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Roberto Caldeyro-Barcia, MD
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- “A Useless Pile of Microchips”

Victor Berman, MD at B.I.R.T.H.S.
Panel Attempts to Rescue Fetal Heart Rate Monitoring

Early discussions reveal few conclusions.

By Bruce Jancin
Rocky Mountain Bureau Chief

San Francisco — When 18 of the nation’s leading experts on electronic fetal heart rate monitoring gathered under National Institutes of Health auspices to figure out if monitoring can be salvaged from its current state of disarray, they didn’t initially agree on much.

There was broad agreement, however, on one critical point. Fetal heart rate variability is extremely predictive of good outcome in terms of absence of deep central asphyxia, Dr. Julian T. Parer said at a meeting on

“There is universal acceptance in North America that fetal heart rate variability is the single most important predictor of a vigorous baby. It doesn’t predict pH as well as it predicts fetal vigor, but I put it to you that fetal vigor is the thing we most want to see. We want to see a kicking baby, and we don’t particularly care what the blood gas machine shows,” said Dr. Parer, chairman of the NIH Committee on Electronic Fetal Monitoring: Research Guidelines for Interpretation.

Essentially, if normal fetal heart rate variability is present, it really doesn’t matter what other findings.
The Bradley Method®

- The History
- The Hardware
- The Diagnostic Mythology
- The Politics
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- History
- Human Monitoring
- Crude Acoustic Devices
- Stylized Acoustic Devices
- Electronic-related Devices EFM
Non-Invasive Fetal Monitoring

Invasive Fetal Monitoring
CONTRAINDICATIONS: The spiral electrode should not be applied: to the fetal face, fontanelles or genitalia. Do not apply when placenta previa is present; when genital infection (e.g., herpes, Group B streptococcus, gonorrhea) or maternal acquired immune deficiency syndrome (AIDS) exists; when mother is a confirmed carrier of hemophilia and the fetus is either affected or of unknown status; or when not possible to identify fetal presenting part where application is being considered.

WARNING: The fetal electrode tip is designed to penetrate the epidermis of the fetus; therefore, trauma, hemorrhage and/or infection can occur. The electrode should be used with strict adherence to aseptic technique. Amniotic membranes must be ruptured prior to attaching the spiral electrode.
Necrotizing Fasciitis of the Scalp in a Newborn

Cecile Davey, MBBS, DM, and Aileen M. Moore, MD, FRCPa

BACKGROUND: Fetal scalp electrode monitoring is usually without complications, but on rare occasions it can serve as a portal of entry for organisms colonizing the maternal genital tract.

CASE: We present a case of neonatal necrotizing fasciitis of the scalp that was associated with intrapartum fetal scalp electrode monitoring. Skin cultures grew Group A Streptococcus M11 T nontypeable serotype, an unusual cause of neonatal necrotizing fasciitis. The neonate's mother had a concurrent perineal infection and the same Group A streptococcal serotype was cultured from maternal blood and vaginal swabs.

CONCLUSION: This case highlights the emergence of life-threatening Group A Streptococcus causing invasive disease in both infants and mothers and the need for careful monitoring of neonates who have had intrapartum electrode monitoring.

(Neutral 2005;107:461–3)

Necrotizing fasciitis is also referred to as "flesh-eating bacteria disease" is an acute, rapidly progressive, potentially fatal infection of the superficial and deep fascia and subcutaneous tissue.\textsuperscript{1,2} Necrotizing fasciitis, although rare in children (0.018 per 100,000 children per year), is even rarer in neonates, occurring most in term infants with an equal gender distribution and a mortality rate as high as 60%.\textsuperscript{1,2} The paucity of cutaneous findings early in the course makes a high index of suspicion necessary for a prompt diagnosis.\textsuperscript{2} Marked tissue edema, rapid progression of inflammation, and signs of septic shock are the clinical diagnostic clues.\textsuperscript{2} Frozen section analysis, polymerase chain reaction assay, ultrasonography, computed tomography, and magnetic resonance imaging are useful diagnostic tools. But the definitive diagnosis is usually made at surgery.\textsuperscript{2} Complications include septic shock, disseminated intravascular coagulation, multiorgan failure, and death.\textsuperscript{2}

Neonatal necrotizing fasciitis is frequently polymicrobial, Staphylococcus aureus, Escherichia coli, Enterococcus, Clostridium spp, and Bacteroides spp being the predominant organism isolated.\textsuperscript{2} However, Group A Streptococcus (S pyogenes) has been associated in necrotizing fasciitis secondary to omphalitis, circumcision, and abdominal surgery.\textsuperscript{4}

CASE

A term female infant weighing 3,560 g was born by vacuum-assisted vaginal delivery for poor maternal effort to a 34-year-old primigravida after 4 hours of ruptured membranes, with intrapartum fetal scalp monitoring. The labor was performed with no difficulty, because of fetal tachycardia, the mother sustained second-degree perineal lacerations. The neonate complained of a sore throat and fever, mother noted 7 hours after birth; treated with 3 doses of tetanus toxoid. The neonate was delivered vaginally 5 days after birth, and the diagnosis of omphalitis was confirmed, and the scalp was debrided. The scalp was debrided 3 times in the first 72 hours of life. The blood was sent for culture and sensitivity, which grew Group A Streptococcus type M11 T nontypeable, with a beta hemolysis, moderate growth, and toxic granulations. The scalp lesion showed bacteremia. The blood and urine cultures were sterile. Imaging studies showed multiorgan hypoperfusion and a subdural hematoma.

