Welcome

Welcome to the second newsletter in a series created just for you: sonographers who perform pediatric echocardiograms in primarily adult echo labs. Each issue features tips on echocardiography of congenital heart disease, short case reports, congenital heart center news, and information on upcoming educational programs.

In an effort to be "green," we send this newsletter as an electronic file each quarter. If you or any of your colleagues would like to be on our distribution list, please send an email to:

gregory.b.frary@osfhealthcare.org

Please include your name and facility affiliation.

Copies of all our newsletters can also be accessed on our website at www.childrenshospitalofil.org Click on "Congenital Heart Center" on the right side, then click on "Sonographer Newsletters" on the right side.

We want you to be successful in performing studies even on newborns that may have critical heart disease. After all, prompt diagnosis and emergency treatment will yield the best outcome for our patients. If you have any questions regarding necessary views or anatomy while doing an emergent echo, please call the Congenital Heart Center 800 number and ask to speak with one of the sonographers or cardiologists.

Sonographer Tip

Imaging The Patent Arterial Duct (aka patent ductus arteriosus) (PDA)

During fetal life the mother's placenta is the blood oxygenator. The arterial duct needs to be patent during fetal life. It bypasses the nearly non-functioning lungs and is the main conduit for cardiac output to the systemic circulation. Immediately after birth, the lungs inflate and become the blood oxygenator for the newly born baby. The arterial duct is no longer necessary and usually closes completely within a few days after birth. If the arterial duct remains patent, it will act as a shunt between the systemic and

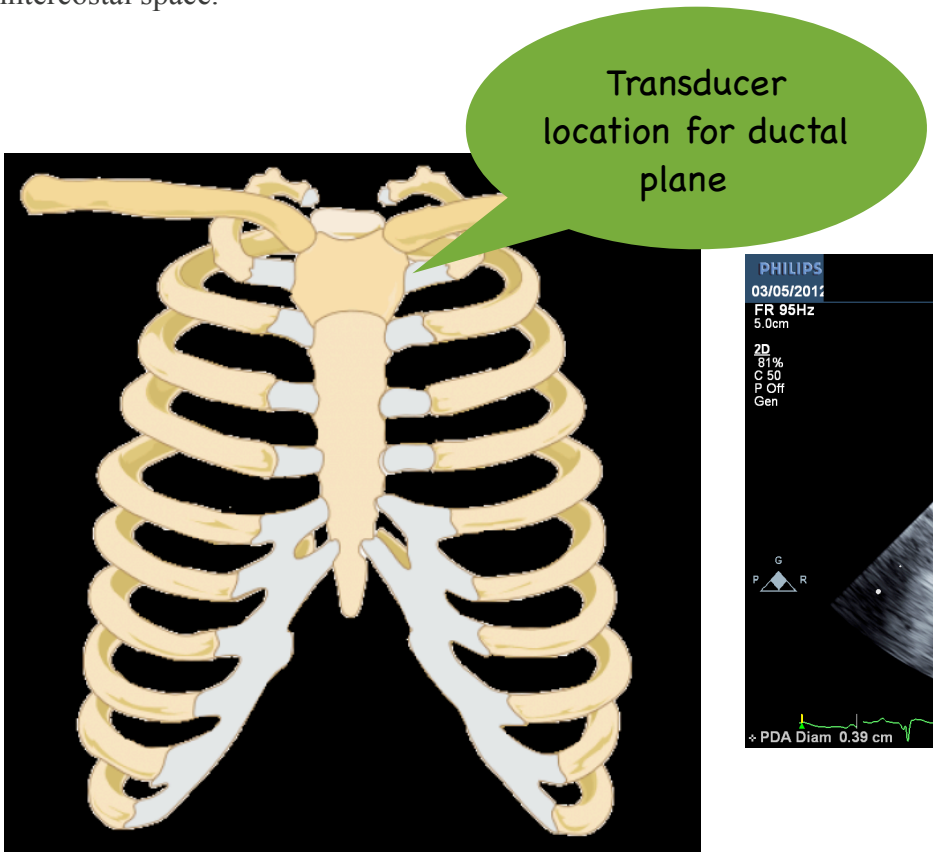
pulmonary circulation causing the lungs to be damaged by too much blood volume and/or pressure. Even though persistent patency of the arterial duct (PDA) is fairly common, especially in premature infants, it is extremely important to be able to assess the existence, size, and hemodynamics of a PDA.

