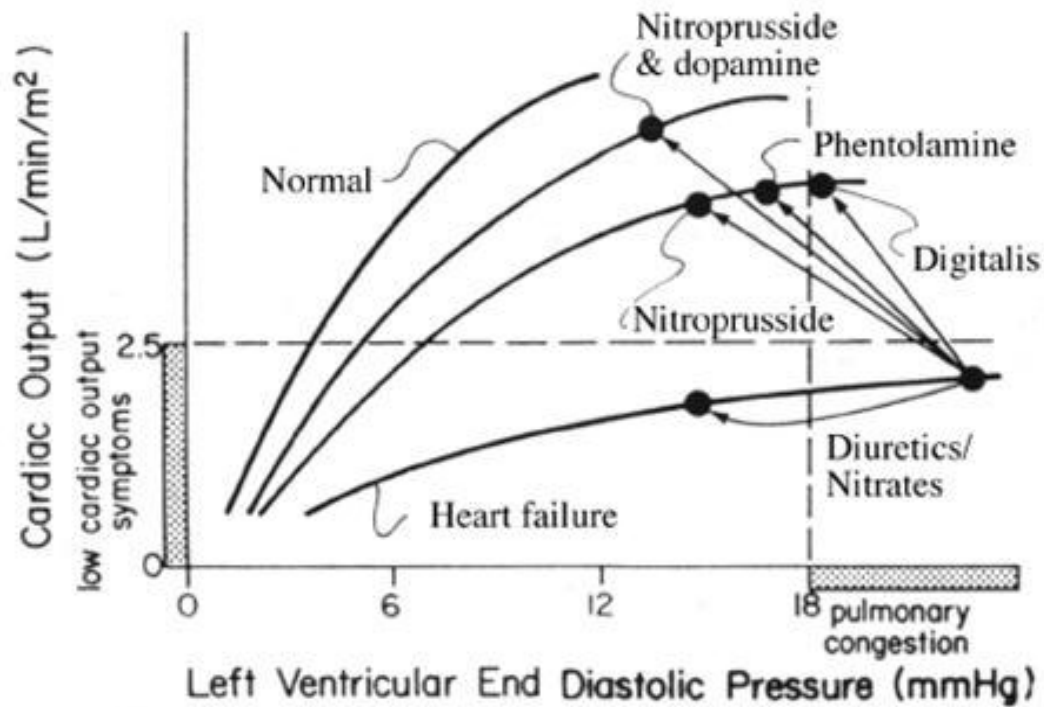




# Chronic Effusive Disease

- **Expansion of pericardial sac**
  - **New connective tissue, fibroblast proliferation**
- **Pericardial tamponade**
  - **Pulsus paradoxus**
  - **Compensatory Mechanisms**
    - **Neurohormonal activation**
    - **Increase blood volume and**
    - **Increase venous pressure**

# Avoid Lasix ! ! !



# Etiologies and Treatment

- Congenital

- Acquired

# Congenital Pericardial Disease

- **Absence of pericardium**
  - Focal or complete
  - Entrapment or strangulation of cardiac structures
- **Pericardial-peritoneal diaphragmatic hernia (PPDH)**
  - Signalment
    - cats most common, Weimaraners

# Congenital Pericardial Disease

## ■ PPDH

### – Clinical signs

- incidental finding
- pain from strangulated organs, vomiting if GI
- rare to see evidence of impaired cardiac filling

### – Physical exam

- muffled heart sounds
- borborygmus
- concurrent ventral midline defects

### – ECG

- reduced size of complexes
- axis deviation

# Congenital Pericardial Disease - PPDH

- Thoracic radiographs
  - generalized enlargement of the cardiac silhouette
  - may see gas-filled viscus within the cardiac silhouette
  - reduced abdominal contents, abnormal gastric axis
- Echocardiography
  - increased pericardial contents
  - visualize pericardium



