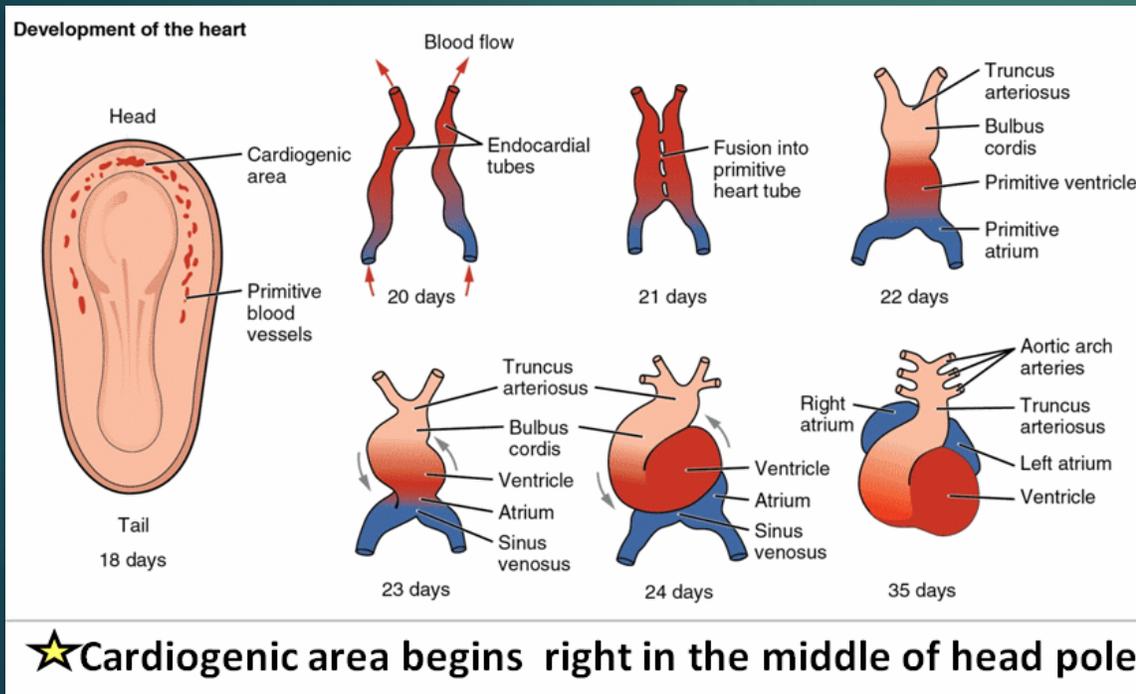


Fetal Echocardiography

BY: MOLLY MCCAIN

Fetal Heart Development



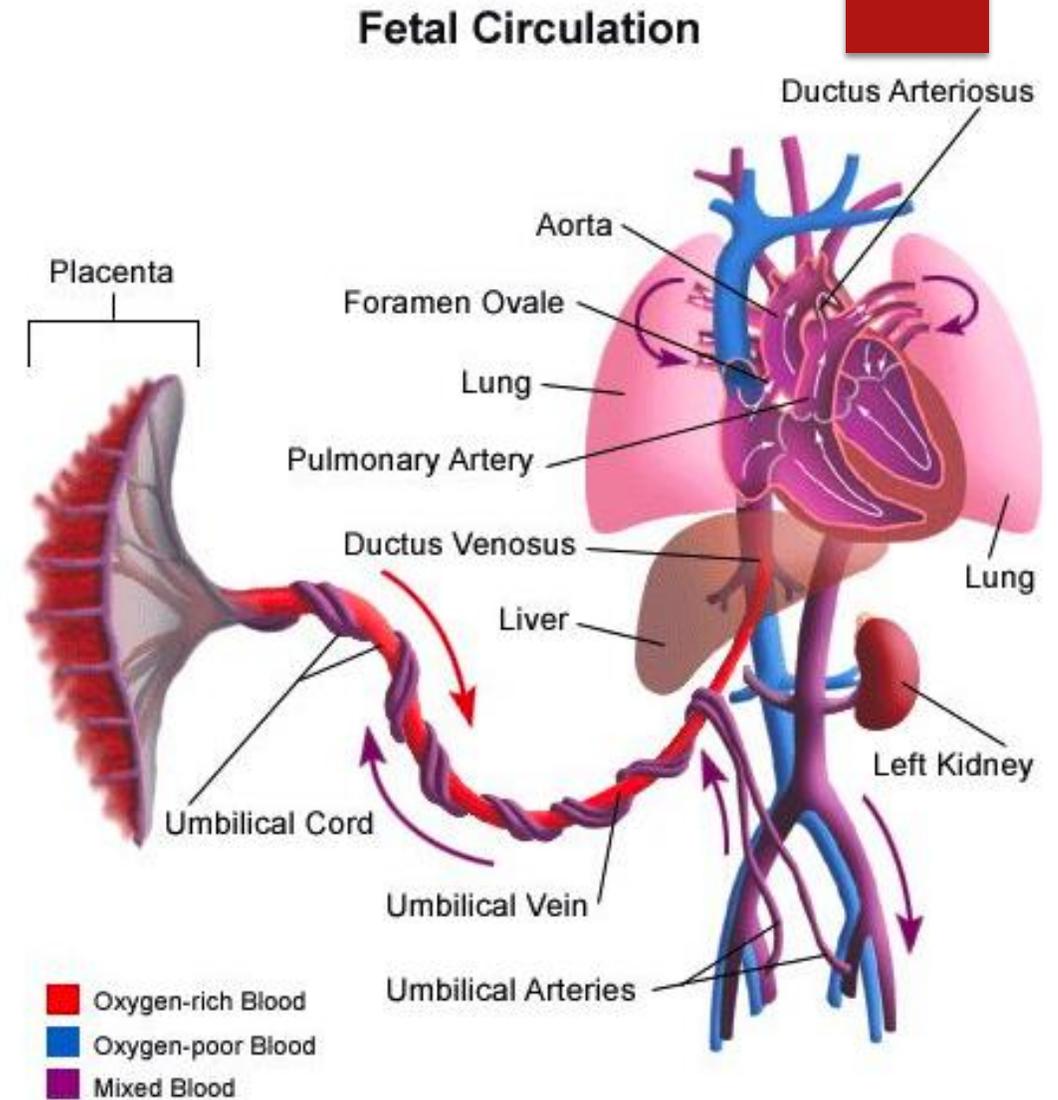
- ❖ The fetal heart is the first functional organ to develop!
- ❖ At 18-19 days the heart forms from mesoderm
- ❖ The heart begins development at the cardiogenic area.
- ❖ The tubes fuse on the 22nd day to form the primitive heart tube.
- ❖ The heart tube loops and separates into the four chambers and paired atrial trunks to form the heart.

Fetal heart development contin.

- ❖ The bulbus cordis forms part of the ventricles
- ❖ The sinus venosus connects to the fetal circulation
- ❖ The heart tube then becomes the left and right asymmetry of the body.
- ❖ Septa form from within the ventricles and atriums.
- ❖ By the end of the 8th week gestation, the heart has COMPLETELY FORMED!

