



# Cardiac trauma

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# *When Minutes Matter*



# General Management

- ATLS Principles of Resuscitation
- Aim.....*To Restore Physiology, rather than anatomy*
- Early assessment and primary survey.
- Simultaneous aggressive resuscitation.
- Secondary survey with full examination.
- Transfer to a definitive site of care.

# Etiology

- *PENETRATING* : Stab wounds ; Gunshot wounds ; Shotgun wounds
- *BLUNT TRAUMA* : Motor vehicle accidents ; Fallings
- *IATROGENIC* : Cardiac catheterization ; CVP ; Pericardiocentesis ; CPR

# EKG in Blunt cardiac trauma

**TABLE 1.** Electrocardiographic findings in 94 patients with suspected myocardial contusion

ECG Findings <sup>a</sup>	Patients (n)	%
No abnormalities	71	75.5
ST segment or T-wave changes	18	19
New Q wave	0	0
Right bundle branch block <sup>b</sup>	9	9.5
Sinus tachycardia <sup>c</sup>	3	3.2
Dysrhythmia (AF) <sup>d</sup>	2	2.1

# Echo in Blunt cardiac trauma

## **Echocardiographic findings in acute cardiac contusion**

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### **Transthoracic echocardiography**

**Regional wall motion abnormalities**

**Pericardial effusion**

**Valvar lesions**

**Right and left ventricular enlargement**

**Ventricular septum rupture**

**Intracardiac thrombus**

### **Transoesophageal echocardiography**

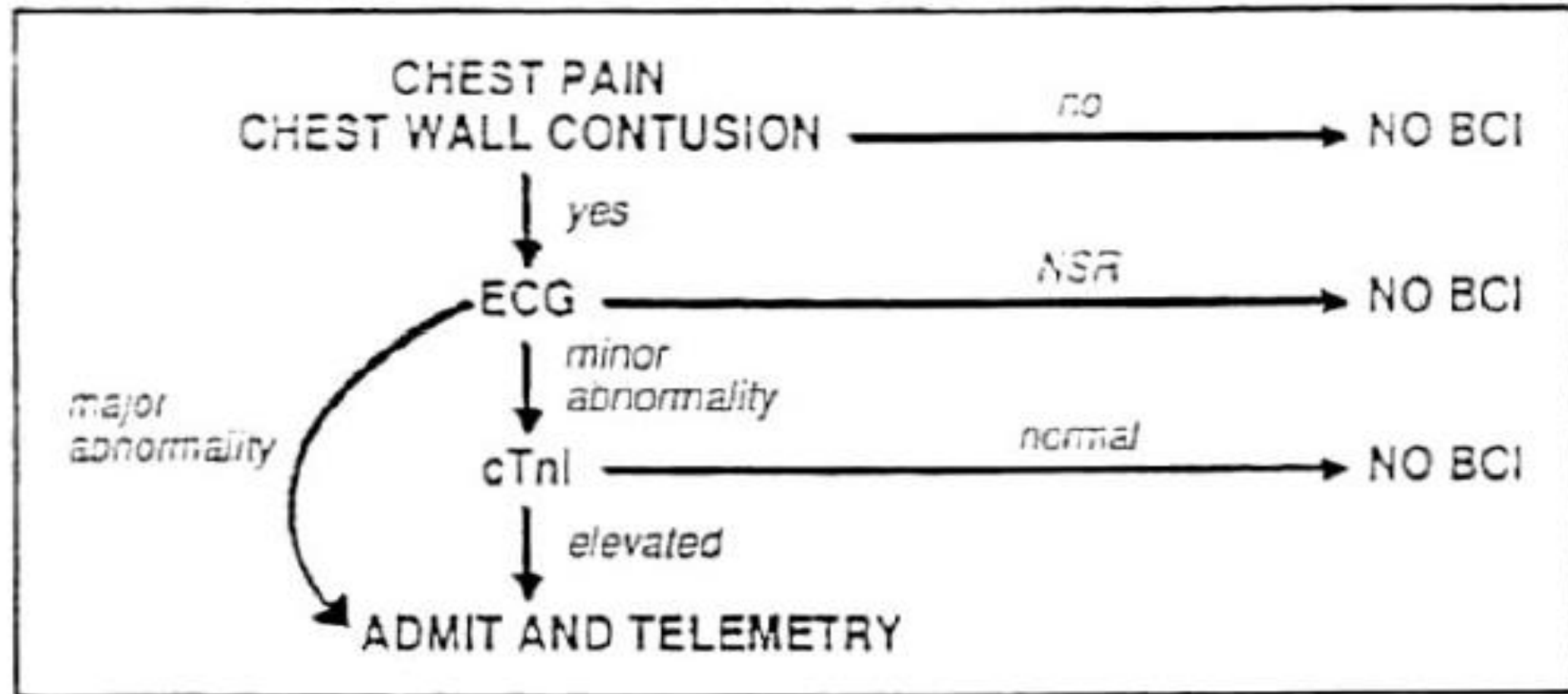
**Aortic endothelial laceration or aortic dissection**