# Congenital Pericardial Disease

- PPDH

- Clinical management

- rarely causes clinical signs
    - surgical correction

# Acquired Pericardial Disease- Pericardial tamponade

- Clinical signs
  - triad of clinical signs
  - exercise intolerance
- Other common signs
  - GI signs (anorexia, vomiting 27%-35%)
  - Coughing
  - Polydipsia
- Physical exam
  - muffled cardiac sounds
  - weak femoral pulses
    - pulsus paradoxus
  - jugular venous distension/pulsations





# Acquired Pericardial Disease

- **Pericardial tamponade**
  - **CBC, Chemistry, & coagulation profile**
  - **Thoracic radiographs**
    - **generalized enlargement of the cardiac silhouette**
    - **distended caudal vena cava**
    - **may see pleural effusion**
  - **ECG**
    - **reduced size of complexes**
    - **electrical alternans**

# Acquired Pericardial Disease

## ■ Pericardial tamponade

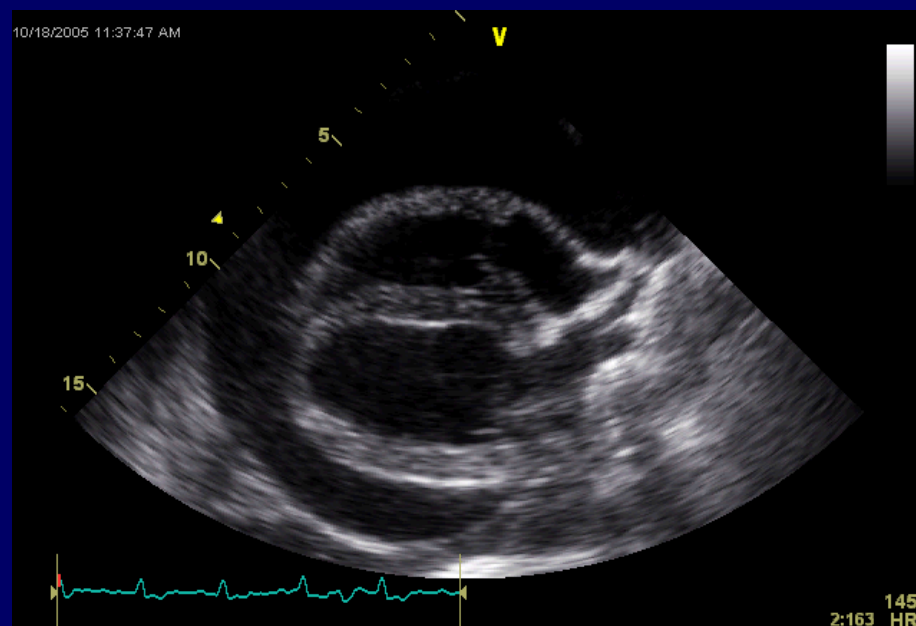
### – Echocardiography

- pericardial fluid
- diastolic collapse of RA and RV
- visualize mass if present

### – Clinical management

#### ■ Disease Dependent

- pericardiocentesis
- partial pericardectomy
- Pericardotomy



# Acquired Pericardial Disease

## ■ Pericardial tamponade

### – Causes

- Idiopathic hemorrhagic pericardial effusion
- Neoplastic pericardial effusion
- Infectious pericardial effusion
- Left atrial tear

# Acquired Pericardial Disease

- **Idiopathic Hemorrhagic Pericardial Effusion**
  - unknown cause
  - 2<sup>nd</sup> most common cause (19%-25%)
  - 50% recur after **pericardiocentesis**
    - hemorrhagic effusate
  - 50% recur after second pericardiocentesis
    - Pericardectomy
    - **Balloon pericardotomy**
  - Persistent hepatic vein dilation? ? ?
    - Prognosis

# Acquired Pericardial Disease

- Neoplastic Pericardial Effusion
  - Hemangiosarcoma
    - Most common cause of pericardial tamponade (33%-61%)
      - poor prognosis
    - Mass usually visualized on echocardiography
      - right atrium/auricle
      - right atrioventricular junction