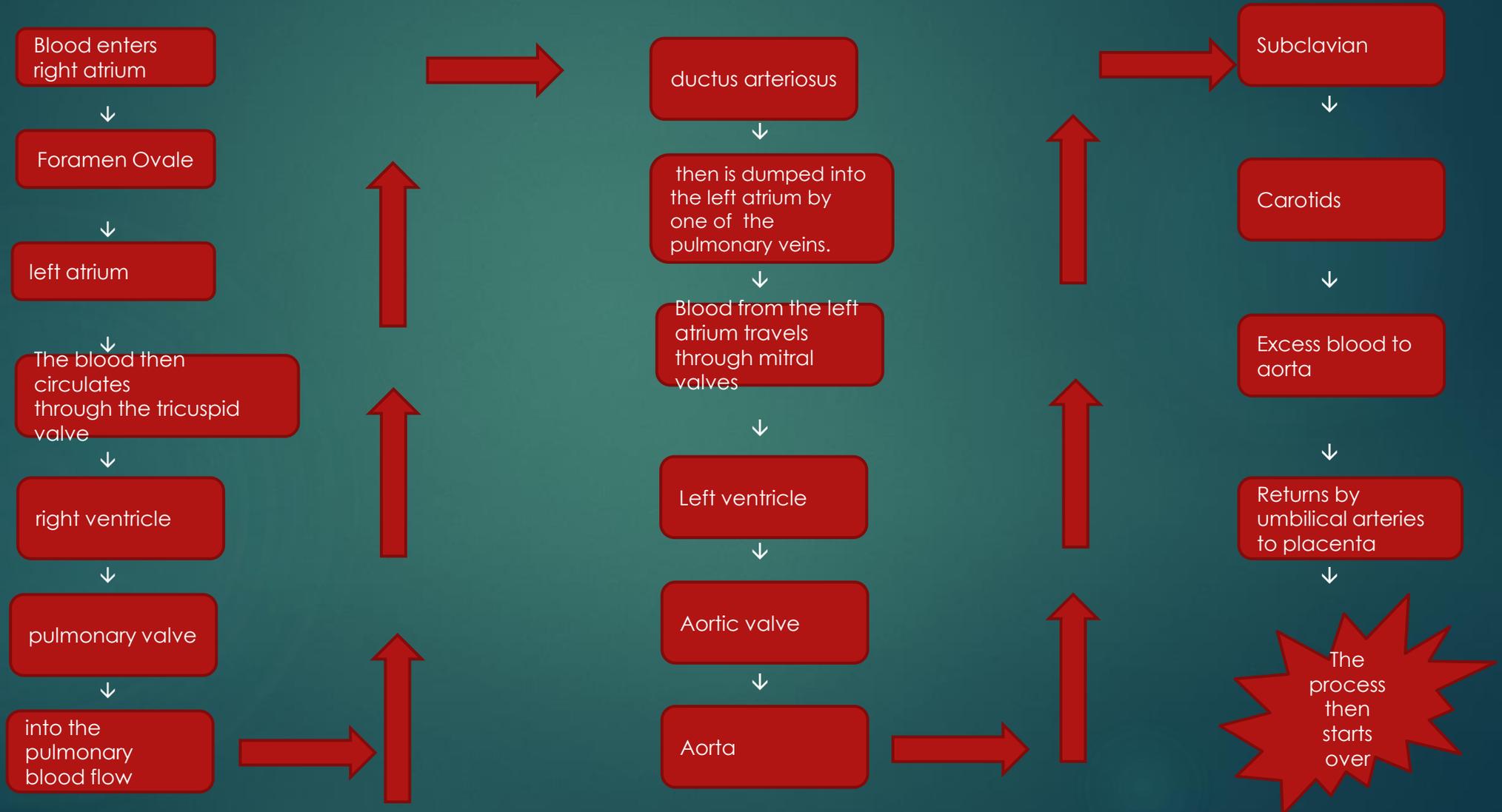
Fetal Circulation

- ❖ The fetal circulatory system has 3 shunts:
 - ❖ Foramen ovale- shunt that allows oxygenated blood to bypass the liver.
 - ❖ Ductus venosus-also allows oxygenated blood to bypass the liver.
 - ❖ Ductus arteriosus-moves blood from the Pulmonary artery to the Aorta.



Fetal Circulation continued

Blood flow:



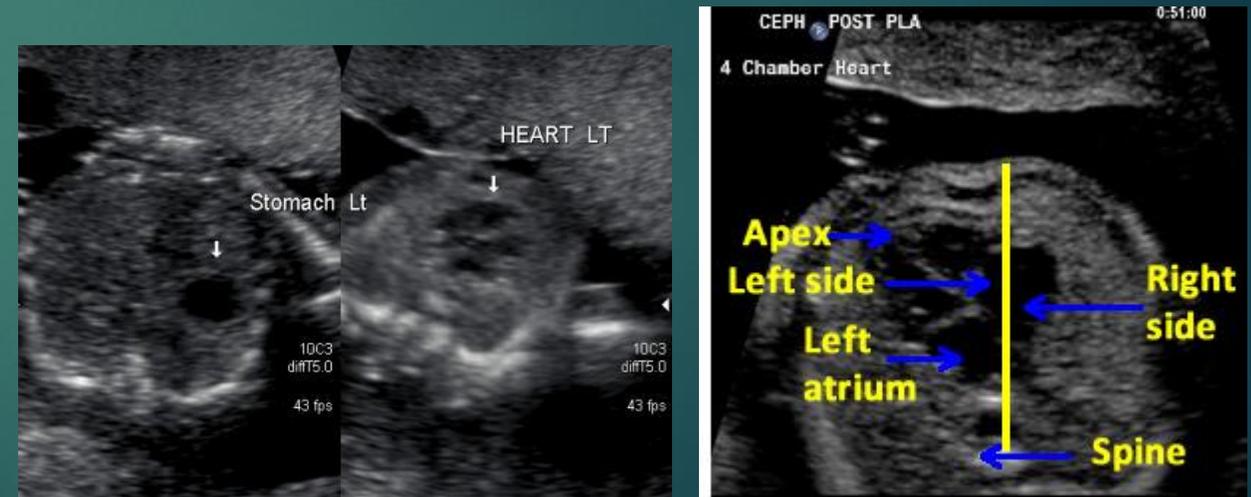
Fetal Heart Assessment

- ❖ 8-22 weeks is when assessment should occur
- ❖ Start by checking for a heart rate while establishing fetal lie (breech, cephalic, or transverse)
- ❖ Image the baby's heart rate using M-MODE. A normal heart rate should be between 120-160 BPM
- ❖ Confirm situs by starting at the abdomen-make sure heart and stomach are on the left side along with confirming the correct fetal lie.

