

# Time Crucial for Success in Perimortem C-Section

*A review says 98% of babies born within 5 minutes of maternal cardiac arrest are neurologically intact.*

BY MICHELE G. SULLIVAN  
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RIVIERA MAYA, MEXICO — A perimortem cesarean delivery should be performed within 5 minutes of maternal cardiac arrest to maximize survival chances for both the fetus and its mother, presenters said at a conference on obstetrics, gynecology, perinatal medicine, neonatology, and the law.

"I've done it a dozen times in 28 years, and it's probably the most frightening thing you will ever encounter," said Dr. John Marx, chair of emergency medicine at the Carolinas Medical Center, Charlotte, N.C. "It is the fastest, hardest decision making you will ever do."

Only about 300 cases of perimortem cesarean section have been reported in the literature, and many of these were confounded by inadequate reporting of time from maternal injury, drawing into question whether the fetus had any chance of survival.

A 2005 review identified 38 cases since 1986 in which the procedure was appropriately documented, and supported it for two reasons: to save the life of a viable fetus and/or to maximize maternal response to resuscitation (*AJOG* 2005;192:1916-21).

The indication for maternal salvage is a rather new thought, said Dr. Bernard Gonik, the Fann S. Srer Chair of Perinatal Medicine at Wayne State University, Detroit. "There are data indicating that the procedure can dramatically improve maternal cardiac output by emptying the uterus so that it's not pressing on the vena cava and inhibiting return. This can improve cardiac output by 25%."

The pregnant uterus consumes a large amount of maternal blood, causing gravid women to become anoxic much more quickly during a crisis. "That's another reason to add C-section to your resuscitation efforts," Dr. Gonik said.

The 2005 review included resuscitation information for 22 women; 12 of them showed profoundly increased response after the procedure. Of 20 potentially salvageable mothers, 13 were discharged from the hospital in good condition.

Time is the most critical factor when a pregnant woman with a gestationally viable fetus arrests, both physicians said. "The earlier you deliver, the more likely you are to have a neurologically intact baby," Dr. Gonik said, noting that the review indicated that 98% of babies born within 5 minutes of maternal arrest were neurologically intact.

Dr. Marx agreed. "If you get the fetus

out within 5 minutes you have a good chance not only for it to survive but to have good neurologic outcome. If you wait 15 minutes, the chance of survival and good neurologic outcome is dim. I'm not sure which is worse from a legal perspective: to wind up with a baby who will never, ever be OK, or to wind up with a dead fetus."

Difficult decisions abound in this kind of situation, both men said. The patient will not be physically or mentally able to give informed consent, and very often, no kin are available to help in that regard. Opinions differ on the importance of accurately assessing gestational age, which is best done via ultrasound. Dr. Marx advised against performing the procedure to try and save a fetus of less than 24 weeks. But some audience members commented that fetal age is irrelevant, since the primary indication should be to maximize maternal outcome.

A similar discussion arose around fetal heart rate: Whereas a good rate is a deciding factor for some physicians, others proceed with the delivery regardless of the rate, in the hopes of saving the mother's life.

"My counterpoint would be this," Dr. Marx said. "Turning the mother onto her left side 50 to 30 degrees should help considerably in maximizing maternal response [by decreasing pressure on the inferior vena cava]. Secondly, if we think the fetus has no chance of survival, we may

end up doing a thoracotomy on the mother, cross-clamping to eliminate any blood lost to the uterus. We want to be very, very cautious about delivering a fetus that is only semi-viable. That's the conundrum."

The procedure demands a team effort by the most experienced people available. "You call obstetrics, you call surgery, and you call people who have expert ultrasound capabilities if you don't have them," Dr. Marx said. "And this is not a procedure for a third-year medical student. You want the most competent person in the room, whether it's the obstetrician or the emergency physician."

The delivery is a midline crash vertical incision "from stem to stern" through all tissue levels of the anterior uterus. "If the placenta is in the way, either push it aside or cut through it," Dr. Marx said.

Despite concerns about informed consent and the ethics of delivering a nonviable or impaired fetus, physicians who perform a perimortem C-section for the correct indication probably aren't in legal danger, Dr. Gonik said. "No physician in the U.S. has ever been found liable in one of these cases. They typically do not go to court or get the physician or hospital in trouble because they were attempting to save the baby."

