Continued from previous page

or in patients for whom we have reason to suspect fetal anemia.

We can extrapolate this further, and ask whether there is a role for Doppler screening. Should everyone receive a Doppler evaluation to detect IUGR and other problems?

A significant amount of research has been done, and is ongoing, to determine Doppler's screening roles. In this context, it is important to consider individual vessels separately. There probably is no role for screening with MCA Doppler (Figure 3), because fetal anemia in the absence of specific risk factors is rare. Doppler screening of the DV has limited application in the second half of pregnancy, but can have a useful role in identifying fetuses at risk for cardiovascular problems when it is performed earlier in pregnancy.

Ductus venosus Doppler can easily be done, in fact, in the context of the first-trimester ultrasound examination. In a study we recently completed at the University of Maryland, abnormal first-trimester DV Doppler findings were predictive of adverse outcomes—including cardiovascular defects, fetal growth restriction, and aneuploidy—in fetuses with normal nuchal translucency. (See Figure 4.)

(Doppler assessment had been known previously to increase the predictive accuracy for Down syndrome when NT is increased. In this study we looked at cases with normal NT.) With respect to the uterine artery and umbilical artery, Doppler's screening applications (in the first half of pregnancy) is not as reliable as its diagnostic role. Patients showing abnormal placental blood-flow resistance before 20-22 weeks may still show normal blood -low patterns in the third trimester, with a normal mother and normal fetus, so we should not base major clinical management decisions or therapies on early Doppler screening.

Although there is not perfect correlation, there does appear to be potential value in Doppler screening in the first half of pregnancy. Uterine artery screening has been used in the first and second trimesters to detect cases in which placental development is deficient enough to put mothers at high risk for developing preeclampsia or isolated hypertension, and it turns out that elevated resistance and persistent notching are significantly predictive of the onset—and even, in some trials, the severity—of hypertensive complications.

Evidence has also suggested that detection of these abnormalities at 11-12 weeks, followed by the administration of low-dose aspirin (ranging in trials from 81 mg to 120 mg daily), may be effective in reducing the incidence of hypertension and preeclampsia.

Although larger trials are underway, they have not yet substantiated the benefits of low-dose aspirin that were seen in the small, original trials; nevertheless, at this point the potential of reducing the incidence and severity of hypertensive complications makes Doppler screening a worthwhile consideration.

Ultimately, I believe, trials will prove that uterine artery Doppler by itself is not the only answer for the detection of hypertensive complications, but is a valuable tool to be used in the context of other forms of evaluation—a conclusion that reflects a broader axiom of Doppler technology.

This principle may be even better illustrated when we consider umbilical artery Doppler screening. We might think that the inability of the fetus to properly develop umbilical arterial perfusion of the placenta would be virtually guaranteed to predict poor placental development and subsequent IUGR. Although that is largely true, studies have shown that it can be up to 24-28 weeks before Doppler predicts with optimal precision the likelihood of severe IUGR.

At this point in time, other factors—such as lack of fetal growth and changes in amniotic fluid volume—are also usually apparent, leaving umbilical artery Doppler without singular, populationwide benefit.

On the other hand, when umbilical artery Doppler, uterine artery Doppler, maternal blood pressure, and biochemical markers are combined, we have the ability to more precisely predict the maternal and fetal ramifications of placental insufficiency. In other words, Doppler by itself is not sufficient, but it will likely be a key component in a multifactorial assessment.

Doppler in 2007

We are on the verge, I believe, of accepting first- and early-second-trimester Doppler—DV Doppler in the context of NT screening, uterine and umbilical artery Doppler screening for placental disease—and putting them into practice.

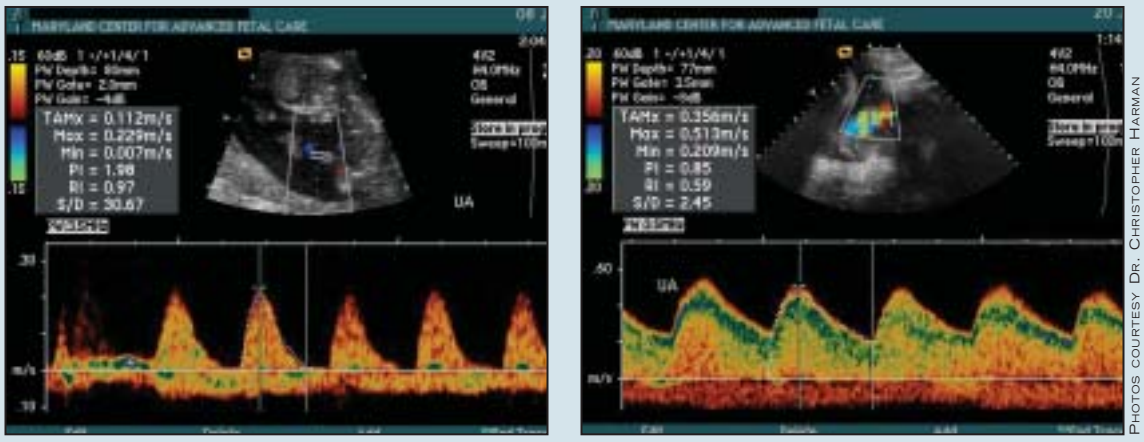
Every ultrasound machine capable of doing fetal measurements and assessing fetal anatomy comes with Doppler capabilities, so access to technology is no longer a pertinent issue. The last 5 years have brought dramatic change in the application of Doppler ultrasound within ob.gyn. residencies as well.

