

ECHO GUIDED PERICARDIOCENTESIS

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TOPIC

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- Definition
- Signs & Symptoms, Causes
- Echocardiography in Cardiac Tamponade
- Indication & Contraindication
- Echo-guided pericardiocentesis
- Complications
- Pericardial Decompression Syndrome



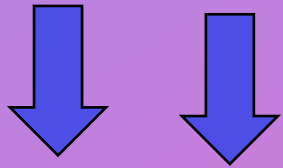
INTRODUCTION & HISTORY

- In 1653, Riolanus suggested that pericardial fluid may compressed the heart, and proposed that trephining the sternum may reduce fluid surrounding the heart
- In 1911, Marfan described the subxiphoid approach, remained the standard approach for blind pericardiocentesis for many years
- Subsequent years, the techniques have changed, using image guided pericardiocentesis - fluoroscopic, ECG & echo approach
- Echo-guided pericardiocentesis was introduced in Mayo clinic in 1979

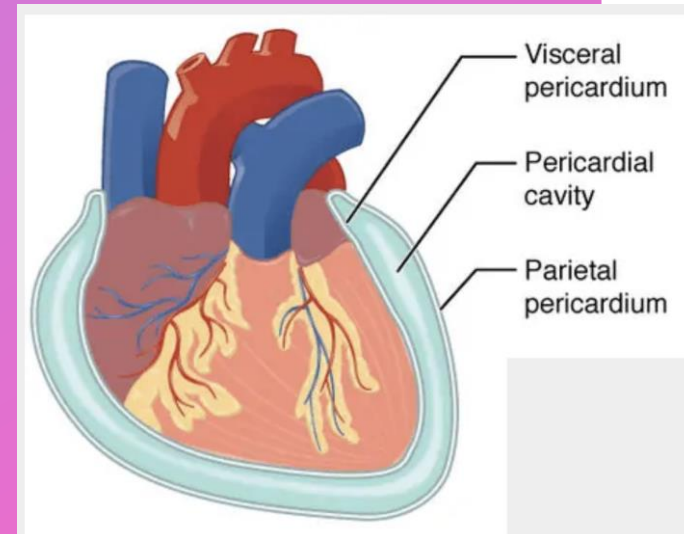


DEFINITION OF CARDIAC TAMPONADE

- Abnormal accumulation of fluid in pericardial space, leads to increasing intrapericardial pressure
- Slow or rapid increasing pericardial fluid causing compression and restricts filling of cardiac chambers
- The cardiac chambers compete for less & less space
- An increase in filling of one ventricle will cause a decrease in filling of other ventricle
- This leads to leftward IVS shift in inspiration (septal bounce) causing reduce LV size & filling



- Decompensated phase of cardiac
- Which leads to reduction cardiac output

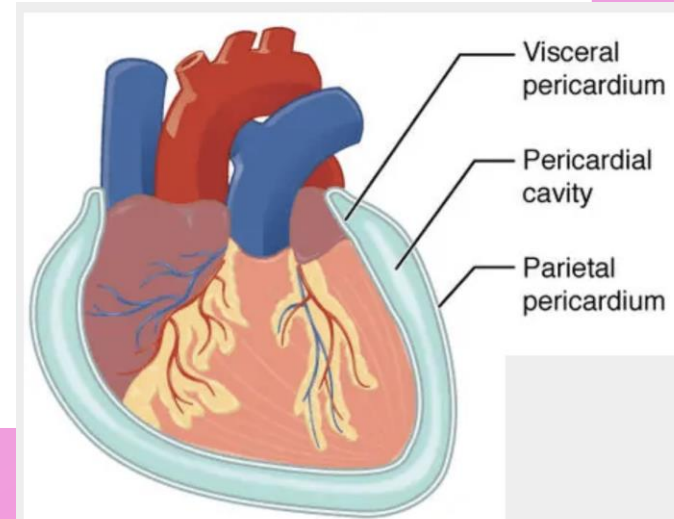


Sign & symptoms

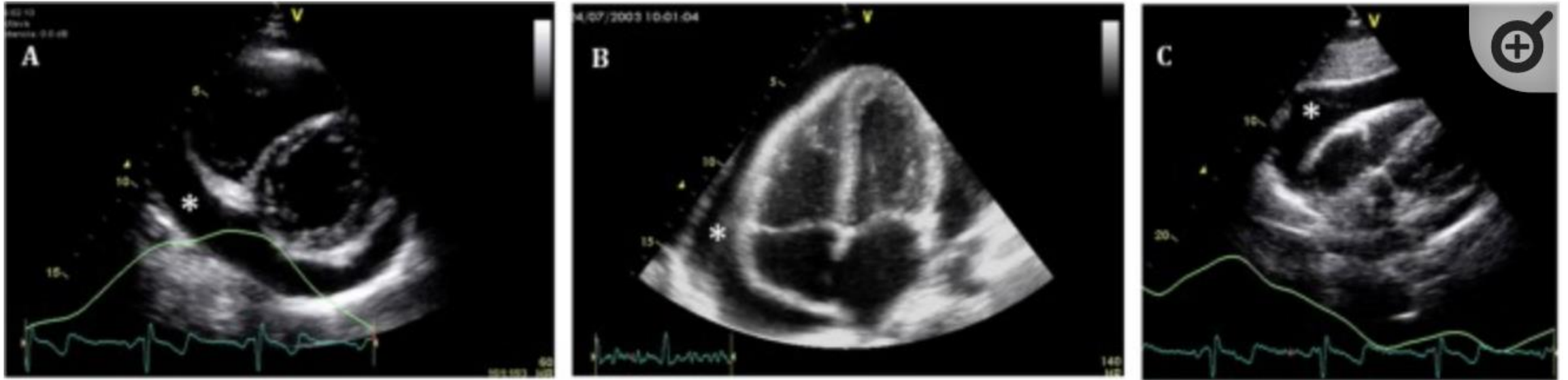
- Dyspnea and exercise intolerance
- Tachycardic
- Hypotensive (with a narrow pulse pressure)
- Pulsus paradoxus (>10mmHg decrease in systolic pressure during inspiration)
- Beck's Triad (distended neck veins, muffled heart tones, hypotension).