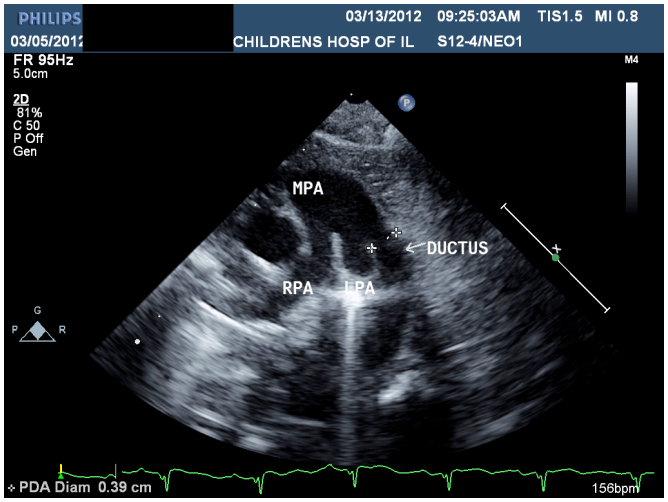
The necessary information that is needed when assessing a PDA is:

1. Ductal Flow velocity
2. Flow direction (Left to Right, Right to Left, or Bi-Directional)
3. Ductal Diameter
4. Flow direction of the abdominal aorta
5. Flow direction of the superior mesenteric artery (SMA).

Even though a PDA may be seen from parasternal and suprasternal imaging windows, its size and function is usually best assessed from the "ductal plane". The ductal plane will allow the best angle to assess flow direction and velocity as well as allow you to measure its diameter. The flow direction of the abdominal aorta and SMA is assessed from the subcostal imaging plane.

The ductal view is obtained by moving just out of the suprasternal notch (SSN) to the first left intercostal space.





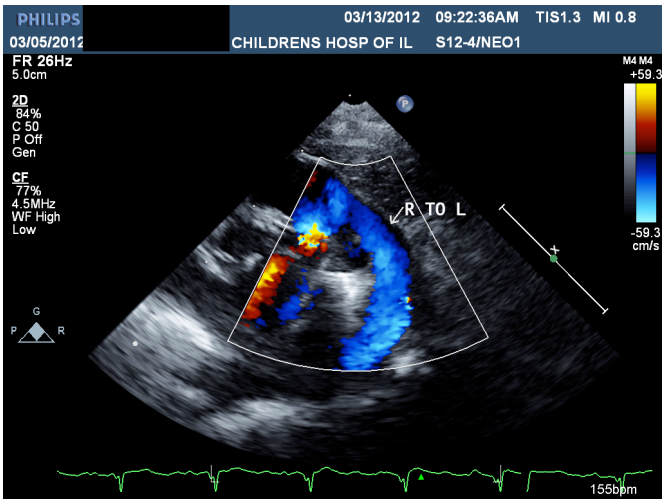
Three Finger View

The transducer plane is rotated to show the “three finger view”. Part of the main pulmonary artery (MPA) plus the three fingers are seen. The first finger is the right pulmonary artery (RPA). The second finger is the left pulmonary artery (LPA). The third finger is the persistent arterial duct (PDA).