Methodologies need to be standardized, and the issues of advanced training, certification, and quality control will be an ongoing focus of discussion and debate. Within the next 10 years, however, Doppler assessment will be not only an established tool but also a routine part of the first-trimester evaluation, even in low-risk populations.

Right now, it is no longer acceptable to use fetal heart rate testing alone, or fetal heart rate testing with biophysical profile scores, in managing the IUGR fetus. Current management should include detailed Doppler evaluation of multiple vessels in the fetal circulation.

Corresponding intrauterine treatment for placental insufficiency is less than optimal, but its development is positive. Work is underway, for example, on ways to alter maternal blood flow, address nutritional aspects, and deliver oxygen, and all these approaches are showing promise in assisting placental development once problems are detected. If these measures prove effective, the role of Doppler will continue to expand. ■

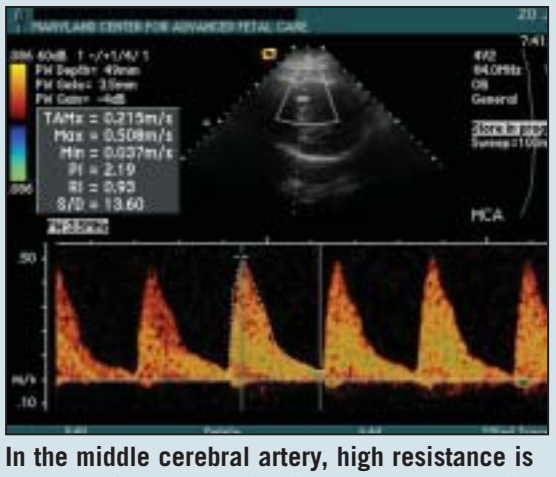
Figure 2



PHOTOS COURTESY DR. CHRISTOPHER HARMAN

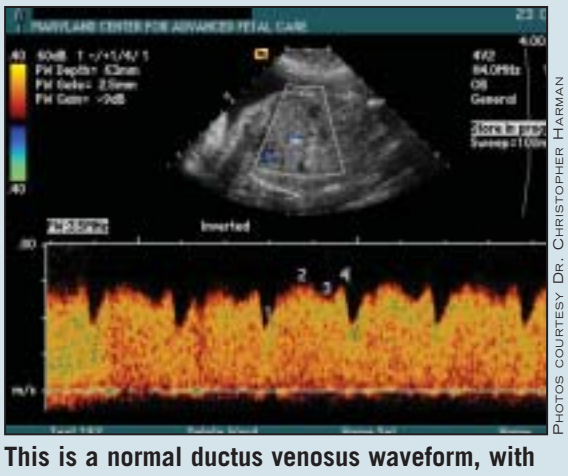
Umbilical artery Doppler in the first trimester (left) also shows high resistance with low velocity in the last portion of the cardiac cycle (low end-diastolic flow). As the placenta develops, the larger area for umbilical outflow means low resistance and much more flow in the end-diastolic phase (right).

Figure 3



In the middle cerebral artery, high resistance is normal, with low flow in diastole: a normal third-trimester pattern in a nonanemic fetus.

Figure 4



PHOTOS COURTESY DR. CHRISTOPHER HARMAN

This is a normal ductus venosus waveform, with only a slight reduction in the amount of forward flow during the a-wave.

CSE Tied to Brief Drop In Uterine Blood Flow

BANFF, ALTA. — Combined spinal epidural produces a transient decrease in uterine but not umbilical artery blood flow that does not impact the fetal circulation, fetal heart rate pattern, or immediate neonatal outcome, according to the results of a small study.

"In normal pregnancies, we were able to a find a statistically but not clinically significant decrease in the uterine blood flow after CSE [combined spinal epidural]," Dr. Cristian Arzola said at the annual meeting of the Society for Obstetric Anesthesia and Perinatology.

The prospective study included 30 healthy patients in active labor with singleton, uncomplicated pregnancies at term. Pain, maternal blood pressure, fetal and maternal heart rate, blood-flow velocity waveforms, and pulsatility indices (PI) of the uterine and fetal umbilical arteries were measured before and at 5, 10, 15, and 30 minutes following administration of CSE (bupivacaine and fentanyl).

Dr. Arzola observed a drop in maternal systolic arterial blood pressure of 20% from baseline that was significant only at 10 and 15 minutes after CSE. Maternal heart rate dropped significantly at all time points, but remained within normal range. Pulsatility indices for the uterine artery were increased significantly at 10 minutes, indicating reduced blood flow; however, the PI for the umbilical artery remained stable, reported Dr. Arzola of the University of Chile, Santiago.

As expected, pain scores dropped dramatically, and with them adrenaline levels, which decreased more than 50% from baseline. Fetal heart rate did not change significantly, and tracings did not show altered patterns. Apgar scores and cord blood gases were all within normal range, and there were no signs of fetal distress, he said.

—Kate Johnson