Causes

- Malignancy
- Infection (bacterial or tubercular pericarditis)
- Idiopathic pericarditis
- Trauma
- Uremia
- Hypothyroidism (myxedema)
- Lupus
- Post-radiation
- Pancreatitis



ECHOCARDIOGRAPHY IN CARDIAC TAMPONADE



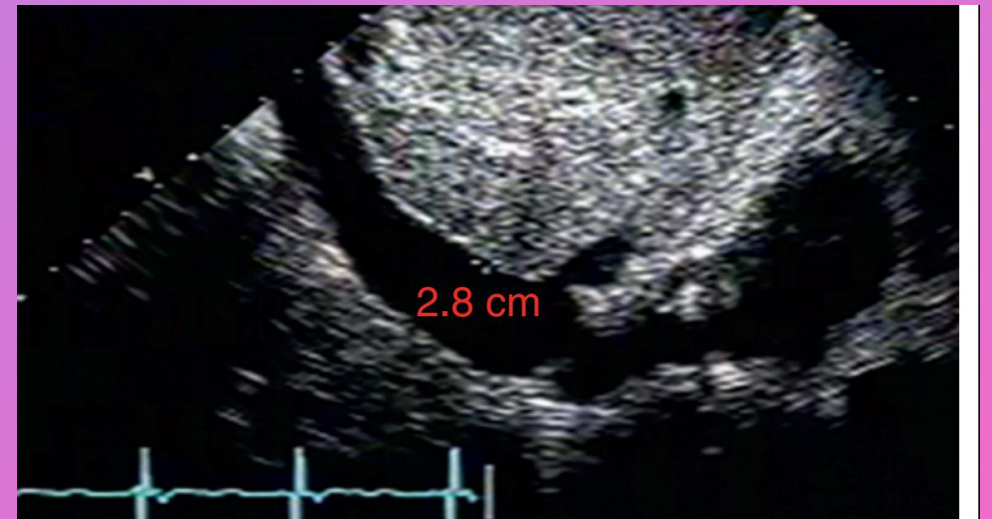
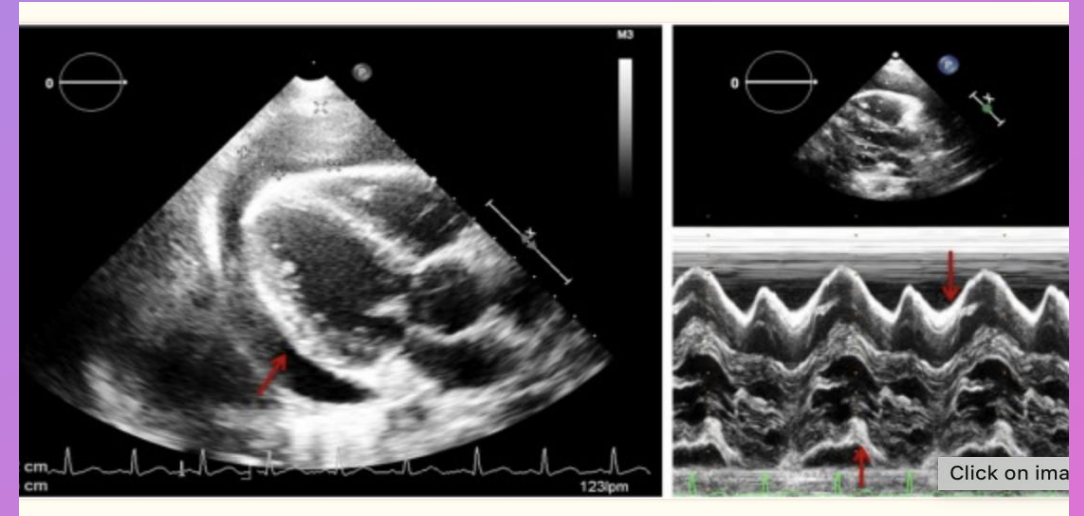
- Pericardial effusion appears an echo-free space between the two layers of pericardium
- The information obtained from this study should assess
 1. quantity and quality of pericardial fluid
 2. Collapsibility of cardiac chambers
 3. Diastolic ventricular size variability with respiratory cycle
 4. septal "bounce"



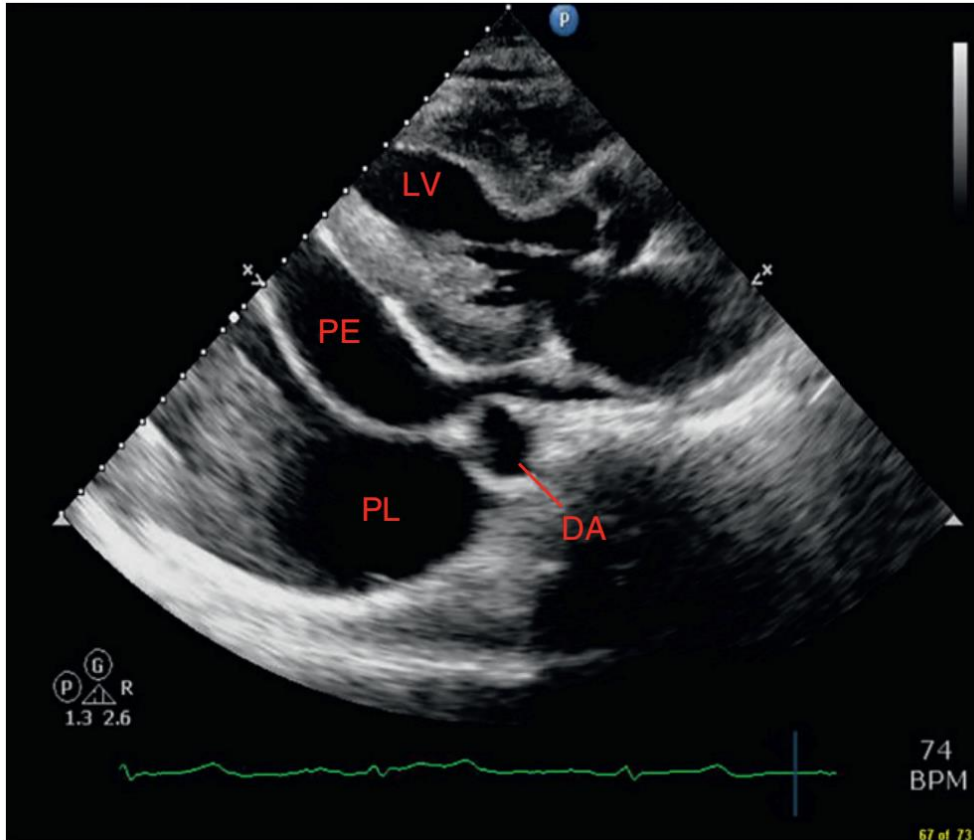
- A common sign of cardiac tamponade with significant hemodynamic compromise is collapse of RA and the RV
- Atrial and ventricular collapses are observed at different points of the cardiac cycle. Atrial collapse is usually observed before ventricular collapse in the sequence of progressive cardiac tamponade
- This happens during their relaxation phase, when intra-chamber pressures are lower than pericardial pressures, causing atrial indentation of the thin free wall

