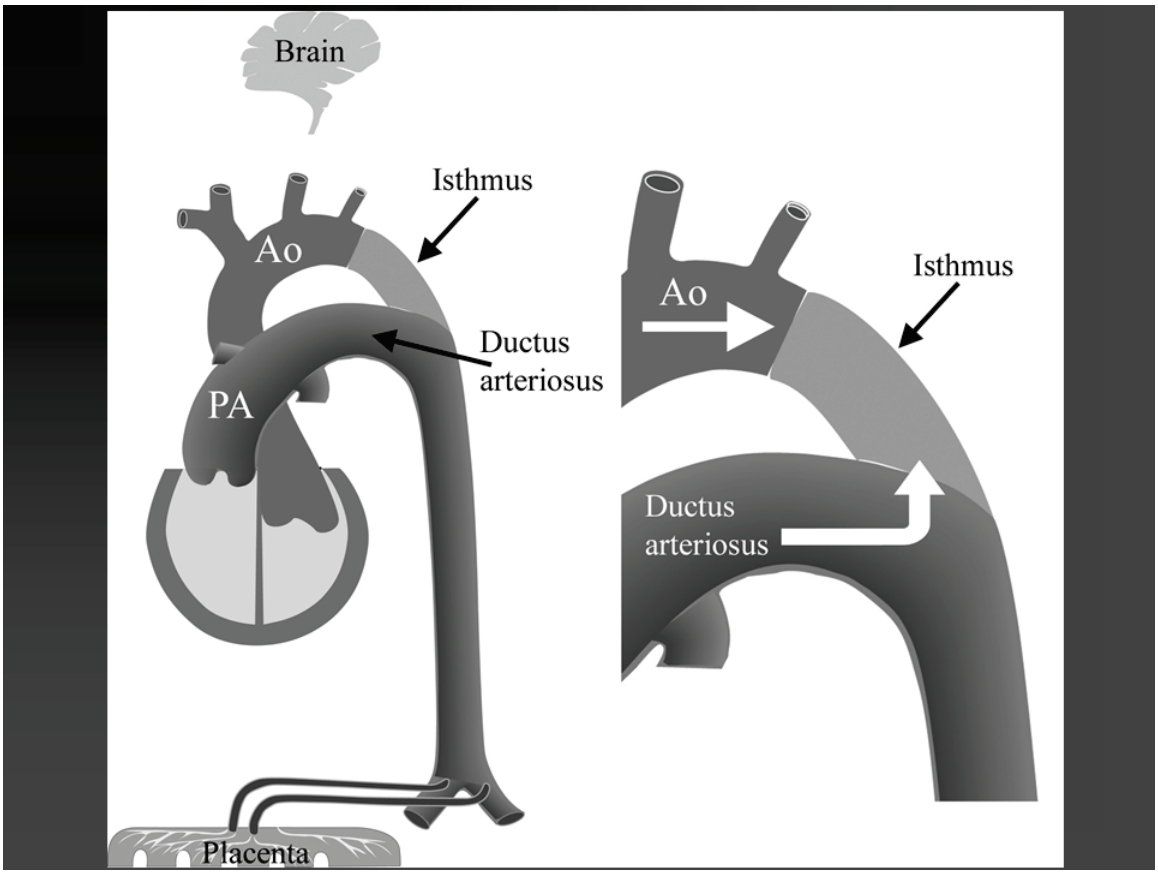
PIAF study: Placental insufficiency and aortic isthmus flow