M-Mode:



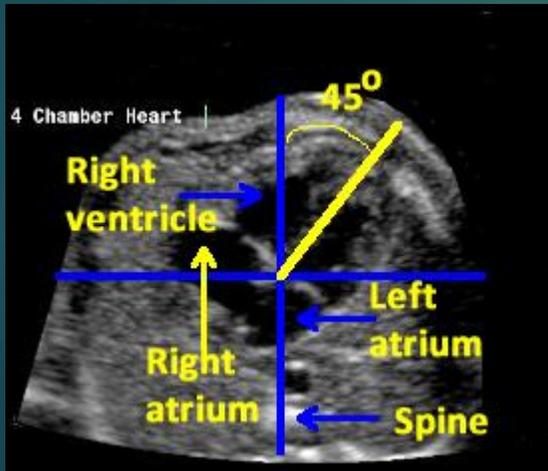
Situs



Fetal Heart Location, landmarks, and Size

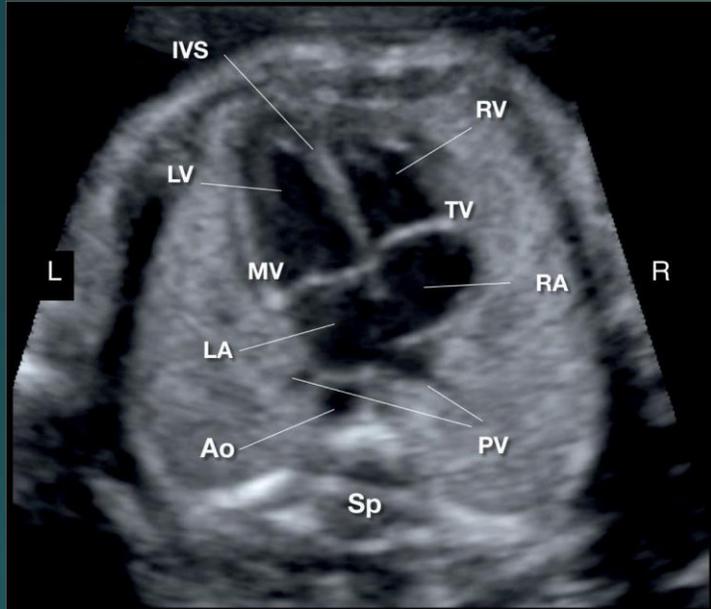
Location: 45 degrees to the left of the anteroposterior line drawn from spine to anterior chest wall

4 chamber heart view landmarks: should include the apex of the heart, superior pulmonary veins, and 1 whole rib.

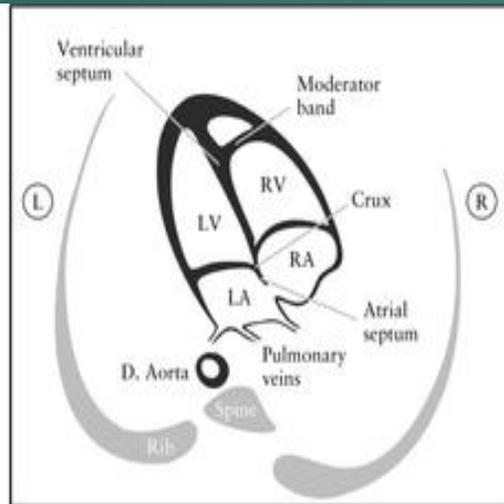
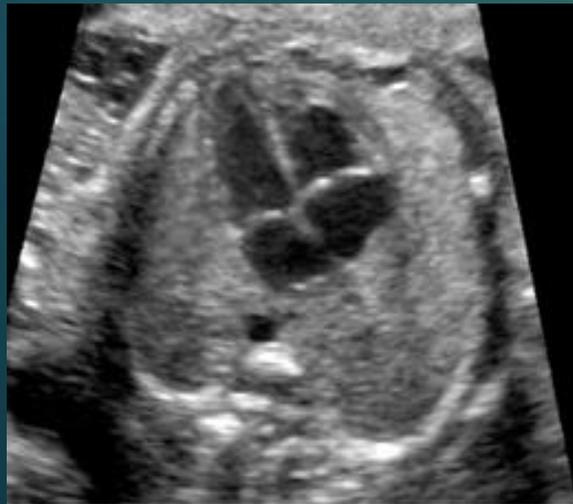


Size: 1/3 of the Thorax.