ECHOCARDIOGRAPHY IN CARDIAC TAMPONADE

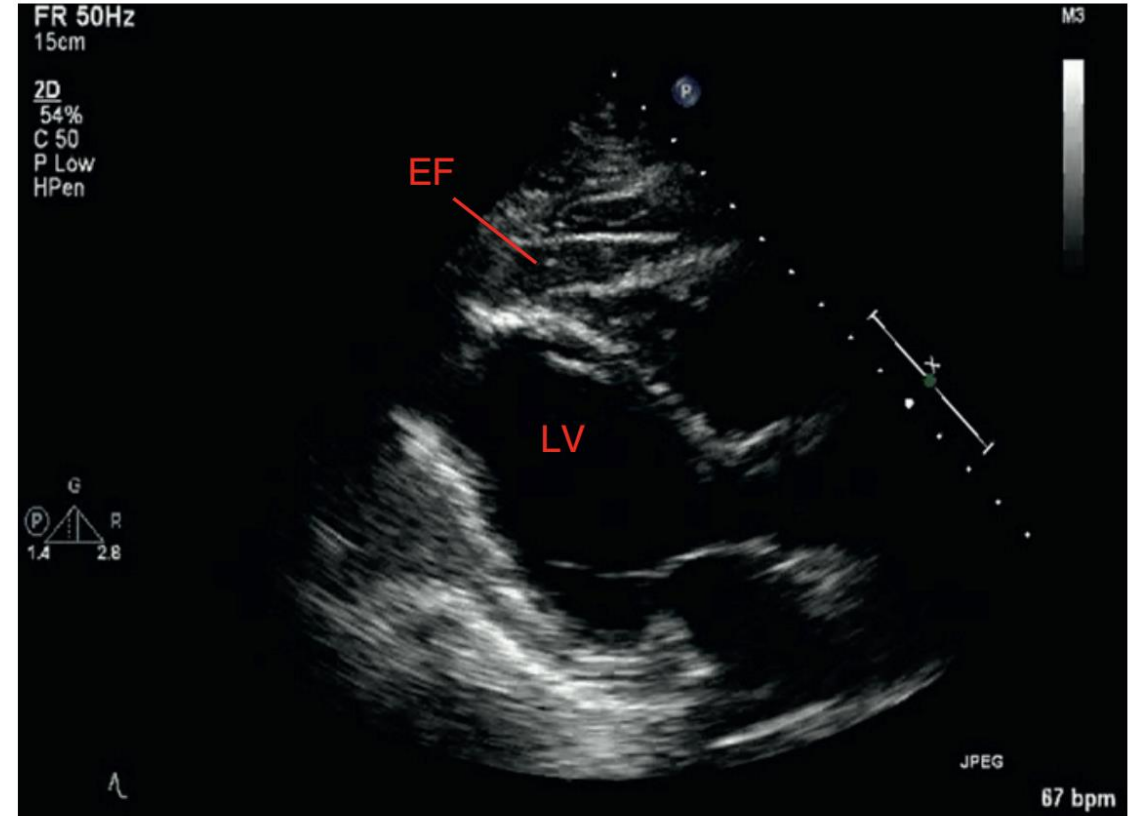
- M-mode echocardiography in the parasternal long axis shows an echo-free space throughout between the visceral and the parietal pericardium
- This sign is only seen in systole in case of mild effusions and during the complete cycle when the effusion is at least moderate
- IVC plethora



Pitfalls in diagnosing pericardial effusion



Left pleural effusion



Anterior epicardial fat

Indication

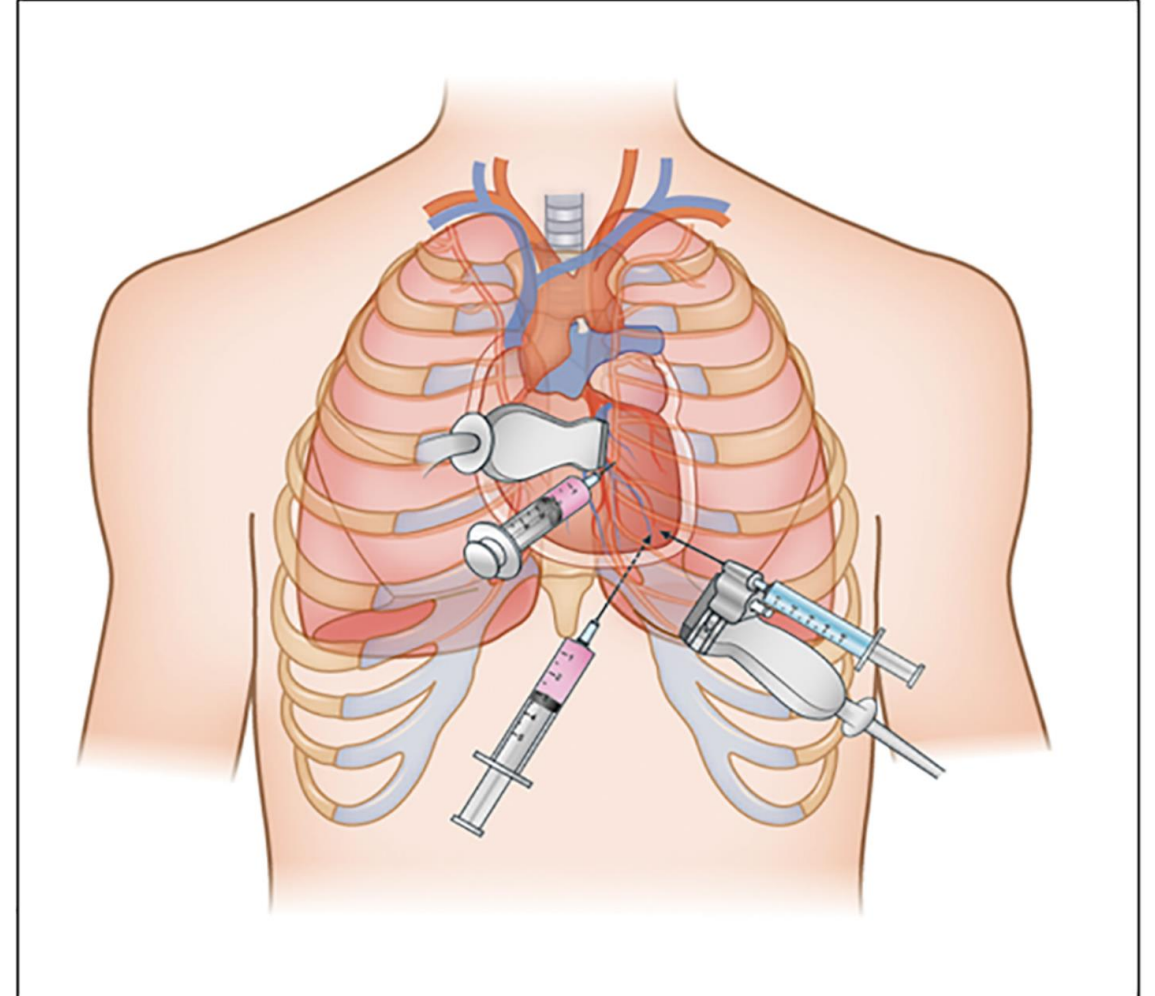
- Evidence of tamponade
- In patients without hemodynamic compromise, pericardiocentesis is indicated for symptomatic moderate to large effusion non-responsive to medical therapy
- when tuberculous, bacterial or neoplastic pericarditis is suspected