**Aortic rupture**

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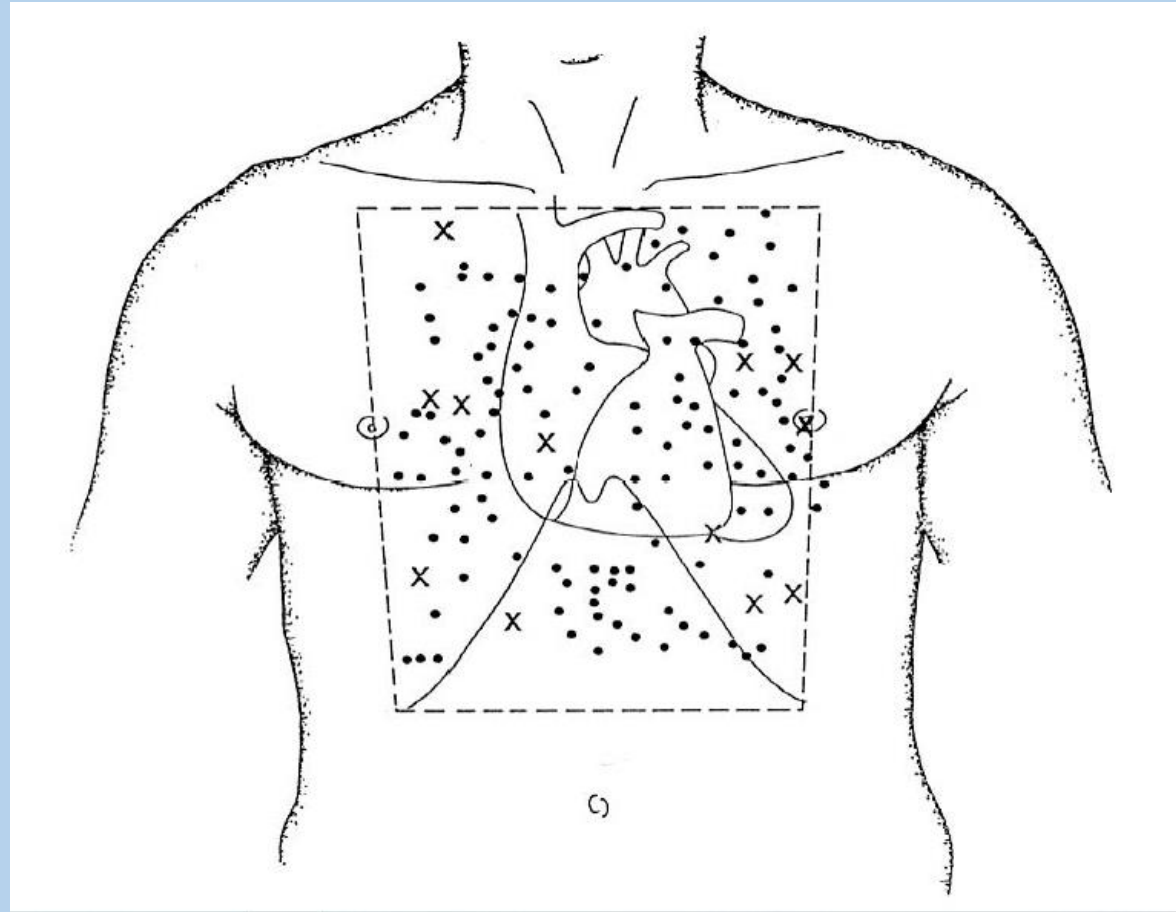


# PROPOSED EVALUATION FOR BCI



\* *Persistent hypotension warrants echocardiography*

# Penetrating cardiac trauma



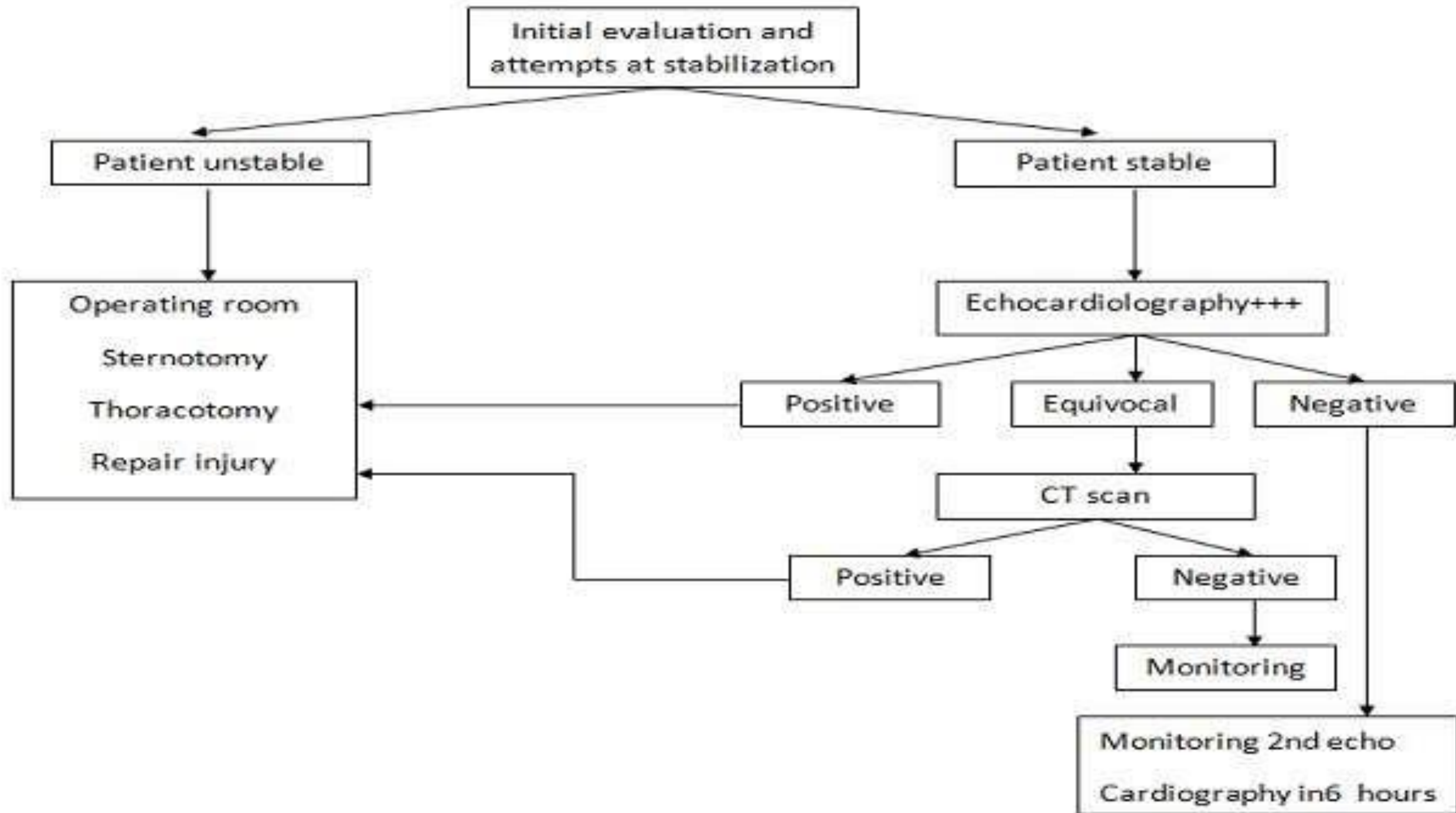
# Penetrating cardiac injury

- Most frequently occur with trauma to the anterior chest. But, may occur with trauma to the upper abdomen, chest, back and neck.
- Majority of the injuries are anteriorly located and on the right side of the heart.

