Antepartum Fetal Surveillance in the 1980's

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Many changes have occured in obstetrics during the past decade and a half. Many different technologies aimed at reducing perinatal morbidity and mortality have been introduced which have changed the manner in which obstetrics is practiced. At the Sloane Hospital for Women (Columbia University) the perinatal mortality rate has been reduced from 25 to <10 (1000 livebirths, 1000 gms & 28 days); virtually all intrapartum patients are monitored electronically and 25% undergo acid-base monitoring with almost total elimination of intrapartum stillbirths and a reduction of morbid Apgar scores (≤6) to 10% & 1.1% at 1 and 5 minutes. The primary caesarean section rate has climbed to 14% (total=23%), but the incidence of fetal distress as a cause for a primary caesarean section has dropped to 11% while the percentage performed for cephalopelvic disproportion remained unchanged (33%). Although antepartum (AP) fetal monitoring is used in ± 15% of AP patients (high risk), the AP stillbirth rate of 0.5% represents almost 100% of all fetal losses (1).

Although AP fetal surveillance utilizes estriol determinations, amnioscopy, evaluation of fetal activity, real-time/static ultrasound, the majority of AP fetal surveillance is by the fetal heart rate test (APFHRT). The primary screening APFHRT is the nonstress test (NST). Abdominal wall fetal ECG (80%), phonocardiography (10%), and ultrasound (10%) are used. Four fetal movements in a 20 minute interval that are noted with FHR accelerations of ≥ 15 seconds and a maximal amplitude of ≥ 15 bpm are referred to as a reactive test indicating a fetus with an intact neurocardiovascular integration (2). Approximately 90% of all NSTs are reative during the first 20 minute interval or following manual stimulation in the second 20 minute interval. Occasionally the nonreactive NST is repeated after a meal and ambulation or even within 24 hours, and 90% of these NSTs become reactive. Usually a nonreactive NST is followed by a contraction stress test (CST) evaluating fetal respiratory reserve. A negative CST--no late decelerations with 3 oxytocin induced or spontaneous contractions in a 10 minute interval--and a reactive NST both are indicative of a healthy fetus and a high probability of good fetal condition for a week unless the maternal condition changes. The NST may be a slightly better indicator of well-being than the CST (3). A positive CST-- late decelerations with each of the 3 uterine contractions in a 10 minute interval--is an indicator of loss of fetal well-being; however, 25 to 50+% of these fetuses tolerate a well monitored induction of labor (4). Thus, in the absence of pulmonary maturity, a positive CST is generally substantiated by a low or fall-

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estriol value before initiating a delivery process although pharmacologic induction of pulmonary maturity may be considered before initiation of a delivery process.

The use of APFHRT is expanding from the very high risk to the lower risk and normal patients. Intensive evaluation of these tests indicate that additional information may be obtained from them such as the liklihood of abnormal cord position or intrapartum cord complications when variable decelerations are noted with fetal movements during an NST (5,6). The use of APFHRT for the improvement in some AP conditions such as sinusoidal patterns or postdatism are just now being evaluated (7). It is expected that additional evaluation of these tests will offer more insight into other pathologic states.

The NST-CST form of APFHRT will probably remain the cornorstone of AP fetal surveillance for well-being in the 1980's; however, if a significant reduction in AP stillbirth rate is to be achieved, it is mandatory that a greater portion of the AP population be tested, and the precision for identification of the fetus who is truly at risk of damage or death in utero must be improved. Some of the techniques for meeting these mandates appear to be already available to the obstetrician. The extension of the testing protocol and the improvement in predictive ability may be achieved by the evaluation of fetal activity on a more formal basis in all AP patients from 28 to 30 weeks gestation to delivery (8,9) and by the use of real-time ultrasound to evaluate additional fetal features including breathing, trunk and limb motion, amniotic fluid volume (10). Electromechanical intervals and urine production (11, 12) can be used with some simplification and refinement of these techniques.

It is relatively easy and inexpensive to instruct all patients to count fetal movements and record them. If a patient notes inadequate fetal movement, this patient can be included easily with those high risk patients who are undergoing APFHRT without adding undue strain on the testing system. Tests of fetal activity have the added advantage of being able to be used by patients already receiving APFHRT as a backup should the maternal medical condition undergo an unrecognized change and thus invalidate the predictive value of a reactive or negative APFHRT.
Current precision at the identification of the fetus in good condition is adequate (99+%); however, high false positive CST and false nonreactive NST rates indicate that greater precision is needed for the identification of the unhealthy fetus. This will probably require additional tests. The test of a profile of fetal functions and amniotic fluid volume is already in early use. It appears that the appropriate evaluation of other fetal functions and measurements will add sig-

nificantly to the ability of the obstetrician to more accurately identify the truly distressed fetus. These evaluations will be performed following a nonreactive NST or a positive CST. It is expected that the currently described tests (10) can reduce the false indication of loss of fetal well-being to 10% within a few years. It is expected that additional tests will be available within this decade to improve the AP diagnostic ability even more.

References

1. Shamsi, H. H., Petrie, R. H., Steer, C. M.: Changing obstetrical practices and amelioration of perinatal outcome. Am J Obstet Gynecol 133:855, 1979

2. Nochimson, D. J., Turbeville, J. S., Terry, J. E., Petrie, R. H., Lundy, L.: The non-stress test. Obstet Gynecol 51:419, 1978

3. Druzin, M. L., Gratacos, J., Paul, R. H.: APFHRT, VI. Predictive reliability of "normal" tests in the prevention of AP death. Am J Obstet Gynecol 137:746, 1980

4. Freeman, R. K., Goebelsmann, U., Nochimson, D. J., Cetrulo, C.: An evaluating of the significance of a positive oxytocin challenge test. Obstet Gynecol 47:8, 1976

5. Bruce, S. L., Petrie, R. H., Davison, J.: Prediction of abnormal umbilical cord position and intrapartum cord problems from the nonstress test. Diag Gynecol Obstet 2:47, 1980

6. O'Leary, J. A., Andrinopoulos, G. C., Giordano, P. C.: Variable decelerations and the nonstress test: An indication of cord compromise. Am J Obstet Gynecol 137:704, 1980

7. Thornton, Y., Yeh, S. Y., Petrie, R. H.: APFHRT and the postdate gestation (in press)

8. Rayburn, W. F., Mc Kean, H. E.: Maternal perception of fetal outcome. Obstet Gynecol 51:161, 1980

9. Sandovsky, E., Yaffe, H., Polishuk, W. Z.: Fetal movement monitoring in normal and pathologic pregnancy. Int J Gynecol Obstet 12:75, 1974

10. Manning, F. A., Platt, L. D., Sipos, L.: AP fetal evaluation: Development of a fetal biophysical profile. Am J Obstet Gynecol 136:787, 1980

11. Murata, Y., Martin, C. B., Ikenoue, T., Lu, P. S.: AP evaluation of the pre-ejection period of the fetal cardiac cycle. Am J Obstet Gynecol 132:278, 1978

12. Gohari, P., Berkowitz, R. L., Hobbins, J. C.: Am J Ob/Gyn 127:255, '77

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