# Hemangiosarcoma

- **Clinical Management**

- **Pericardiocentesis – If necessary**

- **Survival Data**

- **Highly variable**

- **2 days to 8 months**

- **Pericardectomy + Tumor resection + Chemotherapy**

- **Median 175 days in 8 dogs**

- **Median of 46 days minus chemo addition**

# Acquired Pericardial Disease

## ■ Neoplastic Pericardial Effusion

### – Heart based tumors

#### ■ Chemodectoma or thyroid

– Slow growing tumor (10X less common than HSA)

– Brachycephalic breeds overrepresented

– Cranial aspect of heart base

– Caudo-dorsal aspect of LA

– Surgical reduction is sometimes possible

#### ■ Pericardectomy or pericardotomy

#### ■ Median survival 730 days vs 42 days without

# Acquired Pericardial Disease

## ■ Neoplastic Pericardial Effusion

### – Mesothelioma

- discreet mass usually not be seen
- Diagnosed in 5% of PE cases
- Re-effuses often ~40 days
- Large amounts pleural fluid with pericardectomy
- definitive diagnosis requires lymph node biopsy

### – Lymphosarcoma

- responsive to chemotherapy



# Acquired Pericardial Disease

- **Topics of interest**

- **Fluid Analysis**

- **pH, biochemical analysis, troponin I**

- **Cytology**

- **May only be good for lymphoma or infectious cases but should always be performed**

- **Cholchicine, NSAIDS, and steroids**

# Acquired Pericardial Disease

## ■ Infectious Pericardial Effusion

- Extension from pulmonary or pleural abscess
- Penetrating foreign body
- Fungal
  - Coccidioides
  - Blastomycosis
- Feline infectious peritonitis
- Fluid analysis suggestive of infection

# Acquired Pericardial Disease

- Constrictive Pericarditis
  - Rare cause of pericardial disease
  - Most often secondary to infectious process
    - bacterial
    - fungal
    - viral

# Acquired Pericardial Disease

## ■ Constrictive Pericarditis

### – Clinical findings

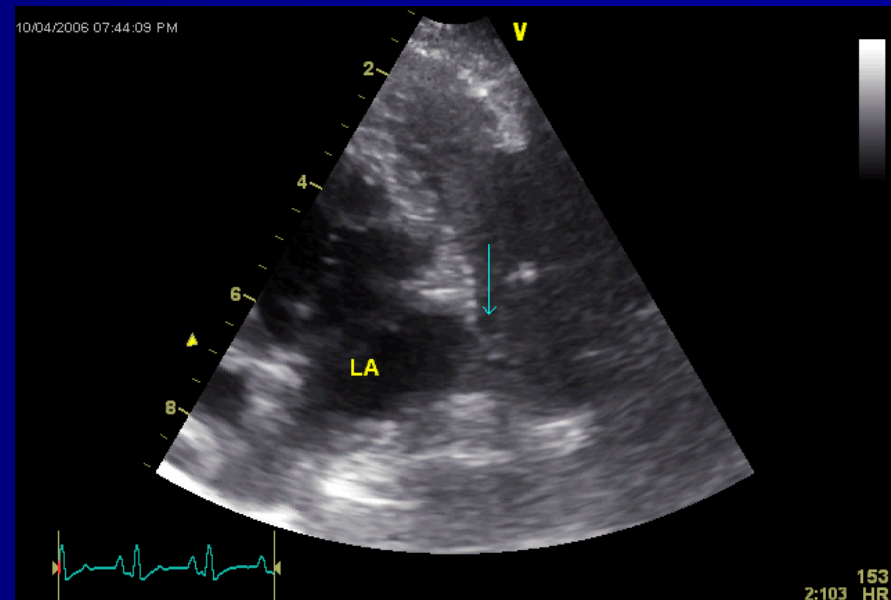
- no pulsus paradoxus
- no electrical alternans
- thoracic radiographs
  - cardiac silhouette may be normal in size
- echocardiography
  - thickened pericardium
  - no collapse of cardiac chambers

# Acquired Pericardial Disease

- **Constrictive Pericarditis**
  - **Clinical management**
    - **Partial pericardectomy**
      - cartilage to bone consistency
      - visceral pericardium may be significantly involved
        - epicardial stripping

# Acquired Pericardial Disease

- Left atrial tear
  - Uncommon cause of small dog pericardial effusion
    - Chronic valve degeneration
  - Clinical signs of acute tamponade
  - Treat
    - Afterload reduction
    - Surgery???