Right ventricle (RV).....	43%
Left ventricle (LV).....	33%
Right atrium (RA).....	14%
Left atrium (LA).....	5%
Coronary artery involvement.....	3.1-4.4%

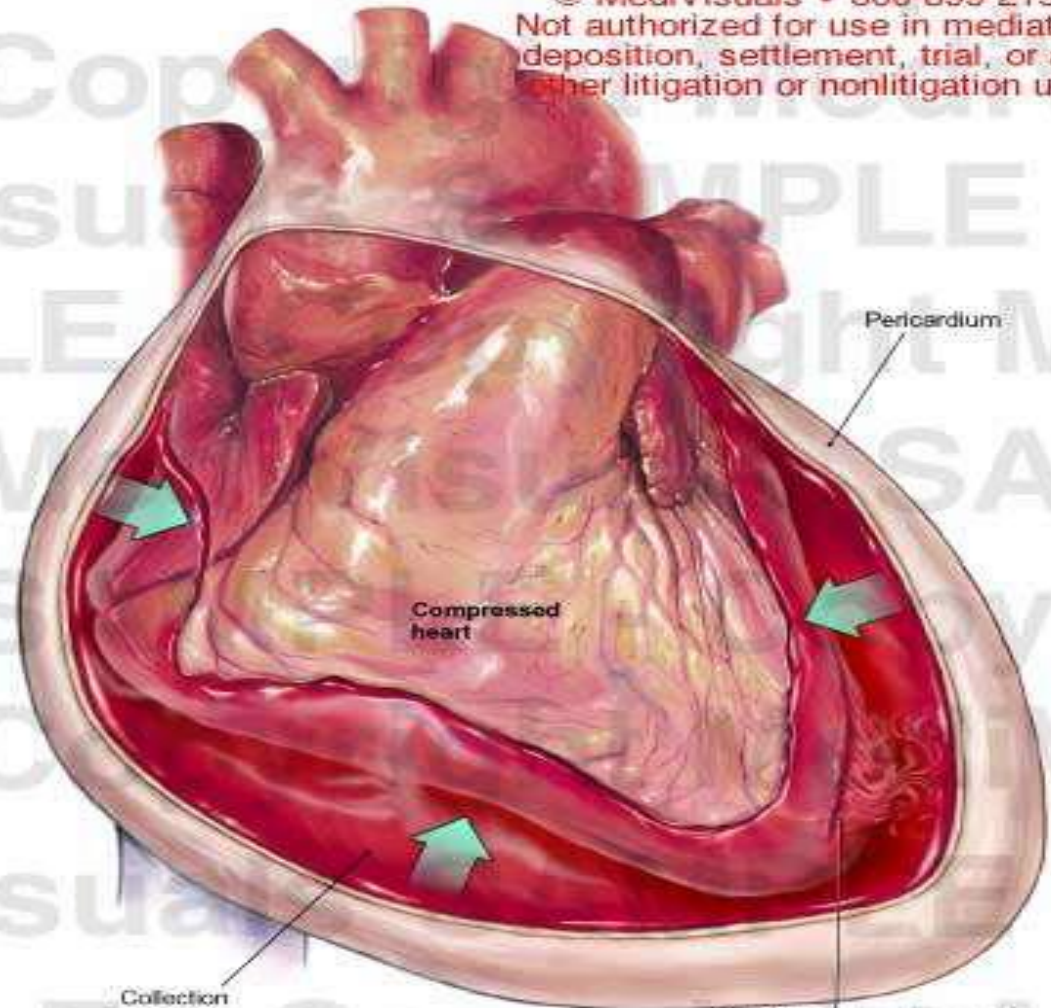
# Location Pearls

- Right heart > Left heart
- Left heart valves > Right heart valves
- Rupture: Atria > Ventricles

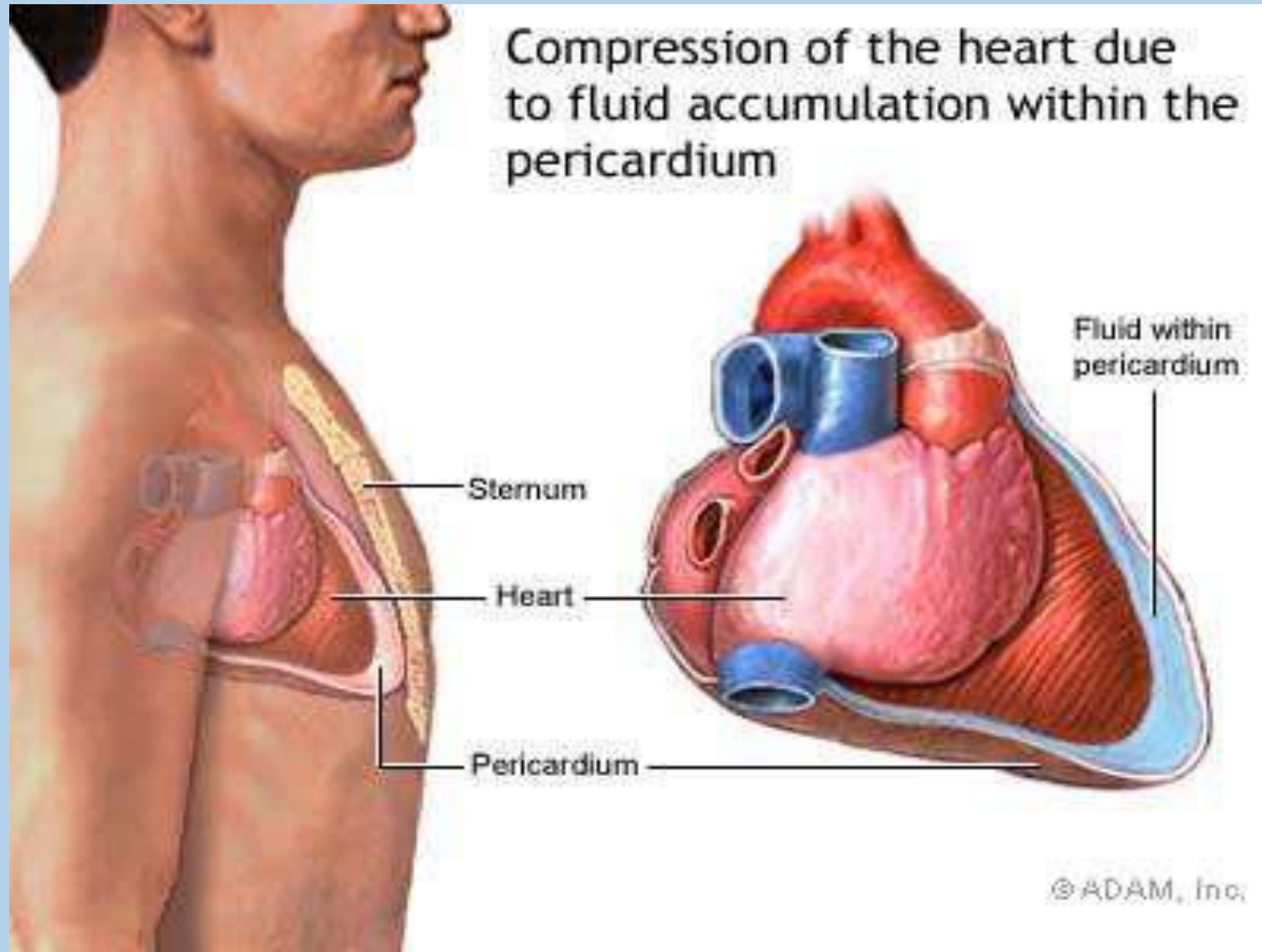


# Pericardial Tamponade

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# Pericardial tamponade



# Pericardial Tamponade

- Penetrating Trauma

Blood and fluids leak into the pericardial sac which surrounds the heart.