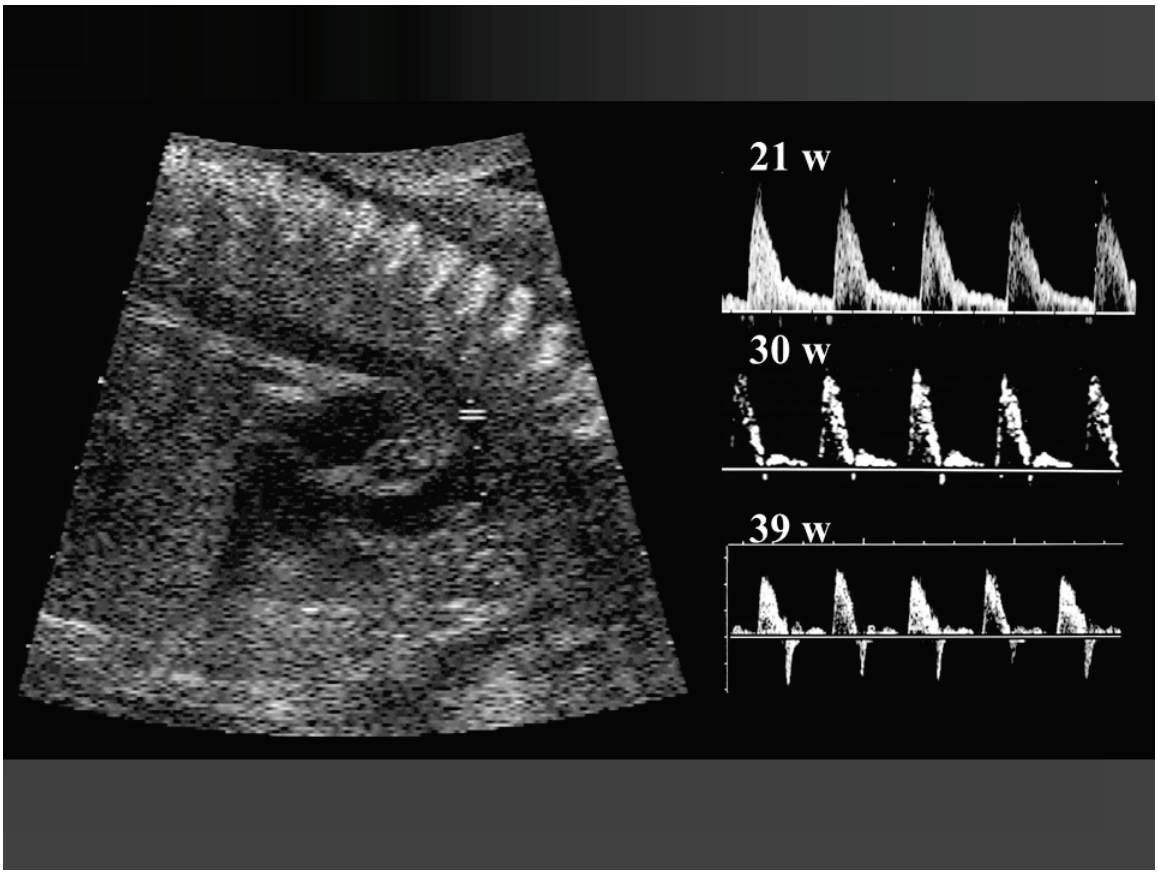
For the purpose of correctly measuring systolic flow in the aortic isthmus, it is important to take into account the opposite effect of right and left ventricles on the direction of the flow. The following precisions explain how the opposite effect of right and left ventricles affects the direction of the isthmic flow during systole and justifies the importance of measuring both antegrade and retrograde systolic velocity integrals as a whole.

As shown on this first image, the forward influence of the left ventricle on the isthmic flow is clearly illustrated while blood ejected by the right ventricle has an opposite effect.



This work was supported by the Canadian Institutes of Health Research (funding reference number: 97986)

This second image attests that when opening and closure of the aortic and pulmonary valves are identical, meaning that the duration of their respective ejection time is the same, a forward flow through the isthmus is recorded because of the low resistance of the placenta. A right ventricular preponderance is normally observed in prenatal life, starting in the second half of the second trimester and increasing up to the end of gestation. Because of this greater stroke volume, the right ventricle ejection time lasts longer than that of the left ventricle. This late systolic influence of the right ventricle on the isthmus translates first in a small incisura at the end of systole and progressively becomes a short systolic reverse flow towards the end of gestation.