Contraindication

- No absolute contraindications
- Surgical tamponade : Aortic dissection
- Post infract myocardial rupture
- Relative contraindications : uncorrected coagulopathy, anticoagulant therapy or thrombocytopenia (platelet count $< 50,000/\text{mm}^3$)

Echo-guided pericardiocentesis

- Safe & simple
- Introduced at Mayo clinic in 1979
- PUNCTURE SITE :
 - APICAL
 - SUBCOSTAL/SUBXIPHOID
 - PARASTENAL
- Select entry point :
 1. CLOSEST TO THE PROBE
 2. ACCUMULATION OF FLUID IS MAXIMAL
 3. AWAY FROM OTHER ORGAN



Equipment for Echo-Guided Pericardiocentesis

Echocardiography with a cardiac probe

Sterile probe cover and sterile echo gel

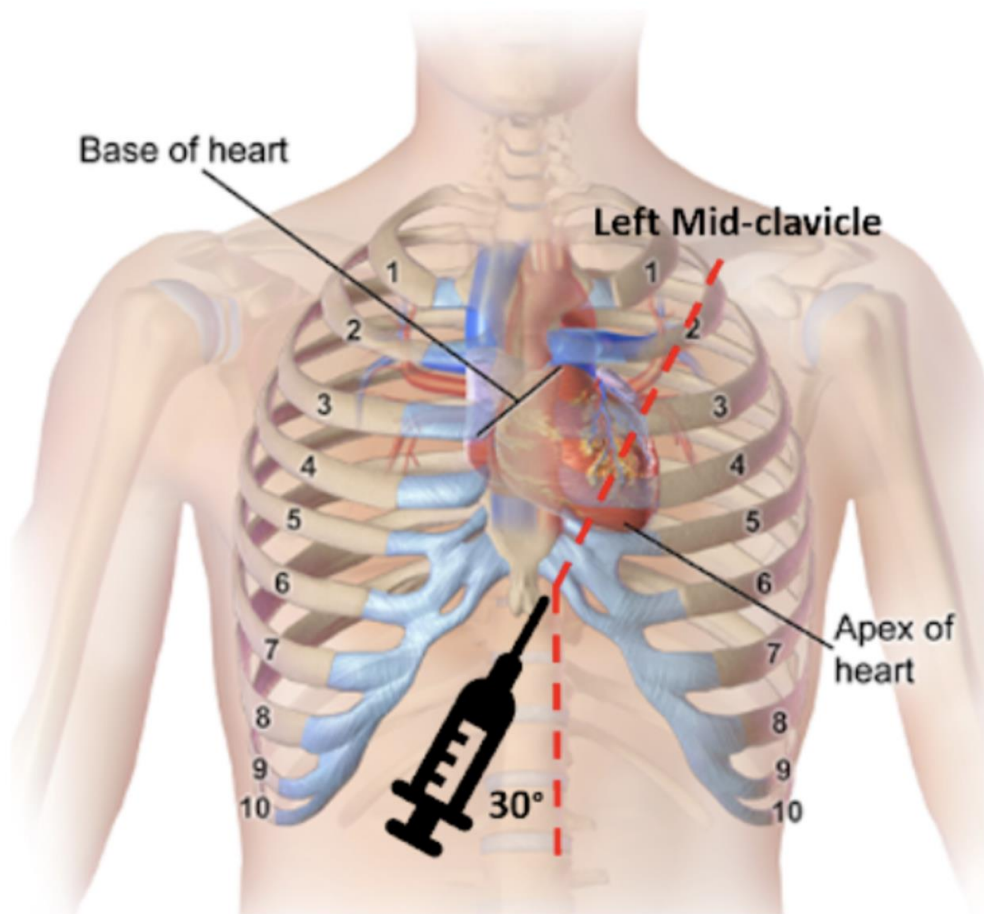
16-18 gauge, Teflon-sheathed needle  needle of 7 or 15 cm in length

6 Fr to 8 Fr dilator and introducer sheath

J-tipped guidewire  guidewire of 0.032 in. × 60 cm in length

Drainage catheter: pigtail angiocatheter 6 Fr to 8 Fr or specific pericardial drainage set

Disposable flushing system to maintain patency of the catheter

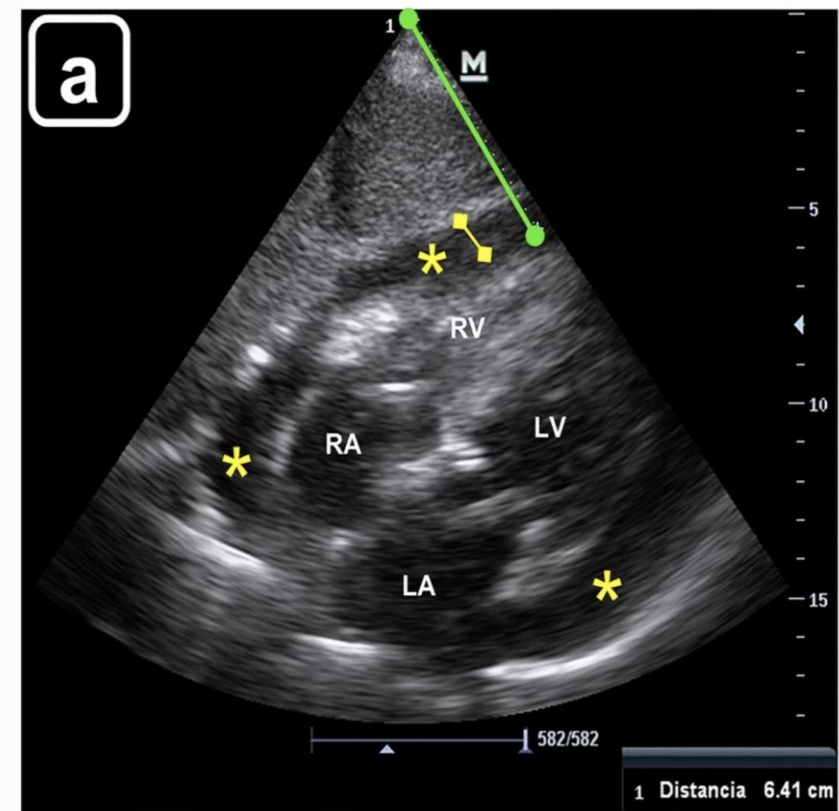


Subxiphoid

SUBXIPHOID / SUBCOSTAL

Insertion: 1 cm beneath the xiphoid process, lower the needle to 15-30 degree angle