As the pericardial sac fills, it causes the *sac to expand* until it cannot expand anymore.

Once the pericardial sac *can't expand anymore*, the fluid starts putting *pressure on the heart*. Now the heart can't fully expand and can't pump effectively.

With poor pumping the *blood pressure* starts to drop ; The *heart rate* starts to increase to compensate but is unable. The patient's *level of consciousness* drops, and eventually the patient goes in *cardiac arrest*.



# S/S of Pericardial Tamponade

- Distended Neck Veins
- Increased Heart Rate
- Muffled heart sound
- Respiratory Rate increases
- Poor skin color
- Hypotension

*Beck's Triad... Low BP, Raised venous pressure,  
Muffled Heart sounds*

- *Others*

*Pulsus paradoxus*

*Kussmaul's sign* : paradoxical inspiratory distension of neck veins upon expiration



# pericardial tamponade

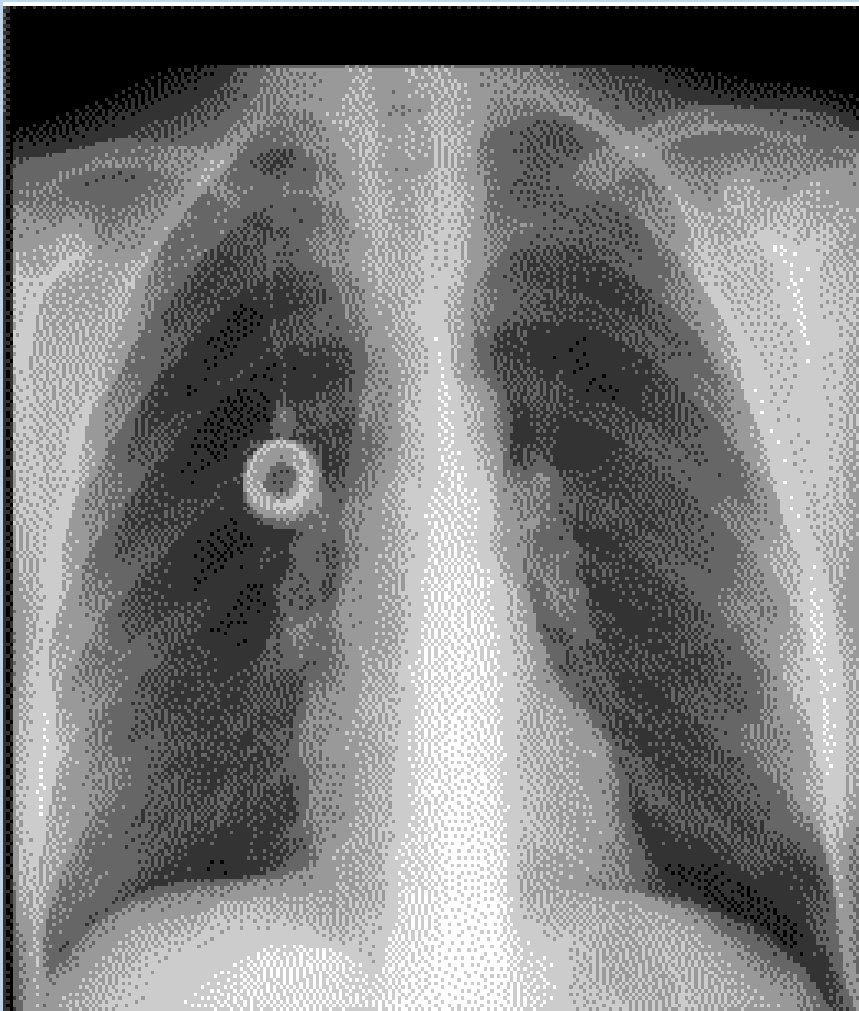
- All the pts with penetrating injury anywhere near the heart + Shock  
-----> Always suspect cardiac injury and tamponade.
- Must be differentiated from Tension pneumothorax.
- In case of major bleeding from other site, neck veins may be flat.

# Diagnosis

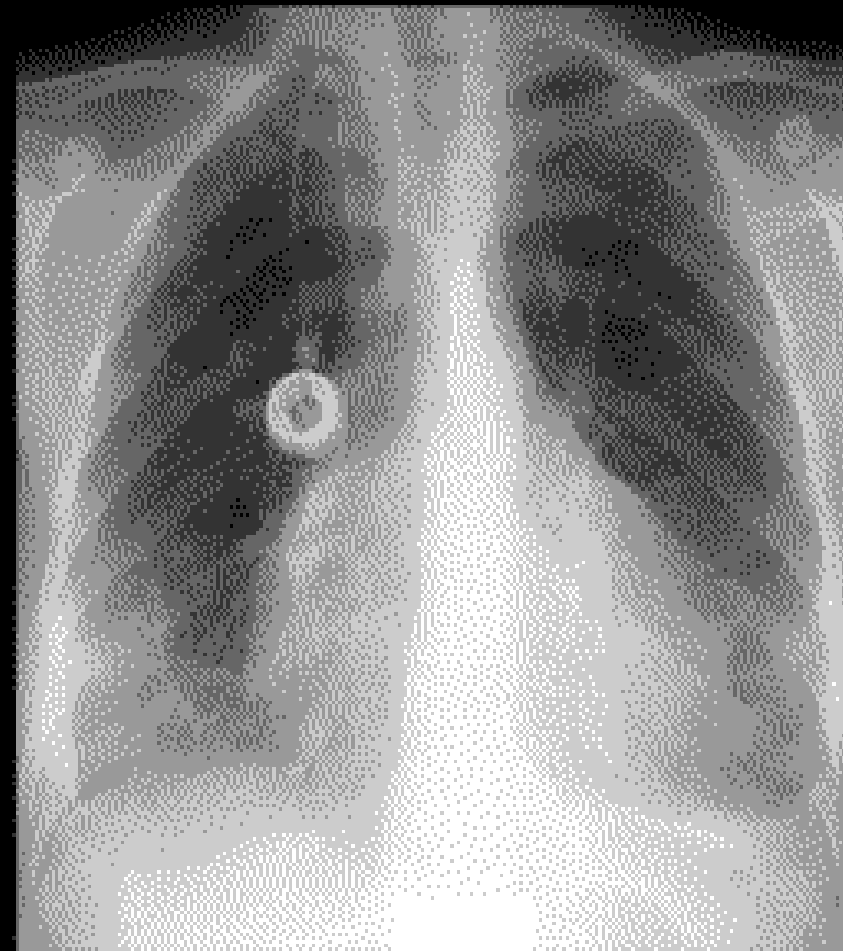
- *Clinical suspicion*
- *CXR*... enlarged Globular heart shadow
- *Echo*.... Fluid in pericardial sac
- *Central venous pressure*... high
- *CT scan*.... Fluid in pericardial sac