# Summary

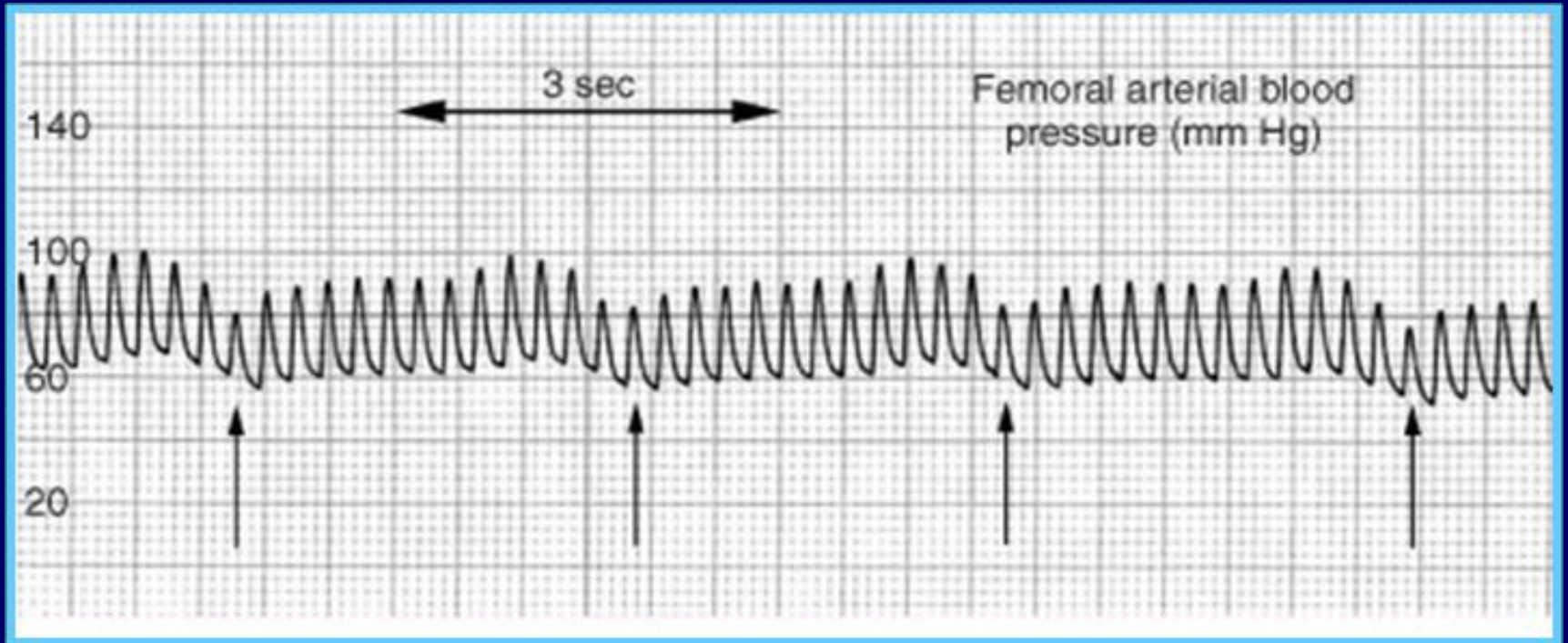
- Pericardial disease common cardiac disease
  - Don't get fooled
- Lasix should be avoided
- If possible echocardiogram before pericardiocentesis
- Early pericardectomy or pericardotomy
- Not a death sentence