4 chamber view of the heart



a

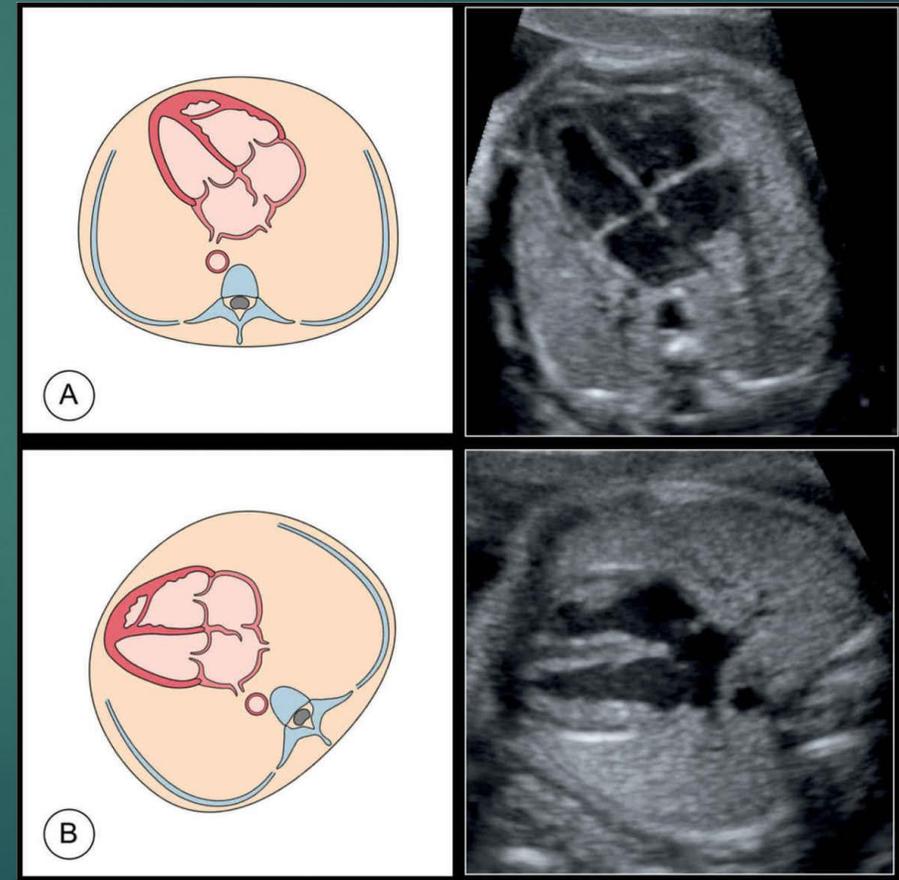
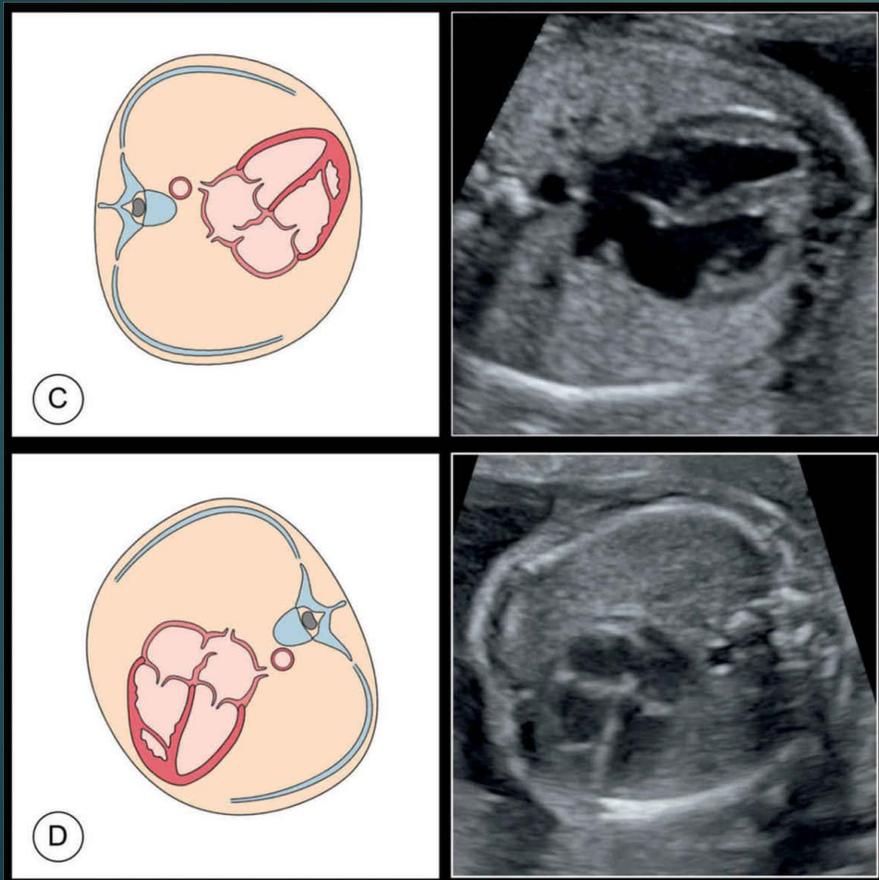


- ❖ This view is considered the most important plane to detect cardiac anomalies such as congenital heart disease.
- ❖ Is obtained with visualization of 1 full rib, apex of the heart, and superior pulmonary veins.