CXR : Mediastinal widening



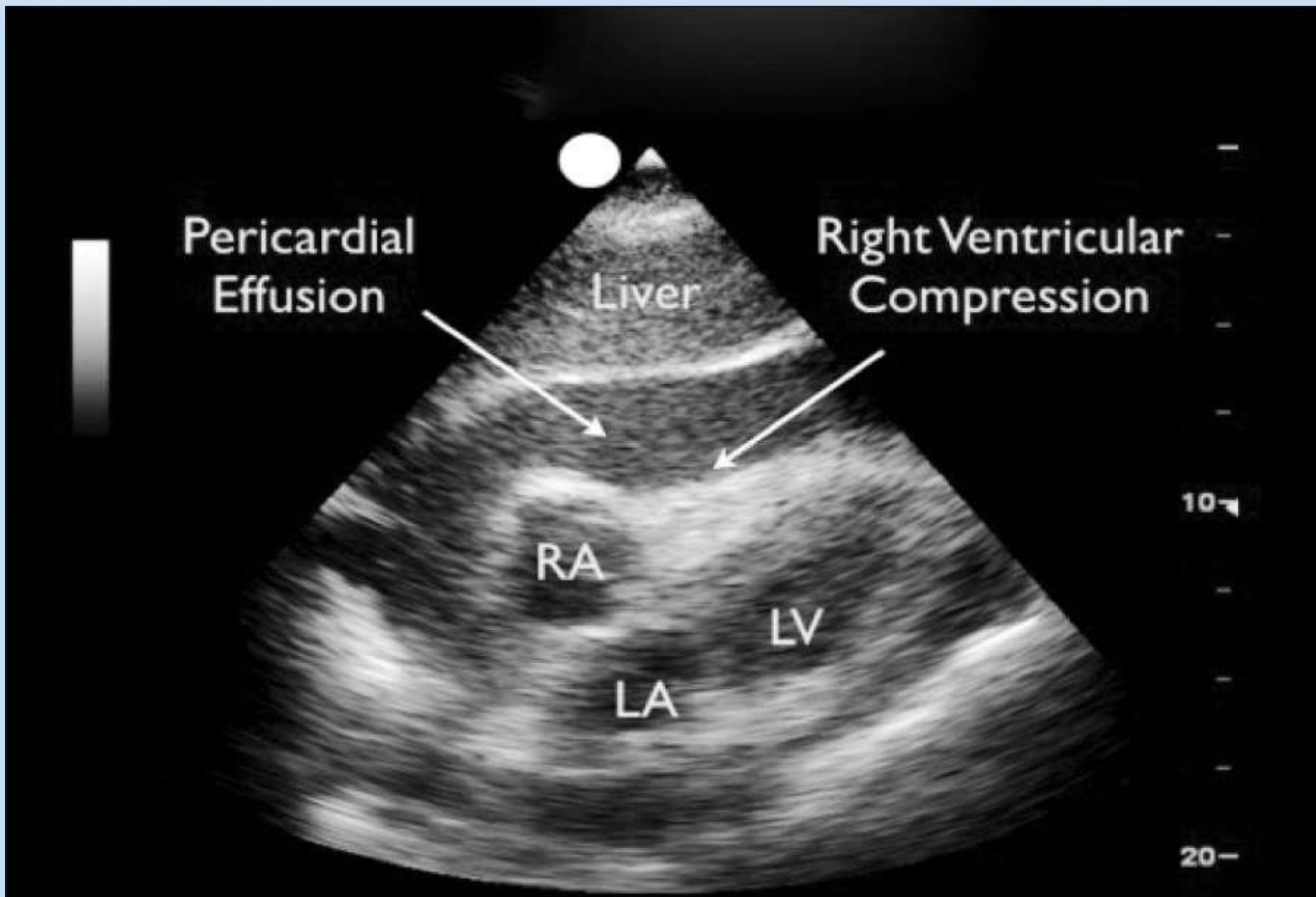


**Normal shaped heart**



**Globular shaped heart  
from pericardial fluid**

(same patient, 2 months apart)