Direction: Towards left mid-clavicle



Steps

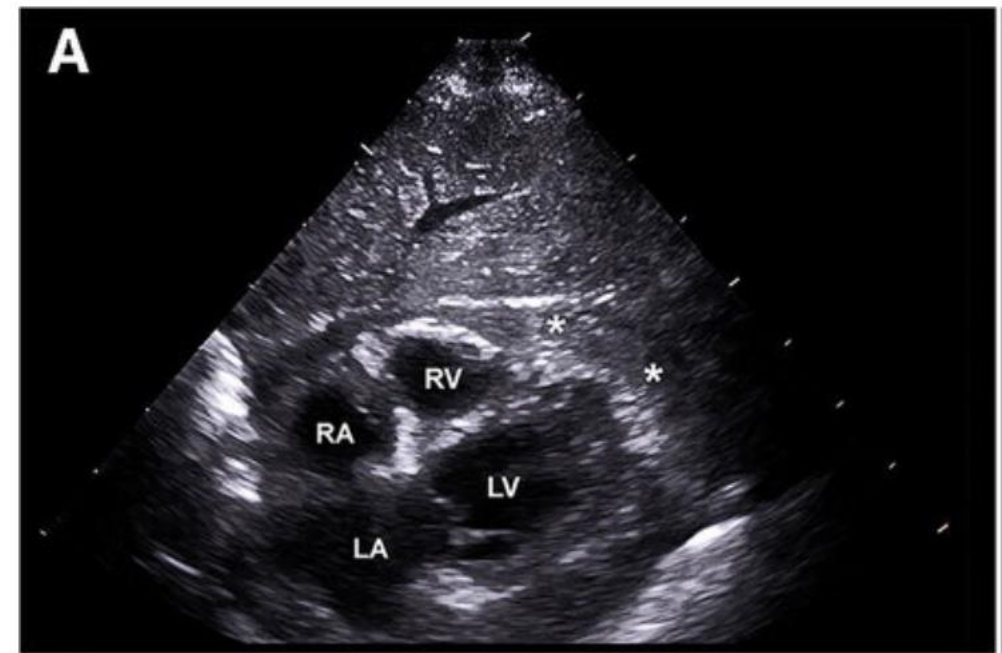
- Choose location
- Sterile preparation of the chosen body region
- Apply local anaesthesia
- Advanced 18G needle, connected to syringe to check for back flow, place Echo probe at puncture site
- Once the needle enters the pericardial space, and serous fluids appears through cannula
- If no optimal view, or if blood is aspirated, confirm the needle's position by injecting Agitated saline , through the needle
- Advance J-tip 0.032 wire into pericardium

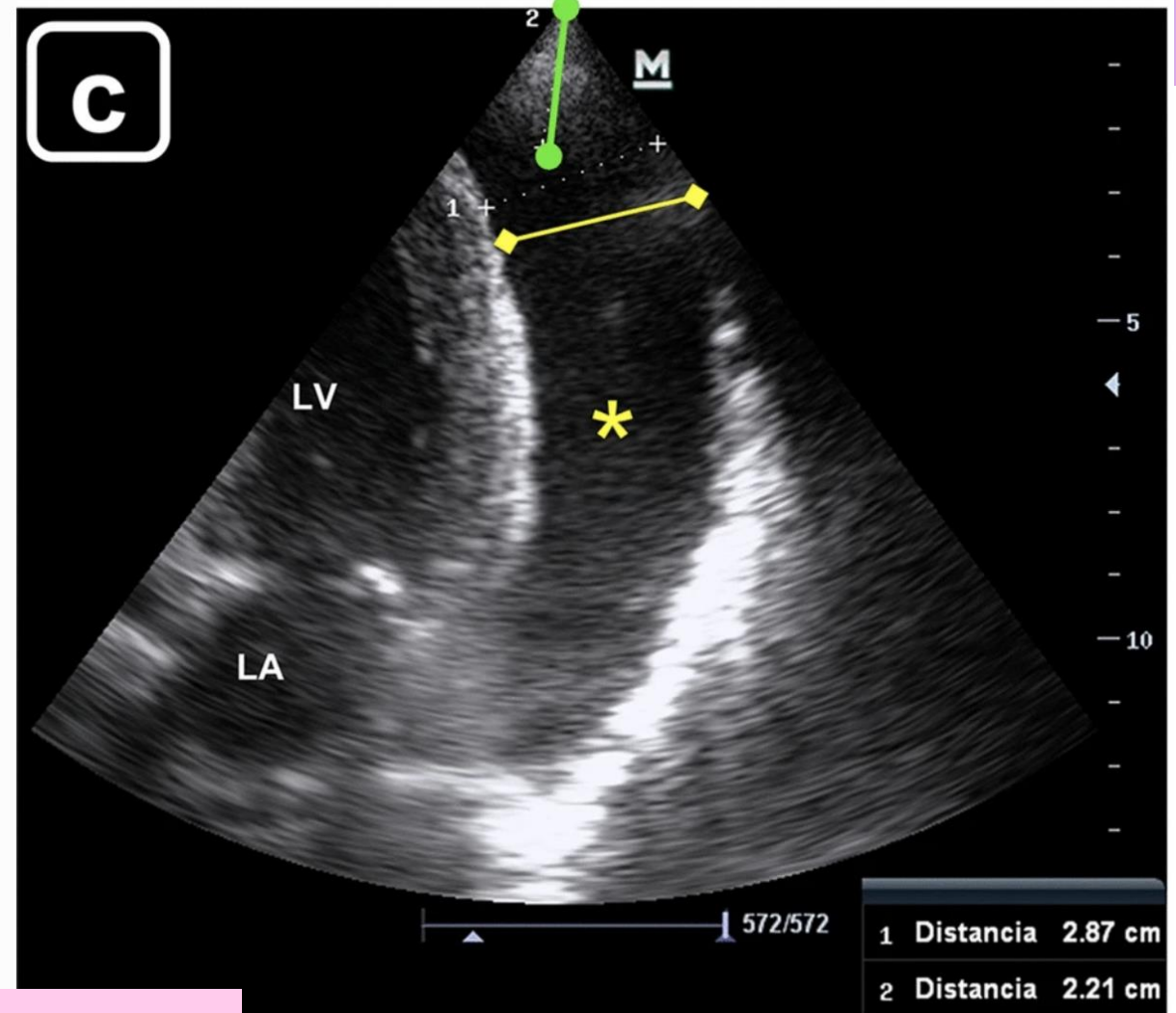
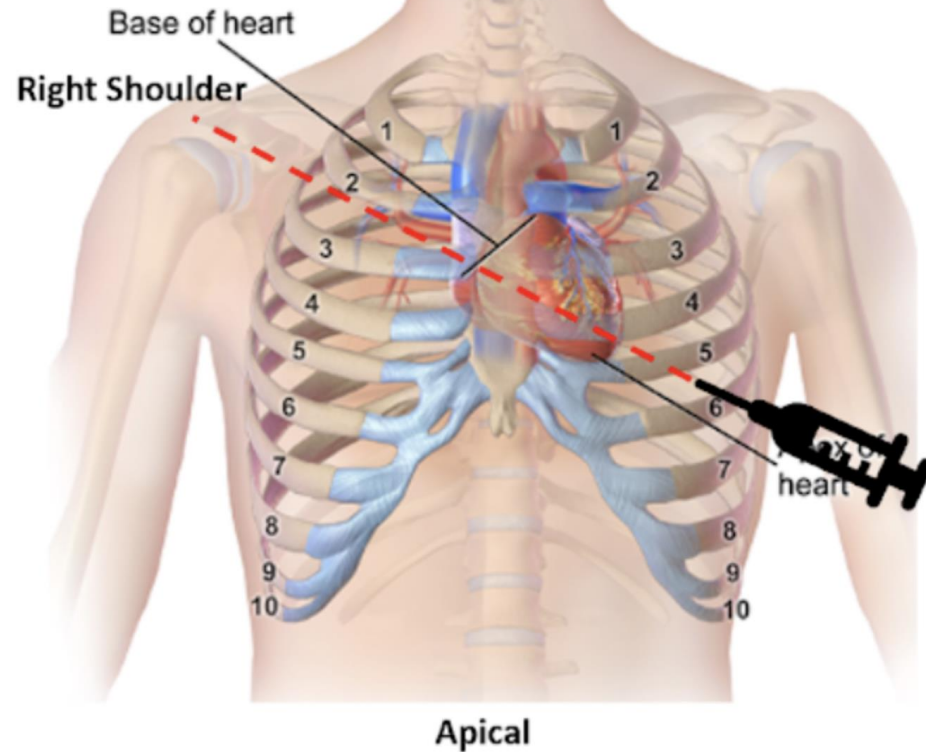