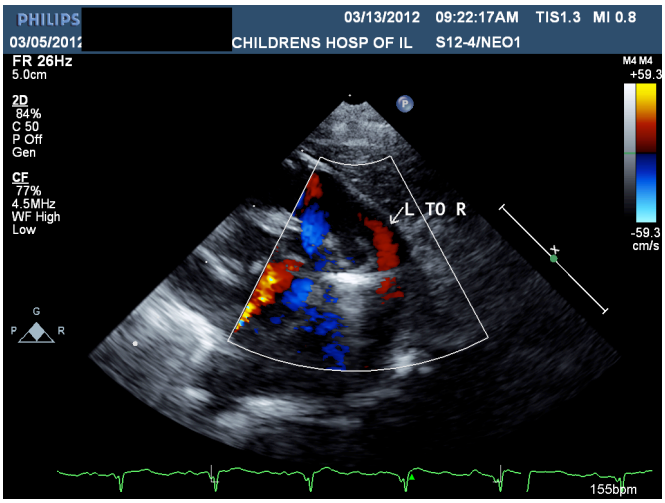
At this point, color flow mapping (CFM) is used to show flow direction during the cardiac cycle. Most PDAs in older children and adults will be left to right. In newborns, and especially premature infants, flow may be bi-directional. In extreme cases of pulmonary hypertension, flow may be all right to left. When flow is all right to left it may be missed, since one may think this is normal LPA flow. Therefore, it is imperative to show all “three fingers” when assessing the PDA in premature infants with persistent pulmonary hypertension.

The flow in the PDA should also be interrogated with pulsed doppler as well to confirm the directionality of flow. An estimation of pulmonary artery pressure can be obtained using the Bernoulli equation as in other obstructions. Be sure to make a measurement of the diameter of the PDA at its narrowest point. Keep in mind that the narrowest point is usually at the pulmonary end, but it may be at the aortic end. Also the presence of large PDA may mask the presence of a coarctation of the aorta.

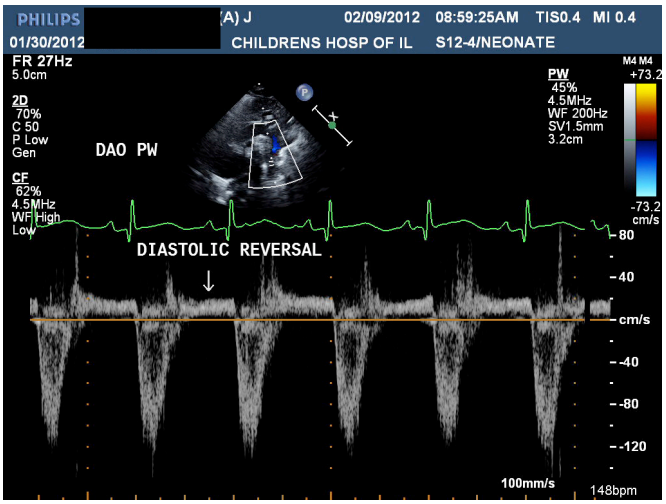
Image the abdominal aorta in long axis from the subcostal imaging window. CFM and pulsed doppler should be used to show direction of flow in the abdominal aorta. In the presence of a large left to right shunt through a PDA, you will find diastolic reversal of flow. Pulsed doppler should also be used to interrogate the superior mesenteric artery (SMA) from the abdomen. Diastolic reversal of flow in the SMA in the presence of a large PDA is extremely important, and may indicate a blood flow steal from the baby’s gut causing necrotizing enterocolitis (NEC).