CT scan : Round pericardiac fluid



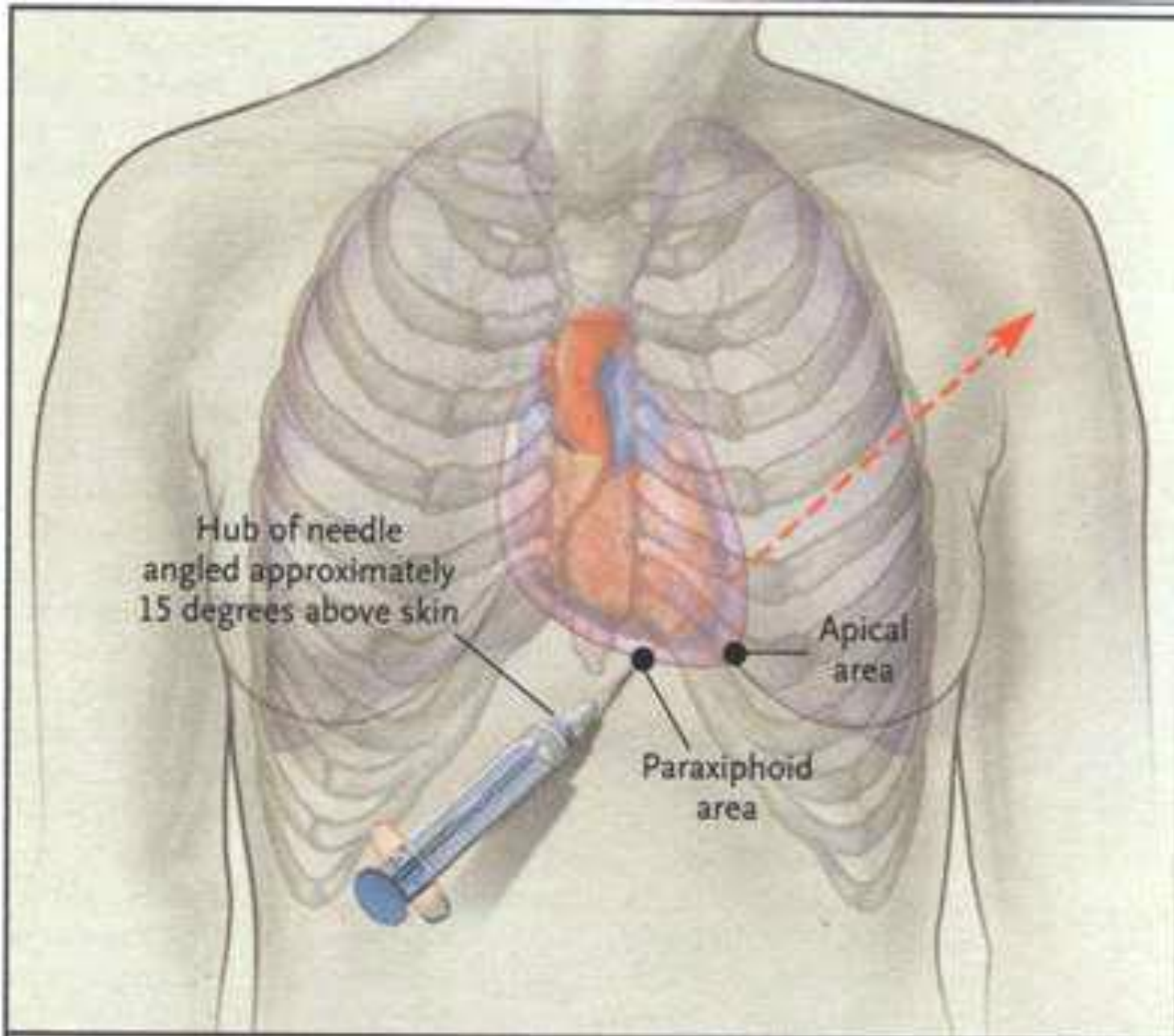


# Treatment of Pericardial Tamponade

- ABC's with c-spine control as indicated
- High Flow oxygen
- Treat S/S of shock
- *Rapid Transport*
- What patient needs is *Pericardiocentesis*

# Pericardiocentesis

- Using aseptic technique, Insert at least 3" needle at the angle of the Xiphoid Cartilage at the 7th rib
- Advance needle at 45 degree towards the clavicle while aspirating syringe till blood return is seen
- Continue to Aspirate till syringe is full then discard blood and attempt again till signs of no more blood
- Closely monitor patient due to small amount of blood aspirated can cause a rapid change in blood pressure



# Definitive treatment

- Sternotomy
- Left Thoracotomy

# INDICATIONS FOR THORACOTOMY

- Post-traumatic cardiovascular collapse
- Pericardial tamponade
- Vascular injury to the thoracic outlet
- Control of hemorrhage from lung injury
- Massive Air leak
- Proved tracheobronchial injury
- Internal cardiac massage

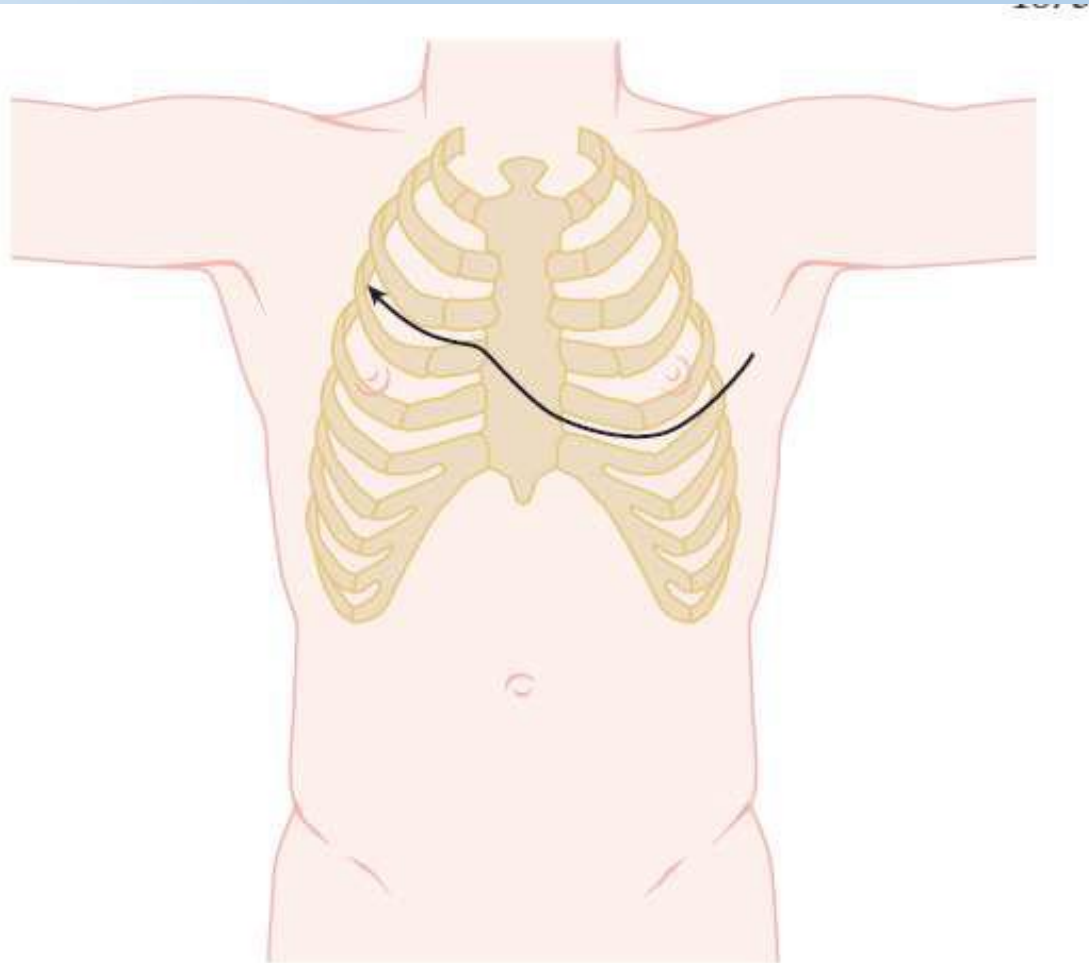
# Types of thoracotomy

- Emergency / Resuscitative Thoracotomy ;  
For bleeding control.

- Planned Thoracotomy ;  
For repair of specific injury

# Left anterolateral Thoracotomy

- Lt lung and hilum
- Thoracic Aorta
- Origin of Lt Sub clavian artery
- Lt side of the heart
- Lower esophagus



## left anterolateral thoracotomy

### Access:

- pericardium and heart
- exposure for aortic cross clamping

**FIGURE 76-1** Left anterior thoracotomy (extension across the sternum if required). See text for details. (Redrawn from Baylor College of Medicine, 2005.)