However, he strongly cautioned, "Never perform this in anticipation of the mother arresting. If the patient is unstable and you proceed, you could push her into needing resuscitation." ■

## Low Placental Growth Factor May Mean Preeclampsia Later

BY MICHELE G. SULLIVAN  
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HOT SPRINGS, VA. — Placental growth factor, an angiogenic factor normally elevated in early pregnancy, may be a valuable biomarker for detecting pregnancies destined to become preeclamptic, Dr. Ramsey Unal said at the annual meeting of the South Atlantic Association of Obstetricians and Gynecologists.

Vascular growth factors are essential in creating and maintaining the placenta, said Dr. Unal, a resident at the Medical University of South Carolina, Charleston. Both placental growth factor (PlGF) and vascular endothelial growth factor (VEGF) are higher in early pregnancy and decrease as delivery approaches. Another factor, soluble FMS-like tyrosine kinase 1 (sFlt1), increases later in pregnancy and binds both PlGF and VEGF, decreasing their bioavailability as the pregnancy nears term.

"Normal pregnancy is a balancing act in angiogenesis," Dr. Unal said. "At the beginning, during placentation, you have a proangiogenic state and toward the end, in preparation for delivery; you shift to an antiangiogenic state. In preeclampsia, we think the shift happens too early and is too exaggerated."

Dr. Unal investigated the utility of using second-trimester PlGF and sFlt1 levels as

predictors of preeclampsia. If the levels were already abnormal in the second trimester, she reasoned, they could easily be included in the quad screen to flag women at risk for preeclampsia.

Her retrospective study included 64 women: 21 of them developed preeclampsia and were delivered for that reason, 34 were healthy women with uncomplicated term deliveries, and 9 had chronic, prepregnancy hypertension. All the women had singleton pregnancies. Dr. Unal performed enzyme-linked immunosorbent assay testing for PlGF and sFlt1 on stored quad screen serum samples obtained from these women at 16-24 weeks' gestation.

PlGF was significantly lower in the group that went on to develop preeclampsia than it was in the normal control group, she said (mean 85.3 pg/mL vs. 133 pg/mL). There were no significant differences in sFlt1 levels between the groups. However, women with chronic hypertension had slightly, though not significantly, lower sFlt1 levels than did normal controls—an interesting relationship, Dr. Unal said. "Preeclampsia is a disease of the placenta, and hypertension can also cause placenta problems."

PlGF levels could easily be drawn from quad screen sera, adding yet another valuable biomarker to the routine screen. "But we need a large, prospective trial before any recommendations can be made," she said. ■

## Third-Trimester Glucose Levels Most Predictive of LGA Infant

BY JOHN R. BELL  
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In a population of mothers with type 1 diabetes and their singleton infants, third-trimester glycemic measures were more predictive of bearing a large-for-gestational-age infant than were earlier parameters, and third-trimester episodic hyperglycemia was most predictive of all.

Dr. Lucrecia Herranz and colleagues at the University Hospital of La Paz in Madrid recruited from the hospital 73 mothers, who had given birth to 37 large-for-gestational-age (LGA) infants and 36 appropriate-for-gestational-age (AGA) infants. The investigators reported their findings in *Diabetes Research and Clinical Practice* (2007;75:42-6).

After researchers controlled for tobacco smoking and history of microsomia, mothers of LGA infants had significantly higher mean overall glucose levels in all trimesters than did mothers of AGA infants. But the difference was most pronounced in the third trimester, when LGA infants' mothers registered a mean glucose level of 7.4 mmol/L, vs. 6.9 mmol/L for mothers of AGA infants. Mean postprandial glucose in the third trimester

was 8.4 mmol/L for mothers of LGA babies and 7.9 mmol/L for AGA neonates' mothers. Moreover, the portion of glucose values higher than the goal was 42% for LGA mothers and 35% for AGA mothers. HbA<sub>1c</sub> levels were significantly higher in the LGA group than in the AGA group only in the third trimester (6.2 vs. 5.9).

Logistic regression of all third-trimester glycemic measures showed that the percentage of third-trimester glucose values above the target value posed an increased likelihood of bearing an LGA infant (OR 1.09; 95% CI 1.02-1.15). AGA infants had a mean birth weight of 3,139 g, vs. 3,830 g for the LGA infants.

Notably, the two groups of mothers, all of whom had been managed at the hospital before conception, had no preconception differences in glycemic parameters.

Dr. Herranz and colleagues noted that their study supports the findings of prior studies that have posited an effect of intermittent maternal hyperglycemia on fetal growth. "Interestingly, our data show that of all third-trimester glycemic parameters, the percentage of glucose values above glycemic target is the most powerful predictor of LGA infants," they wrote. ■