- Make incision with scapel
- Advance dilator, then replace with 6 or 8 Fr pigtail catheter over the J-wire
- Connect to drainage bag
- Check tip of pitail
- Drainage care

Agitated saline

- Transthoracic echocardiographic image obtained from the subcostal view following agitated saline injection after obtaining pericardial access with a 16G intravenous catheter.
- opacification of the pericardial effusion following agitated saline injection confirming pericardial access

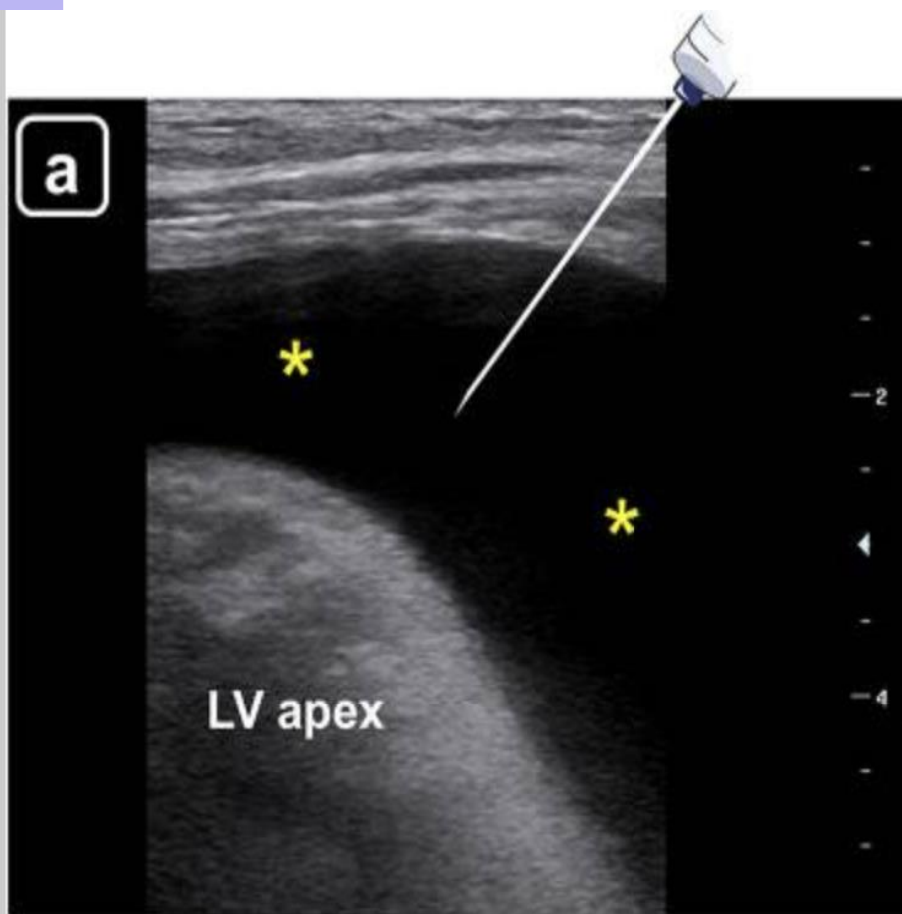


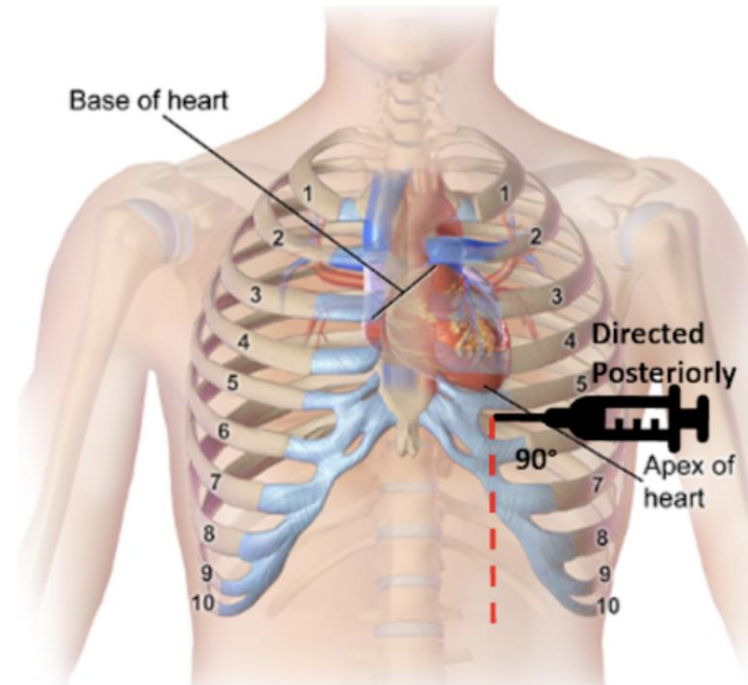
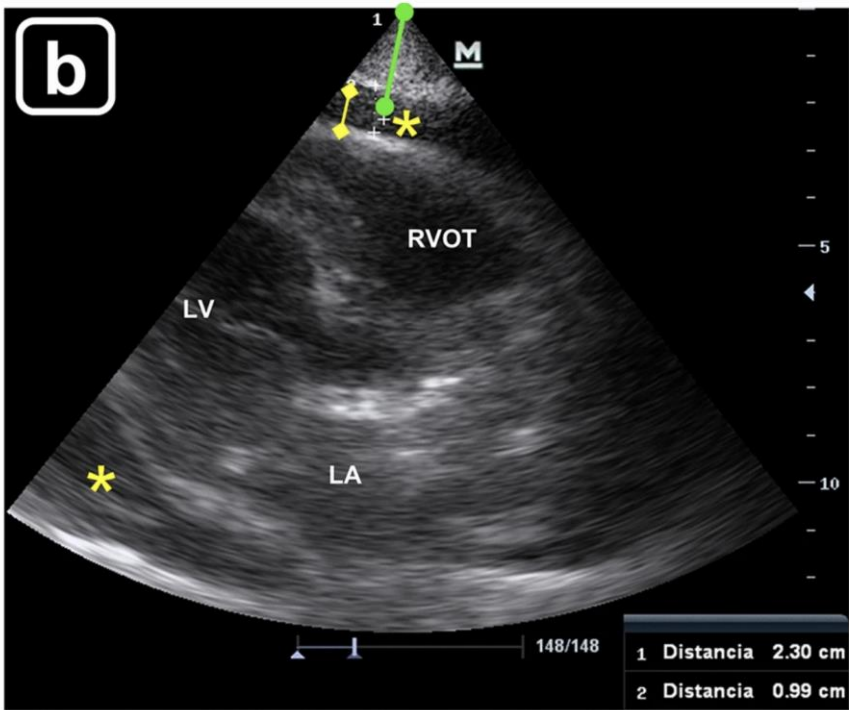


Apical

Insertion: Fifth, sixth, or seventh left intercostal space approximately 6 cm from the parasternal border, 1-2 cm lateral to apex beat, superior border of the rib to avoid intercostal nerves & vessel

Direction: Patient's right shoulder



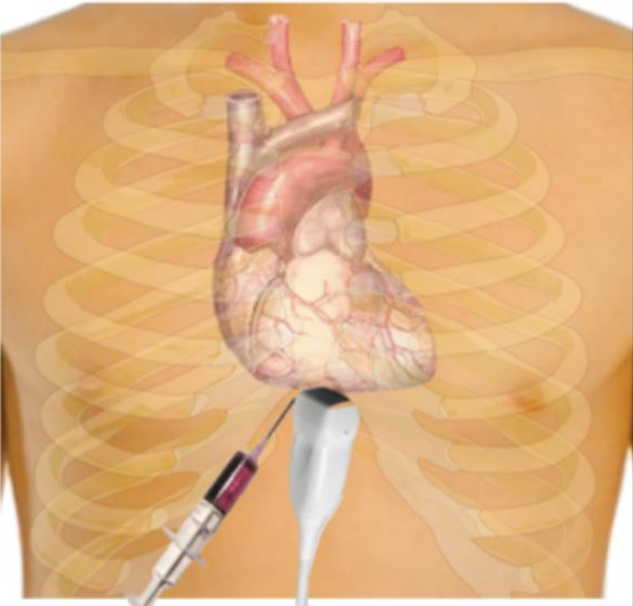
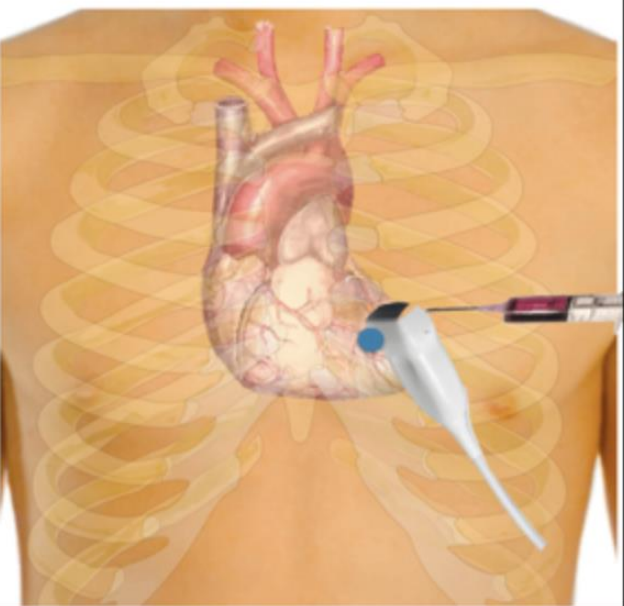
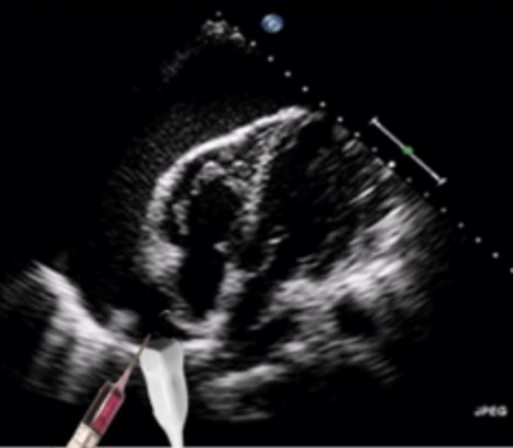


