The Future of Fetal Heart Rate Monitoring

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Medical technology is developing at an accelerated rate. Advances and refinement in techniques of electronic fetal heart rate (FHR) monitoring are continually being designed and tested. Many of these show real promise for the future. Never-the-less, for the next several years there are two major considerations. First, a more universal application of FHR monitoring i.e., to the "normal" patient as well as "high risk" and second, enhance education in FHR pattern recognition and proper management responses.

Perinatal mortality is approximately equally diveded between fetal and neonatal. Of the fetal mortality only about 1/5 occurs intrapartum and the other 4/5 occurs antepartum. Application of FHR monitoring during the antepartum period in an attempt to identify the "at risk" fetus has received wide acceptance. Of the two most commonly utilized techniques i.e., contraction stress test (CST) (1) and non-stress test (NST) (2), the NST has the advantage of being less time consuming and less expensive. The simplicity of the NST, the immediate availability of the results and the reliability of the reactive test seems to make it an excellent antepartum screening tool. A simple antepartum testing tool such as this that can have very wide application is essential, since approximately one half of all perinatal mortality occurs in "low risk" pregnancies.

Schifrin et al (2) performed NST's in 4517 "low" and "high risk" patients. The perinatal mortality was much lower in the reactive fetus of a "high risk" mother (11/1000) than the non-reactive fetus of a "low risk" mother (45/1000). Figure I

Vinacur (3) reported his experience in utilizing routine NST's in private practice. In 208 consecutive singleton pregnancies he found that no neonate was in the "high risk" category when the mother was "low risk" and the NST was reactive. Non-reactive

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NST in a "low risk" pregnancy resulted in 2/7 "high risk" neonatal conditions. The highest risk group was the "high risk" mother and a non-reactive NST.

Six to nine neonates in the "high risk" category.

Antepartum testing allows for individualization of care since the fetus at greatest risk can be identified. This individualization not only benefits the fetus at increased risk but all the other pregnancies by allowing a policy of non-intervention based on the individualization. In the future the trend appears to be toward more universal application of antepartum FHR testing.

Intrapartum FHR monitoring, especially in the 1000 to 15000 gram infant has been shown to result in improved perinatal survival (4). Paul et al reviewed the obstetrical experience at LAC/USC Medical Center from 1970-1975. In infants weighing 1500 grams, intrapartum deaths occured less often in the "high risk" monitored fetus than the "low risk" unmonitored fetus. (Table I) Only four prospective, controlled studies on intrapartum fetal monitoring have been reported in the literature. (5,6,7,8) The total number of patients in these studies is 2026. Schifrin (9) calculated that in order to show a significant reduction in perinatal mortality i.e., from 10/000 to 5/1000 one must have more than 4600 patients.

One of the strongest arguments for elective intrapartum FHR monitoring of all patients is that we are unable to identify all of the "high risk" fetal situations even at the onset of labor. If one wanted to monitor only the "high risk" fetus an accurate selection would be impossible since many "high risk" situations do not declare themselves until the time of delivery. Hobel (10) utilized a risk scoring system during pregnancy with reassessment during labor. He found that the mortality was greater in a "low risk" pregnancy with a "high risk" intrapartum situation than in a "high risk" pregnancy with a "low risk" intrapartum performance. Those who remained in the "low risk" group in both assessments had a very low perinatal mortality. Sokol (11) reported that 40% of women with "low risk" antepartum assessment according to Hobel's scale, developed an intrapartum

risk factor which carried increased risk of perinatal mortality.

A major concern in the utilization of electronic FHR monitoring in the "low risk" pregnancy is that it will result in an increased cesarean section rate. Two recently reported studies of elective FHR monitoring in "low risk" pregnancies did not confirm these fears. Krebs (12) reported a 3% primary cesarean section rate in 919 "low risk" monitored labors. Westgren et al (13) monitored 4278 "low risk" patients and performed a cesarean section for fetal distress in only 30 patients.