**QUESTIONS ? ? ?**

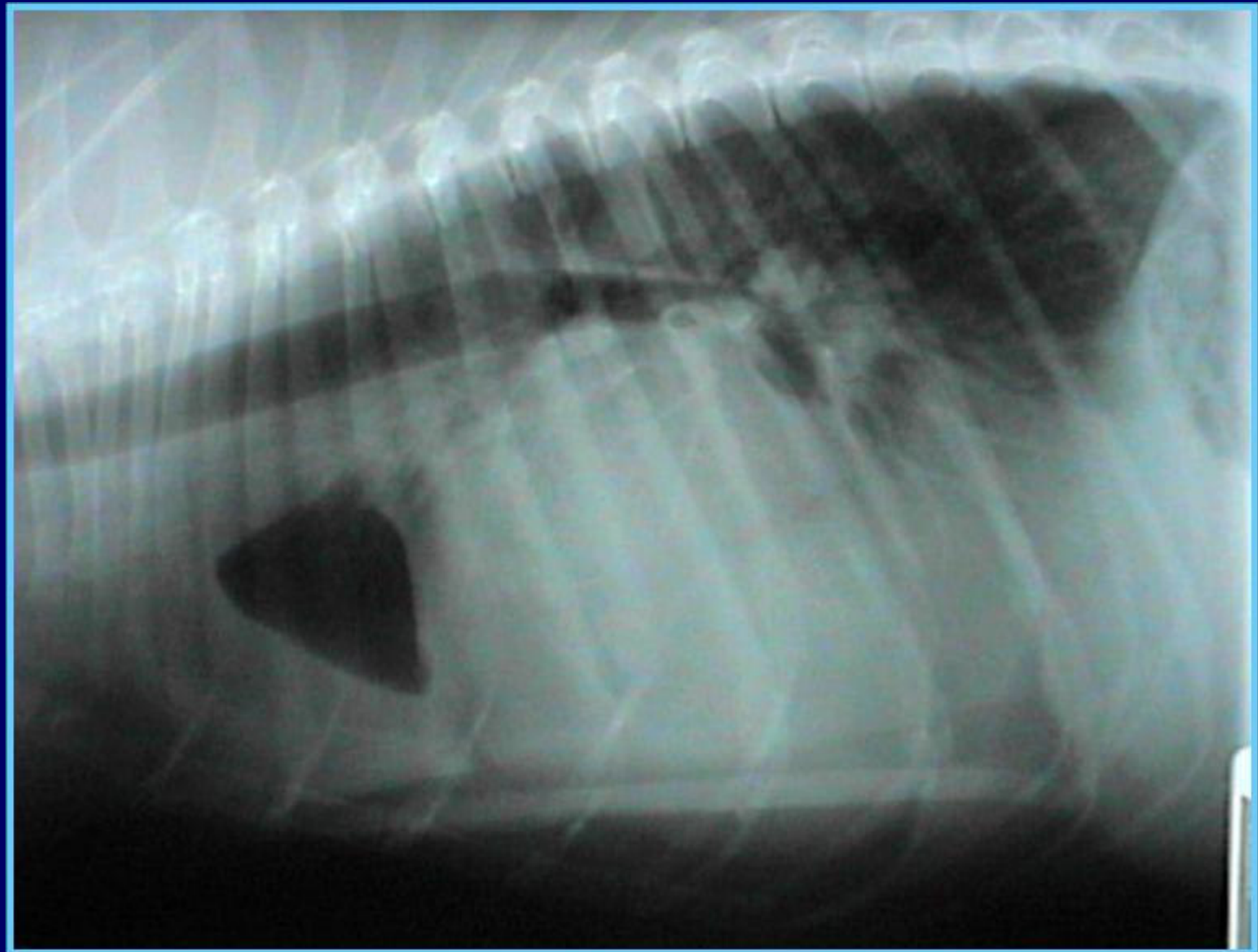


