SCIENTIFIC ASSEMBLY
SEATTLE, WASHINGTON

Echocardiography Skills Lab

Echocardiography is rapidly making its way to the ED bedside to assist in emergency assessment of patients in undifferentiated shock. Exclusion of cardiac tamponade and assessment of normal cardiac function are essential in ruling out primary cardiac etiologies for shock. Normal models will allow the participant to become familiar with the basic views of echocardiography. (This lab is limited to 25 participants.)

- Describe methods for obtaining the basic echocardiographic views.
- Recognize normal cardiac function and anatomy.

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3:00 PM - 4:50 PM
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(+)No significant financial relationships to disclose

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ACEP 2005

Emergency Echocardiography and the Hypotensive Patient

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Cases

- 29 year old female with lupus presents with sudden onset of acute SOB. She can't lay down. She is in obvious distress. BP 70/p HR 130
- 59 year old male presents with syncope. He is non english speaking. He points to his epigastric and chest area. EKG is normal except for sinus tachycardia. BP 70/p HR 130
- 48 year old male present in full cardiac arrest. He lost vital signs enroute 1 minute ago.

Introduction

- Bedside ultrasound has ben used by emergency physicians since the 1980's.
- Focused emergency echocardiography is a accepted component of emergency ultrasound
- Primary application is detection of significant pericardial effusion and qualitative cardiac activity
- Emergency echocardiography has important role in evaluation of hypotensive patient

Equipment

- Most ED ultrasound units can evaluate for primary echo application
- Small curvilinear or phased array transducer are preferred
- 3.5-5.0 MHz transducer is preferred
- Sophisticated software with doppler and color flow not needed for ED applications

Technique

There are 4 primary scanning planes for ED applications. Formal echo may have 6-7 planes.

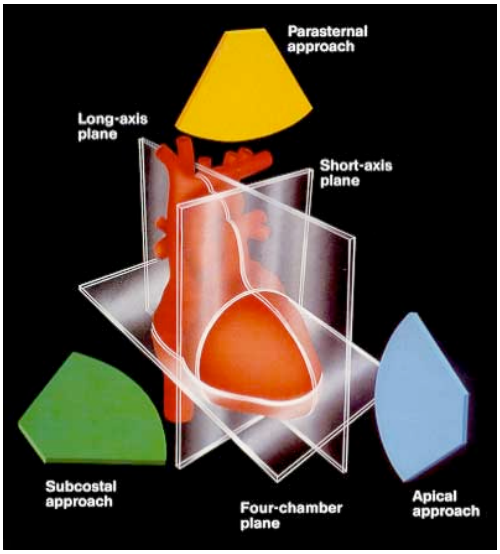
Special note: For echo applications, the position marker on the monitor is on the RIGHT. This is different than other ED scanning protocols where it is on the left. This is the cardiology convention. This will place the heart in the accepted orientation on the monitor.

Parasternal long axis-PLAX

Parasternal short axis-PSAX

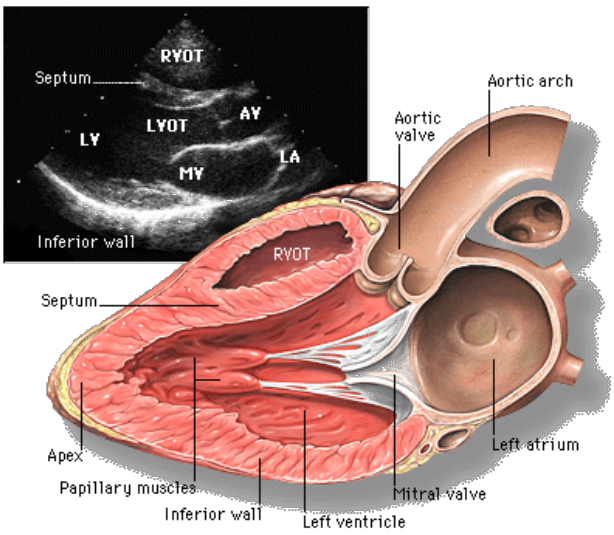
Apical 4 chamber

Subcostal



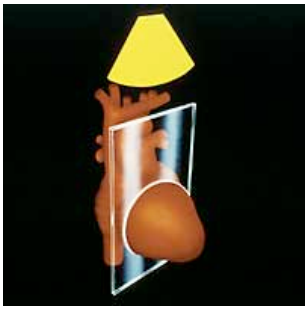
1. Parasternal long axis

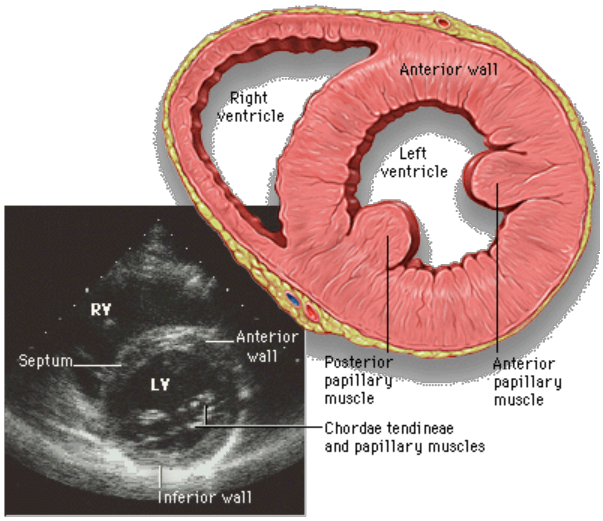
- Transducer at 2nd-4th ICS to the left of the sternum. Point transducer position marker towards the right shoulder
- This is the single best view. It gives the most information.