Can be imaged in apical or subcostal view.

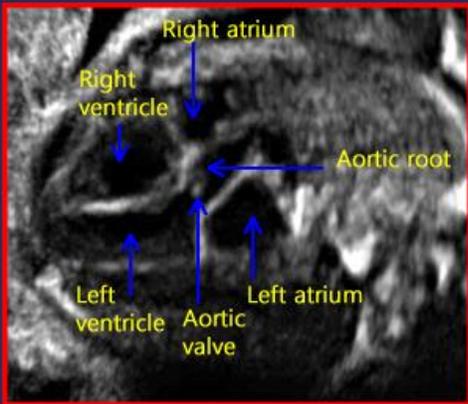
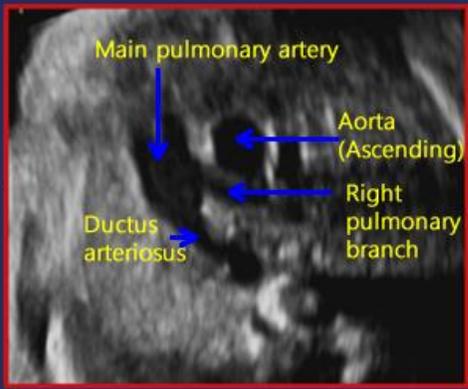
- ❖ **apical view:** transverse of fetal chest allows visualization of right and left atrium left atrium-located close to spine right atrium-located anteriorly
- ❖ Septal defect could occur-dropout
- ❖ **subcostal view:** best way to evaluate the septum.
- ❖ Reduced drop out with this view.

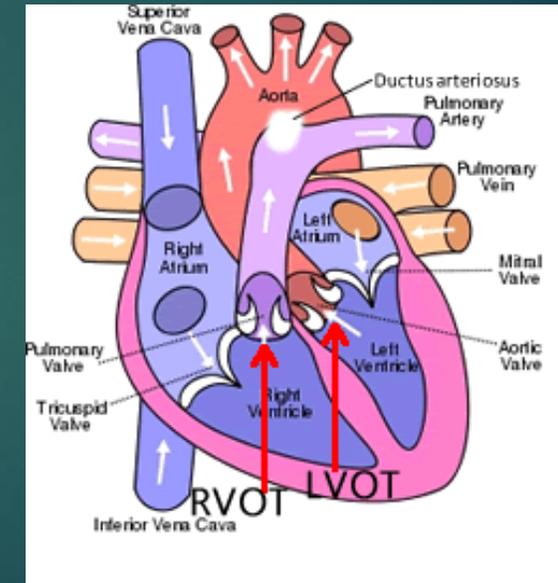
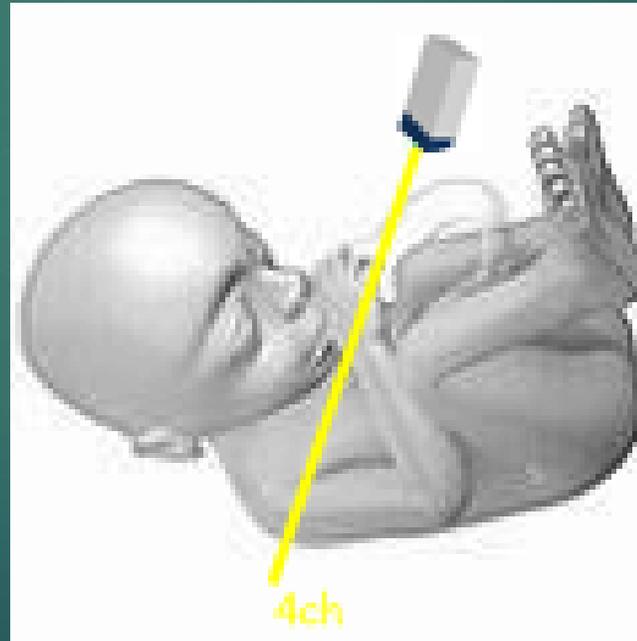
Different views of the heart dependent on baby's position



LVOT & RVOT: How can we achieve these views?