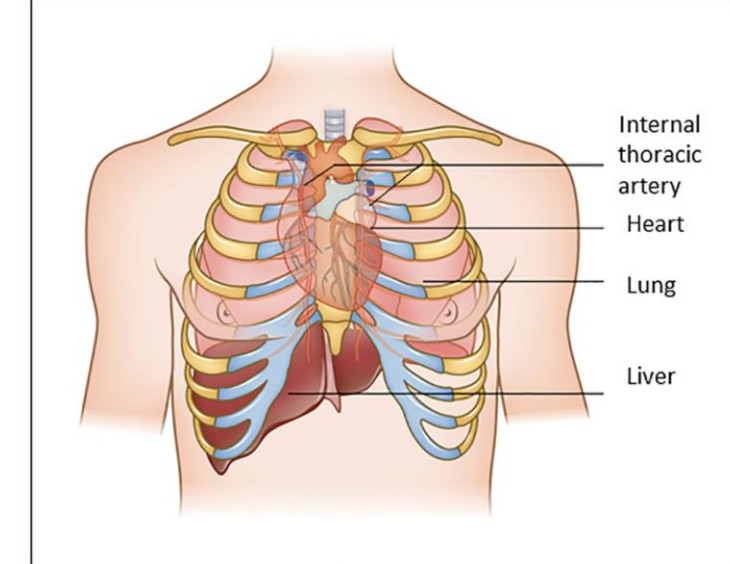
Parasternal

Parasternal

- Insertion: Fifth left intercostal space at the left parasternal border no more than 1 cm lateral and perpendicular to the patient's chest
- Direction: Posterior



	SUBXIPHOID	PARASTERNAL	APICAL
APPROACH			
ULTRASOUND			
LANDMARKS	Under the xiphoid process	3rd or 4th ICS to left of sternum Probe marker - patient's right shoulder	Probe marker - patient's left
RISKS	LIVER	LIMA (left internal mammary artery) - runs 1-2 cm lateral to sternum LAD LUNG	LUNG



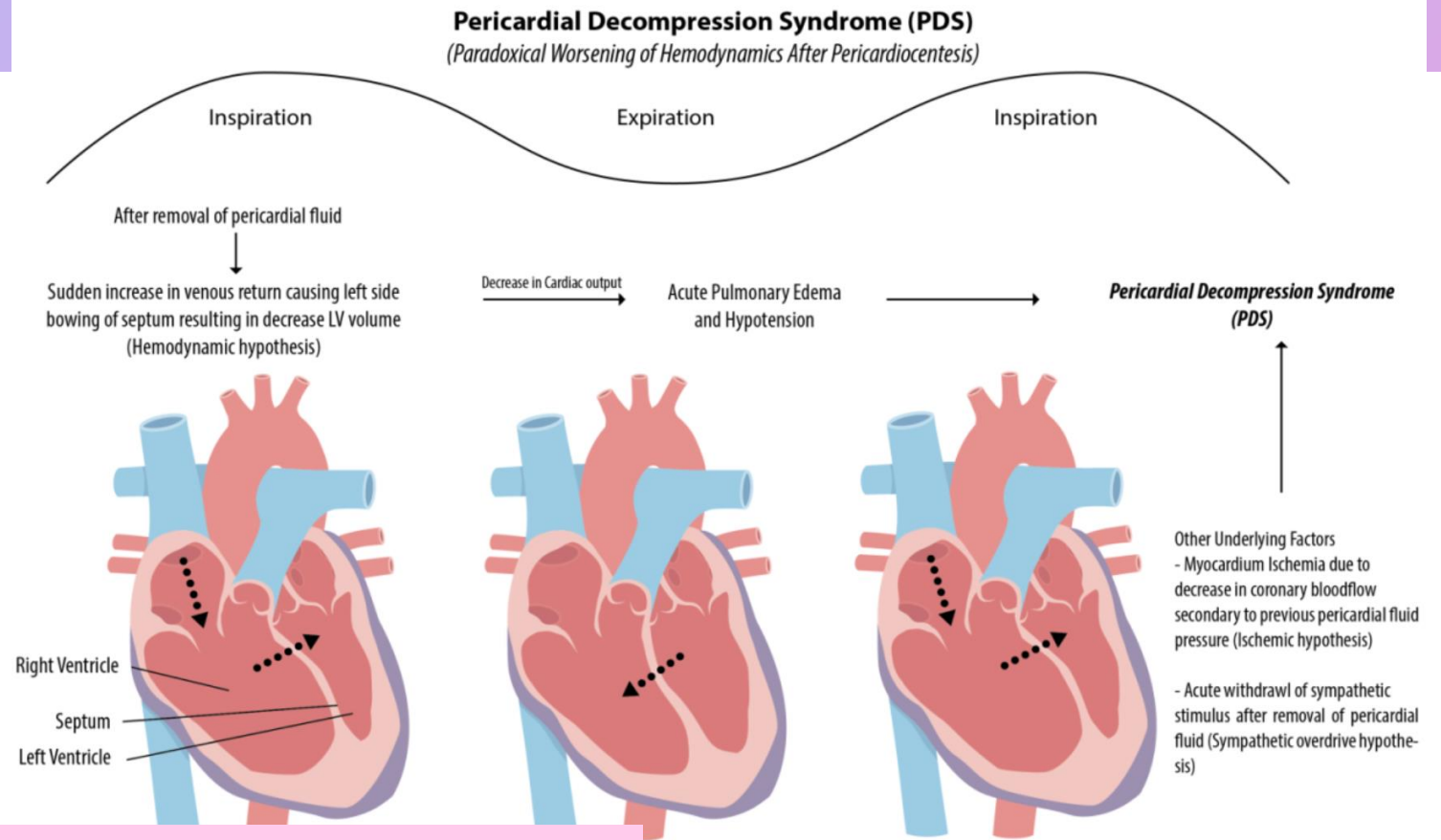
Advantages and disadvantages of pericardiocentesis approaches (modified from [7])

Pericardiocentesis approach	Advantages	Disadvantages
Subxiphoid	Extrapleural route	Liver injury Colon or stomach perforation Long distance to reach the pericardial cavity Irritation to diaphragm or phrenic nerve
Left parasternal	Direct route to reach the pericardial cavity	Internal thoracic vessels injury Pneumothorax
Apical	Direct route to reach the pericardial cavity	Pneumothorax Ventricular apex piercing (ventricular arrhythmias)

PERICARDIAL DECOMPRESSION SYNDROME

- Paradoxical worsening of hemodynamics and development of APO after an uncomplicated pericardiocentesis
- Strong association with
- Low EF
- large amount of effusion
- Prior radiotherapy
- Pericardial calcification

- CTD
- Hx of malignancy
- Symptoms are similar to acute heart failure
- Diff dx : septic / cardiogenic shock, trauma
- Treatment : supportive , HF therapy, vasopressor, diuretics
- Not to drain large quantity in a single procedure i.e < 1L (ESC 2004)
- Or enough to result in resolution of tamponade



Thank You!