# Surgical intervention

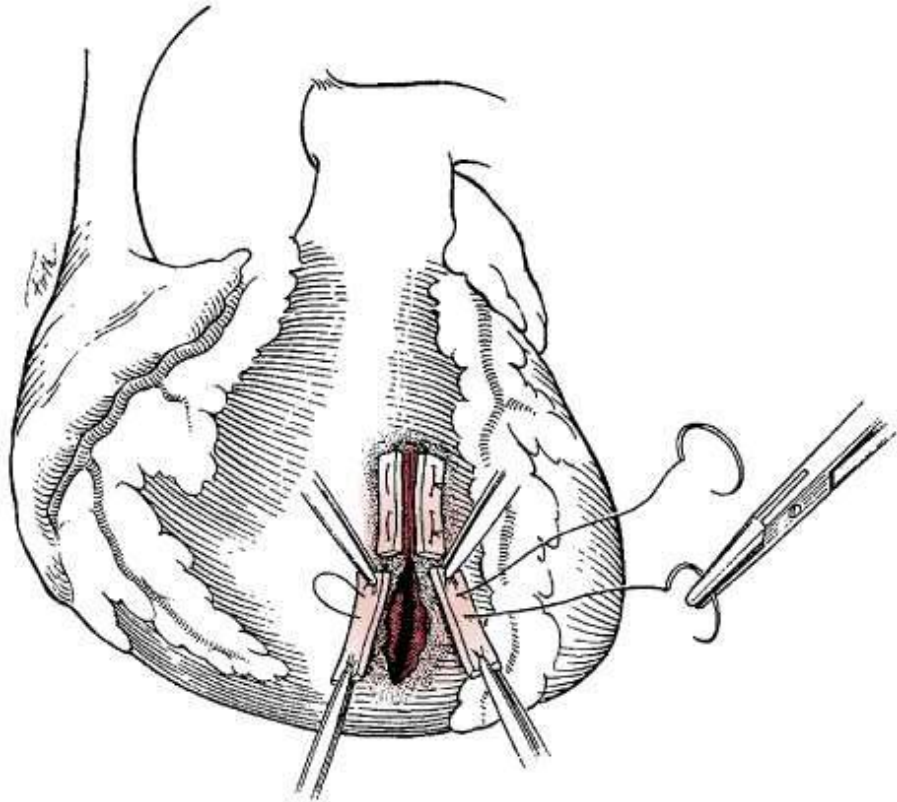
- Penetrating trauma to the chest in an unstable patient is an indication for thoracotomy and possible cardiorrhaphy.
- The ventricles are involved in 80% of penetrating cardiac wounds.
- Once a cardiac wound is identified, hemostasis should be obtained quickly with a finger or Foley catheter while closure materials are prepared.
- method than the traditional approach using suture with pledgets.

# Thoracotomy

- Incision is given in either the fourth or fifth intercostal space. In men, this location corresponds to the area inferior to the nipple; in women, the inframammary fold can be used as a landmark.
- The incision should begin just lateral to the sternum on the left and continue to the midaxillary line.
- Confine the incision to the inferior border of the intercostal space throughout its course. This ensures wide exposure with the rib spreader through a single intercostal space and decreases the possibility of injuring the neurovascular bundle

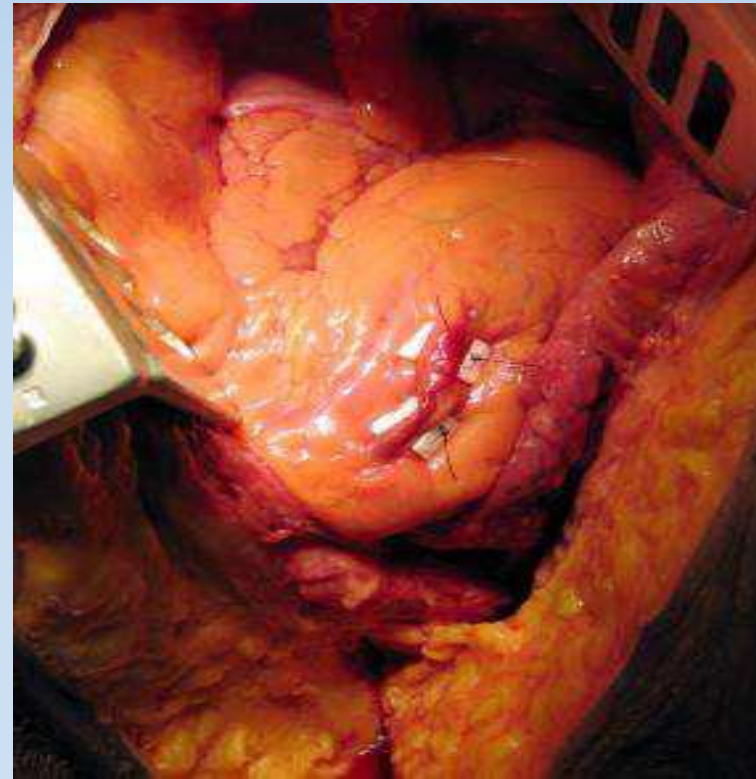
- Once a laceration is found, simple use of a monofilament suture (eg, 2-0 Prolene) can be used.
- Pledgets are used to prevent further injury to already friable myocardium.
- To begin cardiorrhaphy thread nylon suture through the Teflon pledget, and place a horizontal mattress suture across the laceration.

- Identify the pericardium and make a longitudinal opening in the pericardial sac anterior to the phrenic nerve.
- Avoid the phrenic nerve, which runs vertically along the lateral border.
- If cardiac tamponade is present, a gush of blood ensues after the initial opening is made.