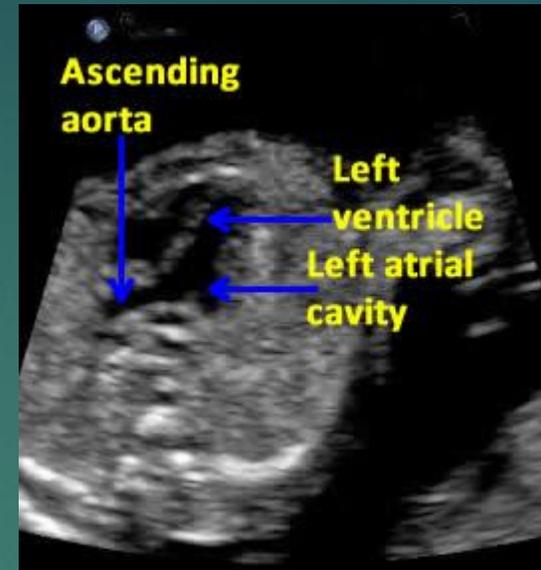
Start by obtaining the 4chamber heart view: then begin angling cranially rather than sliding the probe and the outflow tracts are then easily visualized.

Axial View	Purpose	Ultrasound Findings
Left ventricular outflow tract (LVOT). Sweep transducer from transverse of abdomen to fetal head. In sequence: 4 chamber view then LVOT.	Assess: connection to appropriate ventricle; assess size, position, and arterial valves.	
Right ventricular outflow tract (RVOT). Sweep transducer from transverse of abdomen to fetal head. In sequence: 4-chamber view then LVOT, followed by RVOT.	Assess: connection to appropriate ventricle; assess size, position, and arterial valves.	



LVOT

- ❖ These are long axis views of the aorta
- ❖ There are many ways to obtain this view.
- ❖ One way of obtaining the image:
angling the transducer towards the fetal right shoulder from the 4-chamber view.
- ❖ Another way:
Begin by moving transducer around the fetal thorax until the beam is perpendicular to the interventricular septum.
Then begin to rotate the probe 20-30 degrees to the right of the heart's apex and then angle cranially rather than sliding the probe.



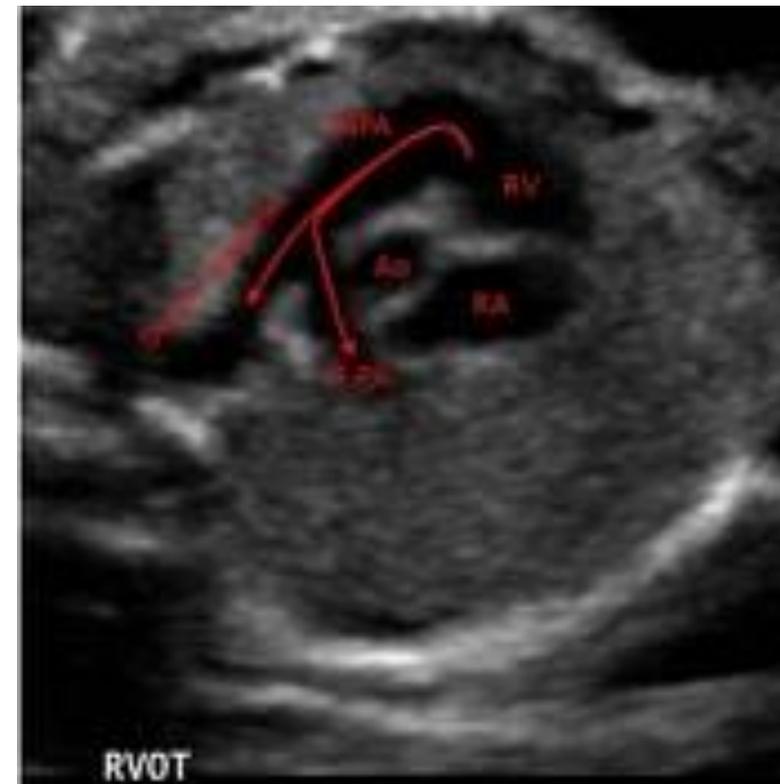
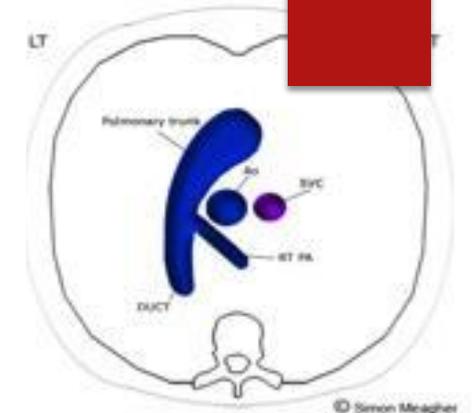
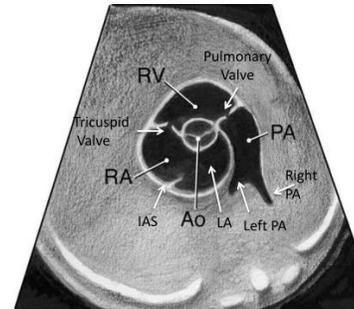
"HOCKEY STICK SIGN"