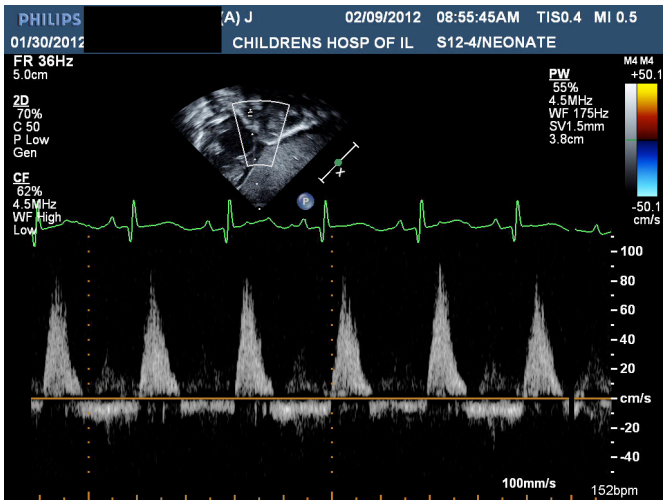
Right to Left PDA flow



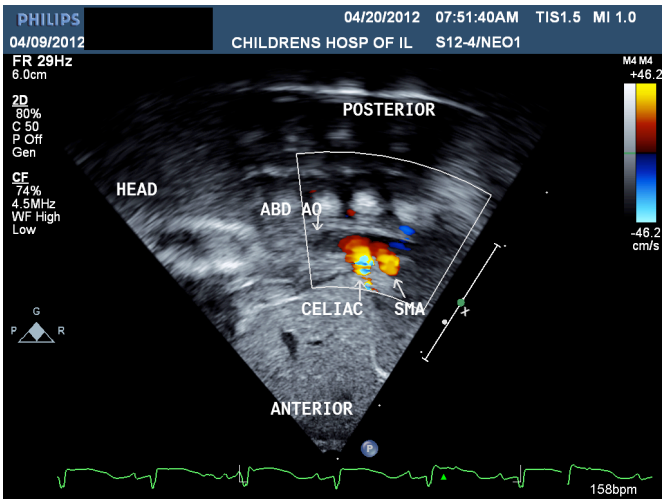
Left to Right PDA flow



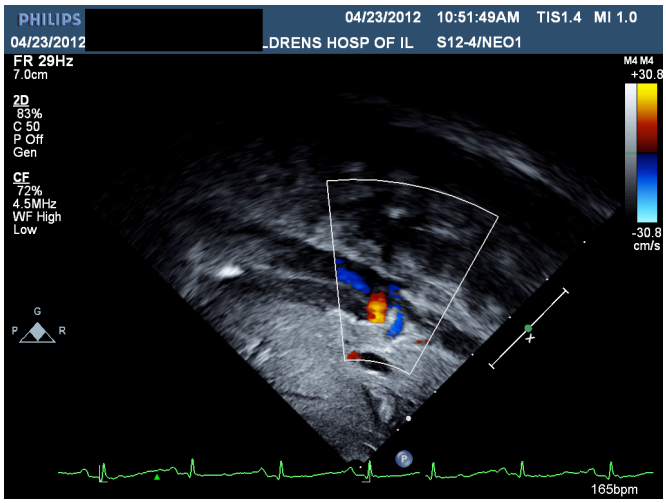
Diastolic Reversal in Descending AO



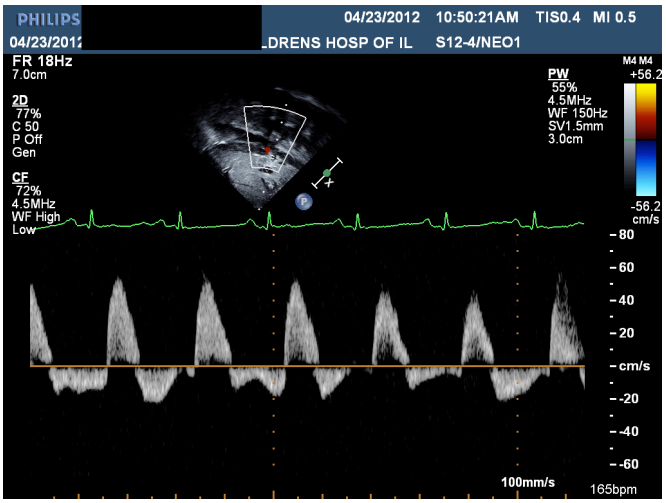
Diastolic Reversal in Abdominal AO



Normal Diastolic SMA Flow



Diastolic Reversal in SMA (CFM)



Diastolic Reversal in the SMA (PW)