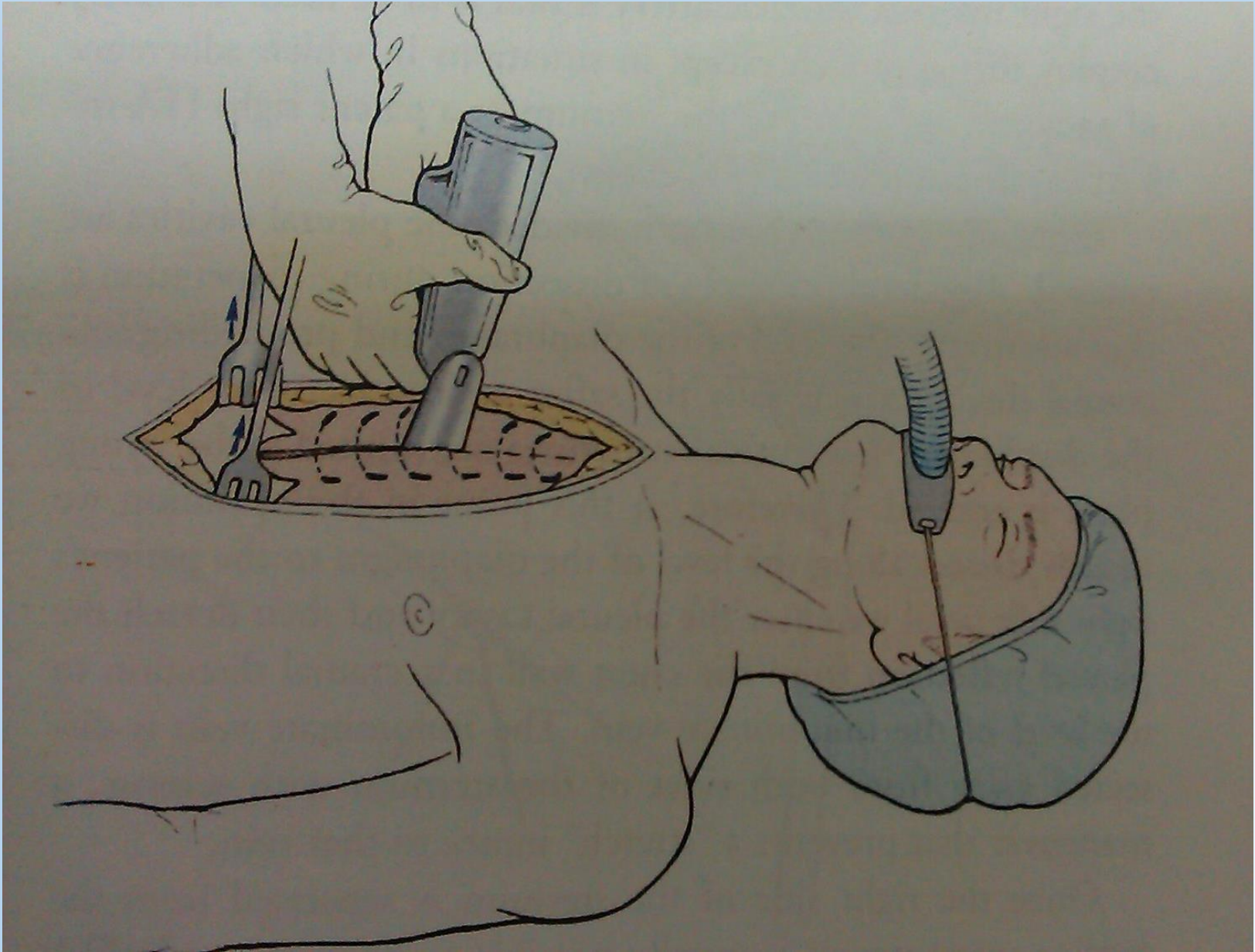
Source: Feliciano DV, Mattox KL, Moore EE: *Trauma*, 6th Edition:  
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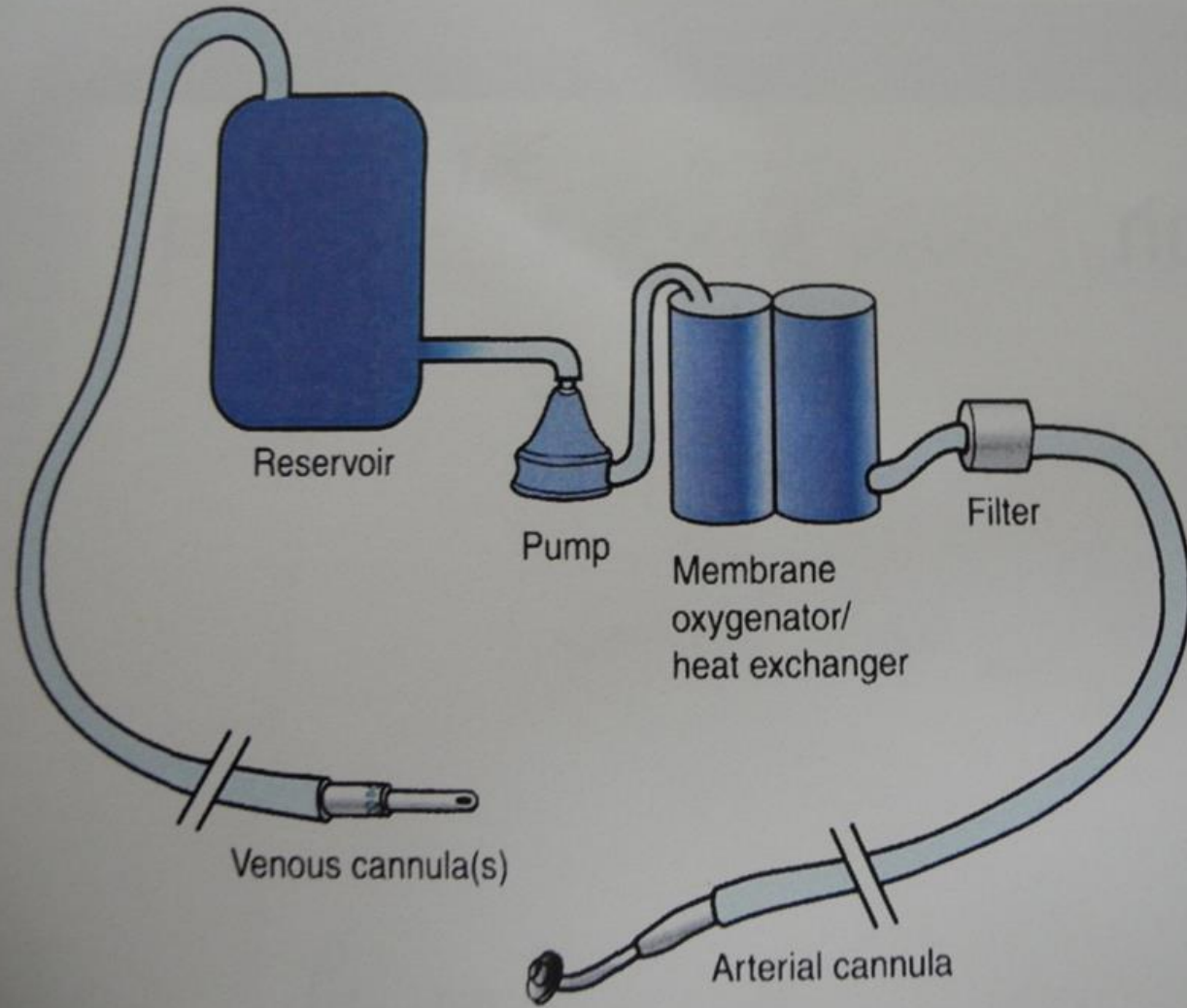


# Median Sternotomy

- Anterior aspect of the heart
- Anterior mediastinum
- Ascending and arch of aorta
- Pul arteries
- Trachea.. Carina



Part 2 / Perioperative/Intraoperative Care



**FIGURE 12-1**  
membrane ox