RVOT

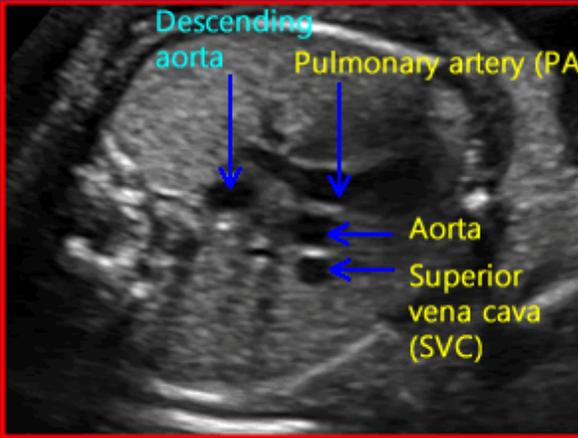
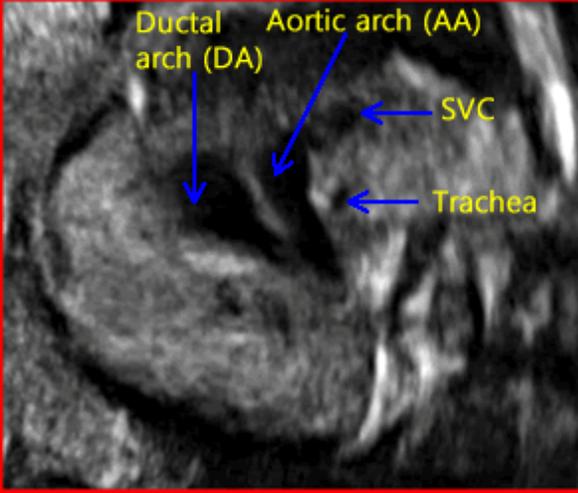
- ❖ This is the long axis of the pulmonary artery.
- ❖ This image can be obtained by angling transducer towards the right shoulder of the fetus.
- ❖ Pulmonary artery course cephalad from right ventricle
- ❖ When LVOT and RVOT criss cross it confirms normal function. Aorta passes over pulmonary artery.
- ❖ Short axis RVOT= angle probe more to the right, creates short axis of ventricles.

SHORT AXIS RVOT



Three Vessel View

- ▶ To obtain this view:
 - ▶ Begin at the RVOT, and keep moving cephalic towards baby's head.
 - ▶ Doing so will land you into the 3 vessel view which includes:
 - ▶ An oblique section of the main pulmonary artery, in cross section of the ascending descending aorta and superior vena cava .
 - ▶ This view assesses the outflow of vessels and the correct location of the superior vena cava.

Axial View	Purpose	Ultrasound Findings
<p>3 vessel view (3VV). Sweep transducer from 4-chamber view towards head in sequence: LVOT to RVOT and then to 3VV.</p>	<p>Defines: pulmonary artery, aorta, and superior vena cava. Defines size, and vascular relationships. PA: largest and most anterior; SVC smallest & most posterior</p>	 <p>Dash, dot, dot → PA, Aorta, SVC</p>
<p>3 vessel + tracheal view (3VT). Sweep transducer from 4-chamber view towards head in sequence: LVOT to RVOT, 3VV and finally to 3VT view.</p>	<p>Defines the transverse aortic arch, & ductal arch in relationship to trachea. Note "V" shaped DA & AA as they form descending aorta.</p>	 <p>DA and AA are to the left of the trachea</p>

References

- ▶ [Heart Embryology- Development of the Heart | Developmental Biology | Microbe Notes](#)
- ▶ [Cardiac Chambers: The Four-Chamber and Short-Axis Views | Obgyn Key](#)
- ▶ [Fetal echocardiography - PubMed \(nih.gov\)](#)
- ▶ [Right ventricular outflow tract view \(fetal echocardiogram\) | Radiology Reference Article | Radiopaedia.org](#)
- ▶ [Normal Fetal Heart Ultrasound | OB Images](#)
- ▶ [Fetal Cardiac US: Techniques and Normal Anatomy Correlated with Adult CT and MR Imaging | RadioGraphics \(rsna.org\)](#)
- ▶ Stephenson, S. and Dmitrieva, J., 2018. Diagnostic Medical Sonography: Obstetrics & Gynecology. 4th ed. Philadelphia: Wolters Kluwer, pp.265-339