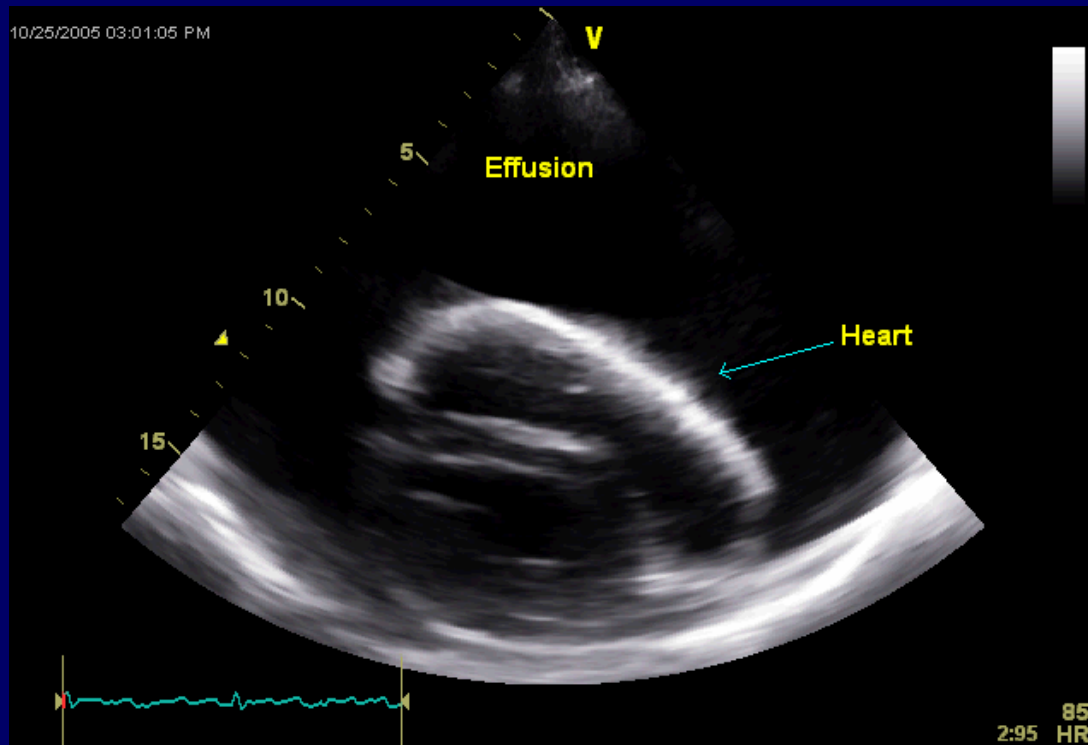
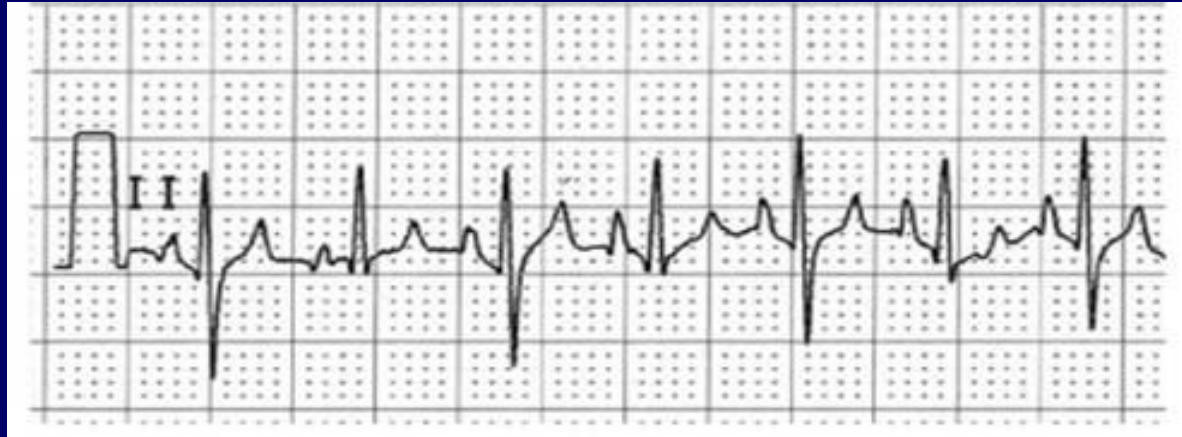


