Continued from previous page

has provided a window of knowledge into the changes in fetal acidosis in relation to particular fetal heart rate patterns.

Early decelerations are generally well tolerated by the fetus and probably do not result in any additional acidosis. These are believed to result from fetal head compression and a subsequent hormonal or vagal response.

Similarly, mild or moderate variable fetal heart rate decelerations, which are due to modest cord compression, are well tolerated if they occur at a reasonable frequency (such as every 3 minutes). The frequency of variable decelerations is critical as lactic acid generated during the variable deceleration may be cleared across the placenta during the periods between decelerations.

When variable heart rate decelerations are severe and of increasing frequency, however, the fetus can accumulate lactic acid—sometimes rapidly—depending on the frequency. A severe variable deceleration results from complete or near-complete umbilical cord occlusion and is typically defined as one that lasts for at least 60 seconds, during which the heart rate drops below 70 beats per minute

In a study we published this year with colleagues in Canada, we found that severe variable decelerations result in an increase in base deficit of 0.5 mmol/L per minute of cord occlusion. We also found, however, that metabolic acidosis is cleared at a rate of 0.1 mmol/L per minute of recovery, when fetal heart rate is normal and stress is reduced (Am. J. Obstet. Gynecol. 2009;200:200.e1-7).

Given these rates of acid accumulation and normalization, one can understand how acidosis may develop when repetitive, severe variable decelerations occur every 3 minutes, for instance. Past a certain frequency and severity, there simply isn't enough recovery time to allow the fetus to sufficiently correct the base deficit.

Although most of us will not actually be using these acid accumulation and recovery rates to calculate specific base deficits, an awareness of the principles can aid us in assessing fetal acidosis. The concept of recovery time is an important one. Again, knowing where your patient is on the spectrum of acidosis tells you how much "buffer time" you have if something goes wrong.

There is policy, sometimes attributed to midwives, that advocates letting the patient push only during every other contraction. Given what we've learned about the development of acidosis, when pushing is associated with severe variable decelerations, there may be an advantage to pushing every other contraction in order to permit sufficient recovery time and clearance of acid between the decelerations.

Prevalence of Intrapartum Fetal Asphyxia

	Rate per 1,000 live births	
	Preterm	Term
Overall prevalence	73	25
Mild	38	21
Moderate/severe	35	4

Source: J. Obstet. Gynaecol. Res. 2004;30:276-86

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One of the signals that acidosis is progressing to a moderate level (approximately 8 mmol/L) is the change in severe variable decelerations from typical (having shoulders, a sharp drop, and a sharp rise) to atypical (a loss of shoulders, a U-shaped variable deceleration, or a slow return to baseline).

Another sign of moderate acidosis is a loss of variability between contractions. These heart rate patterns need more research, but in my experience a prolonged loss of variability between contractions (unrelated to the fetal sleep state) typically does not occur until the base deficit approaches 8 mmol/L or greater. Given that the risk of brain injury begins with a base deficit of 12 mmol/L, an observation of this change provides a buffer zone during which the patient can be even more closely monitored.

It used to be thought that late decelerations were extremely worrisome, but we have learned that these patterns are usually less threatening to the fetus's accumulation of metabolic acidosis than are severe variable decelerations.

When there is good baseline variability between the decelerations, the late deceleration often reflects a vagal-mediated response and probably involves no change in the level of acidosis. When there is a loss of variability between contractions, however, the late deceleration may reflect a hypoxia-induced response. Still, the rate of acidosis accumulation is typically less than it is with severe variable decelerations.

In general, the amount of acid accumulation with late decelerations is dependent on the frequency and severity of the decelerations; the accumulation of acidosis may range from a base deficit increase of 1 mmol/L every 5 minutes to an increase of just 1 mmol/L every 15 minutes.

One of the weak links in our understanding of fetal acidosis today is our inability to recognize preexisting acidosis or preexisting injury. We have little experience in identifying fetal heart rate patterns associated with preexisting hypoxic injuries.