TABLE I

Intrapartum deaths in weight 1500 g (at LAC/USC 1970-1975) occur less often in monitored patients. Patients with severe congenital anomalies and birth trauma assoicated with death are eliminated from both groups.

	Intrapartum fetal deaths	
	High risk Monitored	Low risk unmonitored
Total patients	17,089	43,524
Fetal deaths	7	36
Rate per 1,000	0.4	0.8

$x^2=3.01$, p 0.1

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Paul, R.H., Gauthier, R.J. and Quilligan, E.J.: Clinical Fetal Monitoring. The usage and relationship to trends in cesarean delivery and perinatal mortality. Acta Obstet Gynecol Scanda. 59: 289-295, 1980.

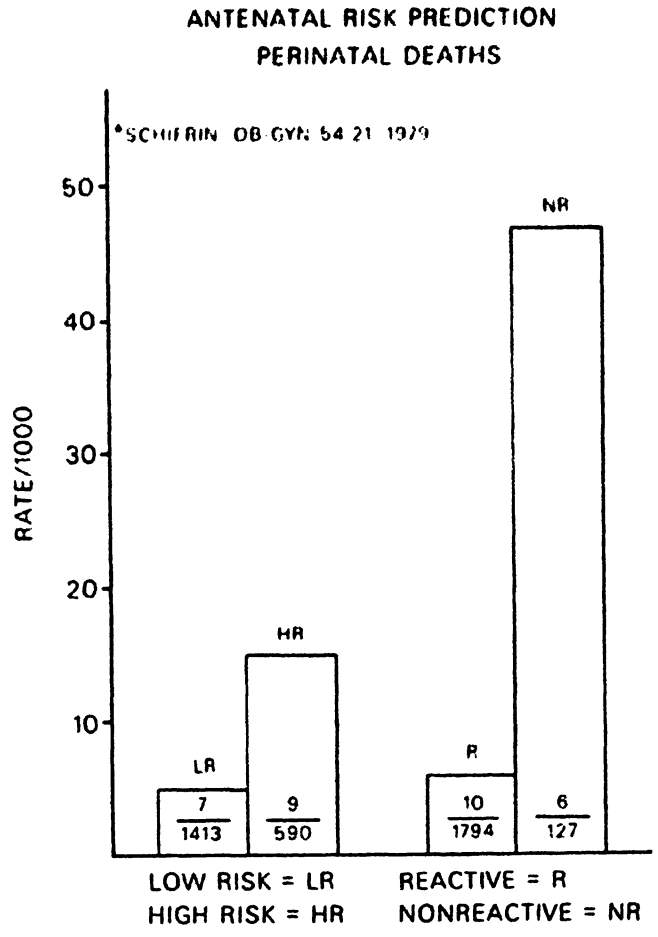

Figure I

Perinatal mortality in high and low risk pregnancies who had antepartum non-stress testing. Adapted with permission from: Schifrin, B.S. et al.: Obstet Gynecol 54: 21, 1979.

Interpretation of FHR patterns and the diagnosis of fetal distress are areas in which education and experience play a very important role. In most clinical situations, the introduction of elective FHR monitoring results in an increased diagnosis of fetal distress and subsequent cesarean deliveries. With continued experience this rate usually levels off or declines. Haddad and Lundy (14) review the cesarean section rate in their hospital over a four year period (1972-1975). One of their conclusions

from this review was: "Close retrospective evaluation of the definition for fetal distress on the monitor tracing would suggest that only half (of) these patients should have required primary cesarean section for the management of fetal distress". A better understanding of the significance of FHR patterns should lead to a reduction in the cesarean section rate for fetal distress.

It is inevitable that techniques will be developed that will lead to improved use of electronic fetal monitoring. Other techniques such as ultrasound in combination with EFM will improve the accuracy of fetal evaluation. For the near future however, a better understanding of the pathophysiology of FHR and greater utilization both antepartum and intrapartum should enhance perinatal outcome.

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