# Pulsus Paradoxus











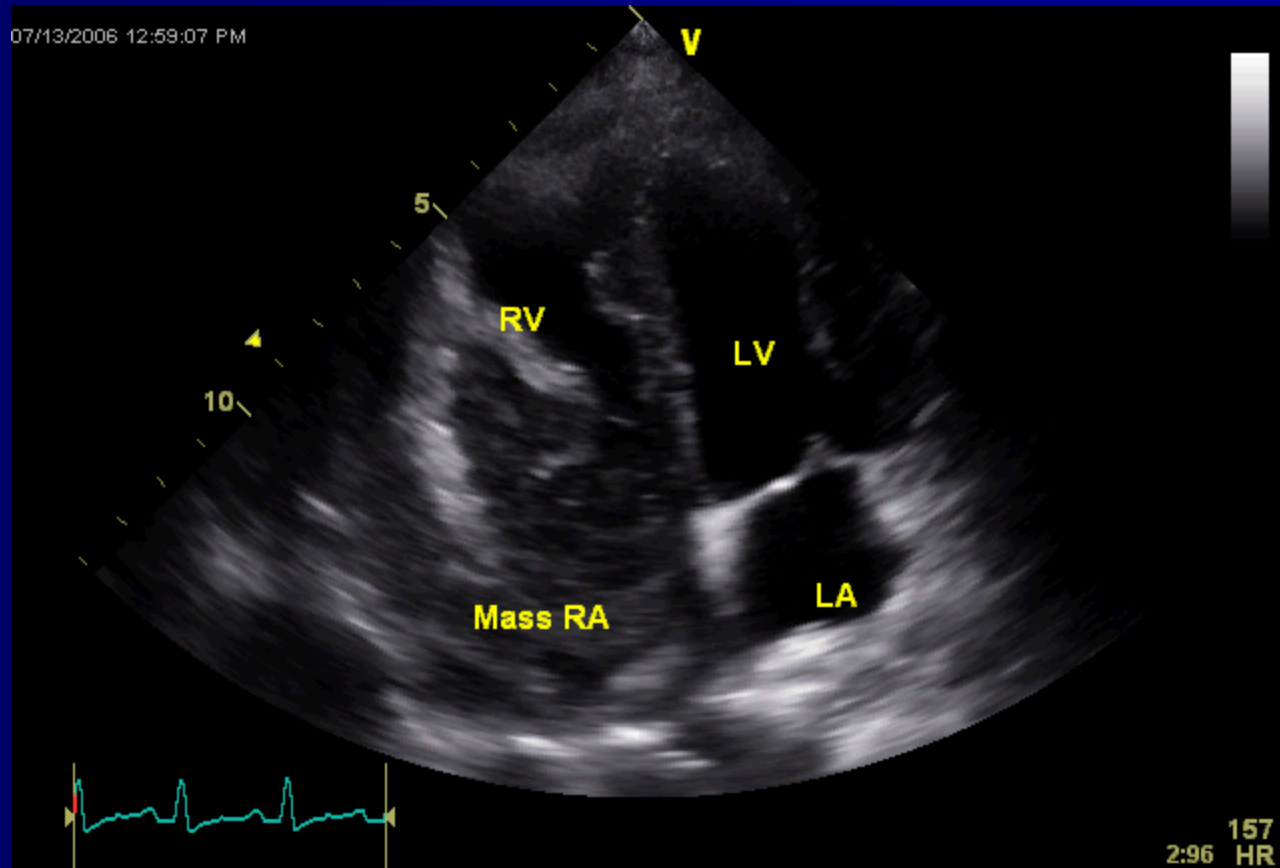
# Pericardiocentesis



# Pericardotomy



# Right Atrial Mass



# HB Mass