2. Parasternal short axis

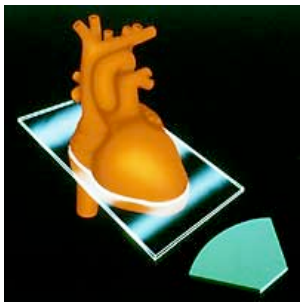
- Transducer remains at 2nd-4th ICS to the left of the sternum. Rotate transducer 90 degrees with the position marker towards the left shoulder. Slowly fan the transducer to scan from the base to the apex of the heart.
- Obtained best after obtaining the long axis view.

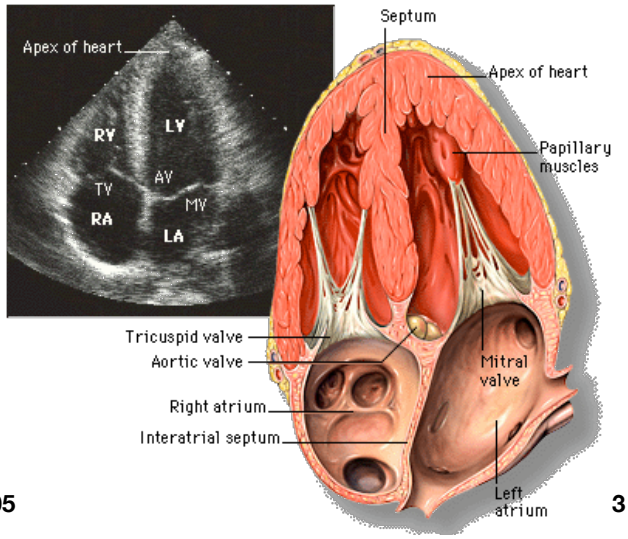




3. Apical 4 chamber

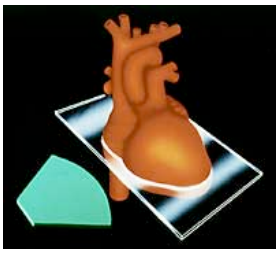
- Patient should roll 30 degrees to their left. Transducer is placed at the PMI and aimed at the right shoulder..
- Patient needs to be stable.
- Best overall view of the heart. Good approach for pericardiocentesis.

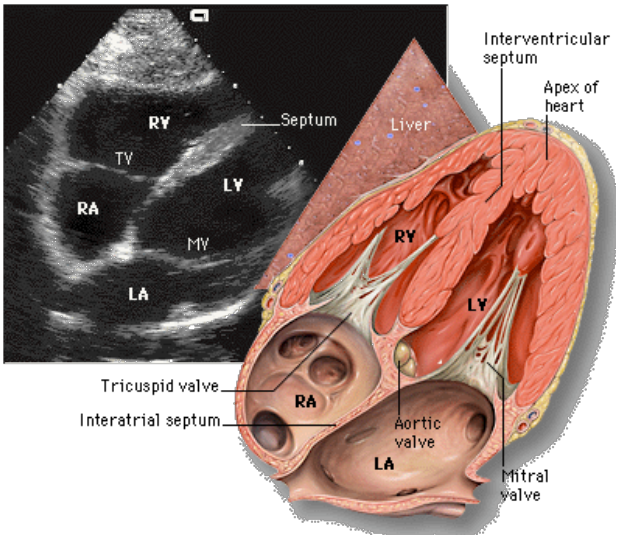




4. Subcostal

- Place transducer below xyphoid process in transverse orientation. Push down to obtain view.
- A modified 4 chamber can be seen.
- View is variable depending on patient size and abdominal tenderness





Emergency Application

Cardiac arrest

Incorporated into resuscitation. View heart directly.

Detect organized cardiac activity=good thing!

Detect absence of any cardiac activity=bad thing!

PALX give most information since LV, aortic valve and mitral valve can be viewed in the same plane. Observe for organized activity amongst valves and LV.

View PEA vs Pseudo PEA

Tamponade-Fluid in pericardium

Pulmonary Embolus-large RV

Hypovolemia-empty LV

Pericardial Effusions

Trnasudative-CHF, hypoalbuminemia

Exudative-Uremia, malignancy, infection, post radiation

Hemorrhagic-trauma, dissection, free wall rupture post MI

Echocardiagraphic finding of effusion

Fluid is easier to see

Fluid is anechoic or black

Fluid will collect in the far field or posteriorly. Look there first.