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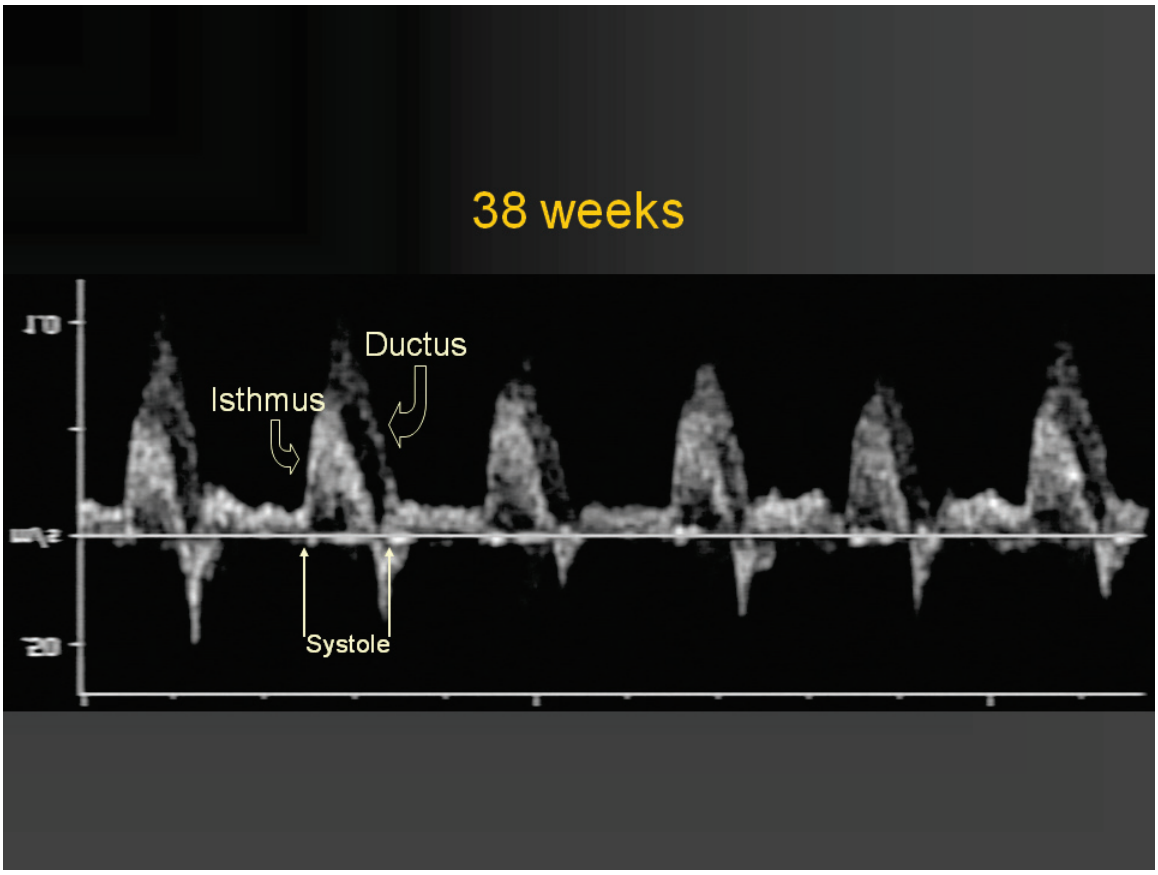
Finally, simultaneous Doppler recording of ductus arteriosus and aortic isthmus flows shows very well how the right ventricle ejection time, reflected by the duration of the systolic wave of the ductus arteriosus, goes beyond the end of the forward isthmic wave. At this point, the aortic valve is closed and the only influence left is that of the right ventricle causing a short systolic reverse wave.



For the IFI measurement, it is therefore important to include the small end-systolic reverse wave as part of systole for the calculation of the systolic flow integrals of the aortic isthmus. The arrows at the bottom of the image point to the onset and the end of the systolic cycle.

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