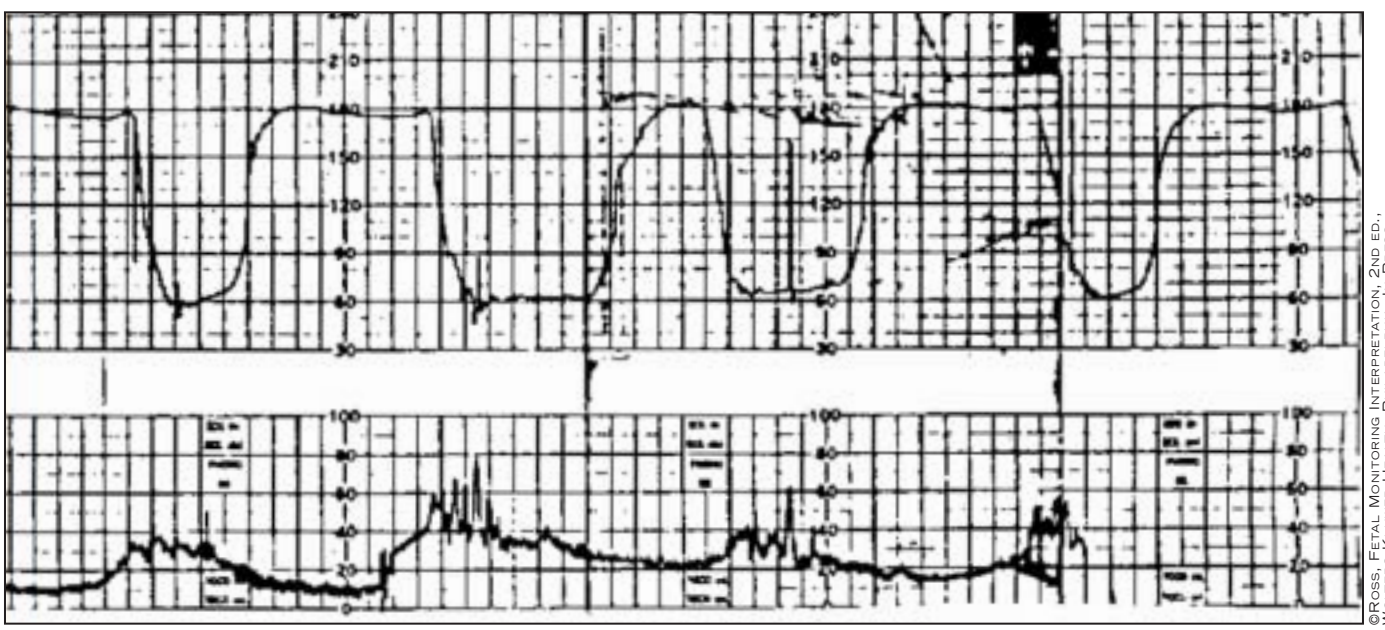
Adding to the challenge is the knowledge that a post-term fetus or one with intrauterine growth restriction may begin labor with a slightly greater level of acidosis. Furthermore, fetuses with true sepsis or severe anemia may accumulate acid at an increased rate compared with normal fetuses.

Where We Stand

Practically, attempting to avoid injury by recognizing mild, moderate, and potentially severe levels of fetal acidosis means that one must carefully examine fetal heart rate tracings, not only for the time we are present in the room, but at least back to the time of our previous assessment. As much as is possible, we should understand what the entirety of the monitoring has shown.

We should attempt to factor in the known changes in fetal acidosis associated with normal stages of labor together with estimated changes in acidosis related to superimposed fetal heart rate decelerations. With an understanding of the progress and stage of labor, the current fetal heart rate pattern, and the approximate level of fetal metabolic acidosis, we will be best prepared to manage the pregnancy for an optimal outcome. ■

DR. ROSS *said he has no disclosures relevant to the content of this article. Send comments to Dr. Ross at mikeross@ucla.edu.*



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This fetal heart rate tracing shows repetitive, severe variable decelerations.

Pregnant Teens: Look For STIs

BY DAMIAN MCNAMARA

SAN ANTONIO — Routine repeat screening for sexually transmitted infections is worthwhile for pregnant adolescents during the third trimester, a Canadian study showed.

"We screen all adolescent pregnancies at baseline and again during the third trimester. This is different from adults, who we only screen at baseline," said Dr. Anjali Aggarwal of the Hospital for Sick Children in Toronto.

Part of the concern is that teenage women tend to use condoms less often once they become pregnant (Am. J. Public Health 2009 April 16 [doi:10.2105/AJPH.2007.131870]; J. Natl. Med. Assoc. 2008;100:929-35). Some discontinue condom use because they consider them primarily for pregnancy prevention and much less so for avoidance of sexually transmitted infections (STIs), Dr. Aggarwal said in a poster session at the annual meeting of the North American Society for Pediatric and Adolescent Gynecology.

She and her associates at the University of Toronto hospital assessed 89 pregnant adolescents with a median age of 16 years (range, 13-17 years) who were screened both at baseline and during the third trimester. They also screened 77 of the same participants again during the postpartum period.

Overall, 26 patients (29%) were diagnosed with an STI during or after pregnancy. "I was surprised it was that high," Dr. Aggarwal said in an interview. Specifically, STIs were detected in 17 patients during the first trimester, 7 in the third trimester, and 1 in the postpartum period. An additional patient was diagnosed in the first trimester, treated, and then treated again during the third trimester, based on symptoms later in her pregnancy.

The finding that more than 25% of the patients identified as having an STI were diagnosed in the third trimester justifies routine rescreening, said Dr. Aggarwal.

Only one statistically significant risk factor was associated with an STI in pregnancy: a history of not using contraception, other than a condom. There was no significant association with patient age, previous pregnancy, or previous STI. Women who lived with a partner, lived with the baby's father, or reported only one previous sexual partner versus more than one were at lower risk of an STI during pregnancy. These factors only trended toward statistical significance.

Dr. Aggarwal said she plans to compare computer-based patient interviews with those done by clinicians. The goal would be to determine if pregnant teenagers are more forthright when interfacing with a computer, she said. ■