Will will move to near field or anterior

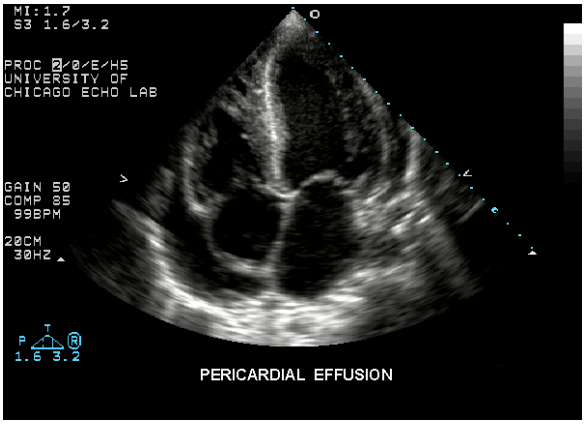
Isolated anechoic signal anteriorly can be fat and not fluid.

Quantitative measurement of fluid

< 1cm posterior-small

<1cm circumfrential-moderate

>1 cm circumfrential-large



Tamponade

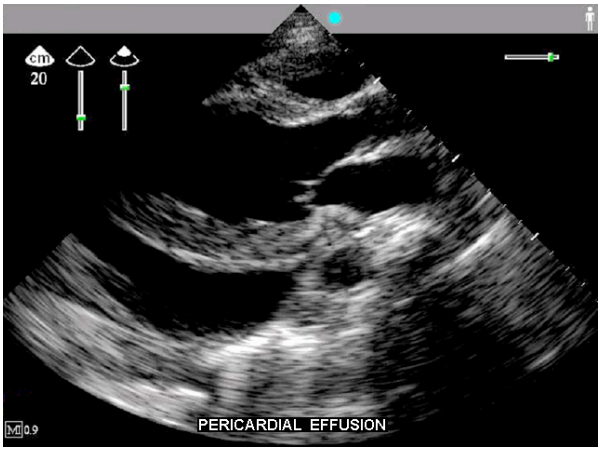
Physical findings unreliable

Echo will precede physical exam findings

Diastolic collapse of RV

LV collapse can occur as late finding

IVC dilatation due to increased venous pressure



Pericardiocentesis

Echo eliminates the need to perform a subxyphoid approach which places the needle too close to heart, pierces the live, and is completely blind.

Echo allows for guided and safe approach

Locate area of maximum fluid collection

Cardiac ischemia

Very helpful exam but quite technical. Generally only performed by a cardiologist.

Wall motion abnormalities have good predictive value for ACS

More advanced training is required

Shock

Hypovolemia

Small LV

Hyperdynamic activity

Obstructive

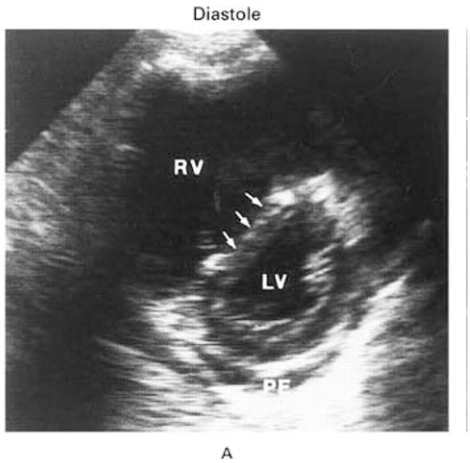
Dilated RV in PE

RV collapse in tamponade

IVC dilation

Distributive

Hyperdynamic LV though good LV size



Cardiogenic

Dilated LV

Hypokinetic

IVC Dilated

CVP measurement

IVC visualization can give rough estimate of CVP

View IVC as it passes diaphram through liver

Sniff test-have patient take forced inspiration while viewing IVC

If >50% collapse then CVP <10mm Hg

If <50% collapse then CVP > 10mm Hg

If IVC does not collapse at all then IVC pressure is significantly elevated

Emergency Pacing

Detect mechanical capture

observe pacer tip in RA/RV

Use ultrasound to place line also

Undifferentiated Hypotensive Exam (UHP)

Protocol derived as a component of the emperic approach to hypotensive patient

Looks for readily reversible causes of hypotension that can be

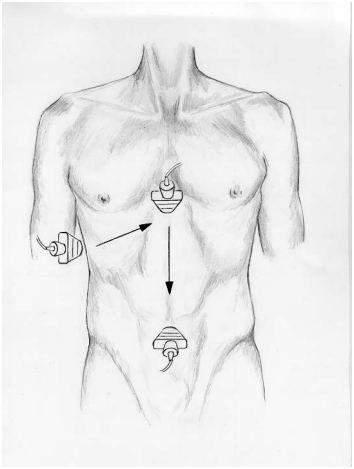
detected with ultrasound

3 views

Limited echo,

RUQ for hemoperitoneum

Short axis of aorta



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