Fig. 1. Necrosis, sloughing, and bleeding of almost the entire scalp seen on admission, distinguishing necrotizing fasciitis from a cellulitis.
Fetal Heart Rate --- FHR
Fetal Heart Tones --- FHT

Auscultation = To diagnose by listening
(Auscultare = To listen to)

Fetal Heart Rates for Near-Term Fetuses

Average Baseline FHR 100-160 BPM
Tachycardia 161-up BPM
Bradycardia Below 100 BPM

Source: ACOG Technical Bulletin #132
Pressure

Anoxia or Hypoxia

Type one dip

Type two dip
Fetal heart rate monitoring: Is it salvageable?

Julian T. Parer, MD, PhD, and Tekoa King, CNM, MPH
San Francisco, California

Fetal heart rate monitoring was introduced in the 1960s. After a number of randomized controlled trials in the mid 1980s, doubt arose regarding the efficacy of fetal heart rate monitoring in improving fetal outcome. The potential reasons why fetal heart rate monitoring has not been shown to be efficacious are (1) use of an outcome measure that is not related to variant fetal heart rate monitoring patterns, (2) lack of standardized interpretation of fetal heart rate patterns, (3) disagreement regarding algorithms for intervention of specific fetal heart rate patterns, and (4) the inability to demonstrate the reliability, validity, and ability of fetal heart rate monitoring to allow timely intervention. A recent National Institutes of Health committee proposed detailed, quantitative, standardized definitions of fetal heart rate patterns, which can serve as a basis for determining whether fetal heart rate monitoring is reliable and valid. In this article we examine reasons why fetal heart rate monitoring did not live up to its original expectations and why the randomized controlled trials did not demonstrate efficacy, and we make suggestions for determining whether electronic fetal heart rate monitoring should be abandoned. (Am J Obstet Gynecol 2000;182:982-7.)
FETAL MONITORS RIDICULED

An editorial in the March 1, 1990 issue of the New England Journal of Medicine (a general medical journal... rather than an obstetrical journal) put yet another nail in the coffin of electronic fetal monitoring. Doctors in other fields of medicine have traditionally held low opinions of obstetricians, anyway... but this time obstetrics has given it’s critics some new and powerful ammunition.

Using put-down words such as “loyalists” and “zealots” and referring to an “electronic fetal monitoring camp” The NEJM wondered, for all to see, why nobody did scientific tests of efficacy before using a potentially harmful gadget.

This same line of questioning could and should be applied to almost every existing obstetrical device, test or intervention... as well as to obstetrics itself. The history of obstetrics is a sad and sordid affair, and fetal monitors will go the way of un-washed hands, ether, DES, thalidomide, weight leeches, diuretics, leeches, and all the rest.

Bradley advocates have often been attacked with similar put-downs... it is refreshing to see a little balance sneak into medical thought... but is anyone really listening??

Jav Hathaway, AAIHC
The success rate of electronic fetal monitoring was high in the fetal-monitoring group. A subsequent study of the children involved in the studies of Haverkamp et al. failed to show any long-term benefits of electronic fetal monitoring. Critics were quick to point out that the number of infants was small and that with larger numbers the benefits of electronic fetal monitoring were likely to become evident.

Since then, there have been six prospective, randomized trials of electronic fetal monitoring in a total of 17,510 fetuses born at term. None of these studies found decreases in the rates of intrapartum death, low Apgar scores, or fetal acidosis (see references cited by Shy et al.). The study from Dublin did find more seizures in the auscultation group, but long-term follow-up failed to demonstrate any difference in neurologic outcome.

At this point, many loyalists suggested that if there was to be a benefit from electronic fetal monitoring, it would certainly be demonstrated in a randomized trial in premature infants. In 1987 Luthy et al. studied 246 women whose infants weighed between 700 and 1750 g, and this study too failed to show any difference in immediate outcome between the infants monitored electronically and those monitored with auscultation.

The article by Shy et al. in this issue of the Journal
UNCERTAIN VALUE OF ELECTRONIC FETAL MONITORING IN PREDICTING CEREBRAL PALSY

KARIN B. NELSON, M.D., JAMES M. DAMBROSIA, PH.D., TRICIA Y. TING, B.S., AND JUDITH K. GREther, PH.D.

Abstract Background. Electronic monitoring of the fetal heart rate is commonly performed, in part to detect hypoxia during delivery that may result in brain injury. It is not known whether specific abnormalities on electronic fetal monitoring are related to the risk of cerebral palsy.

Methods. Among 155,636 children born from 1983 through 1985 in four California counties, we identified singleton infants with birth weights of at least 2500 g who survived to three years of age and had moderate or severe cerebral palsy. The children with cerebral palsy were compared with randomly selected control children with respect to characteristics noted in the birth records.

Results. Seventy-eight of 95 children with cerebral palsy and 300 of 378 controls underwent intrapartum fetal monitoring. Characteristics found to be associated with an increased risk of cerebral palsy were multiple late decelerations in the heart rate, commonly defined as slowing of the heart rate well after the onset of uterine contractions (odds ratio, 3.9; 95 percent confidence interval, 1.7 to 9.3), and decreased beat-to-beat variability of the heart rate (odds ratio, 2.7; 95 percent confidence interval, 1.1 to 5.8); there was no association between the highest or lowest fetal heart rate recorded for each child and the risk of cerebral palsy. Even after adjustment for other risk factors, the association of abnormalities on fetal monitoring with an increased risk of cerebral palsy persisted (adjusted odds ratio, 2.7; 95 percent confidence interval, 1.4 to 5.4). The 21 children with cerebral palsy who had multiple late decelerations or decreased variability in heart rate on fetal monitoring represented only 0.19 percent of singleton infants with birth weights of 2500 g or more who had these fetal-monitoring findings, for a false positive rate of 99.8 percent.

Conclusions. Specific abnormal findings on electronic monitoring of the fetal heart rate were associated with an increased risk of cerebral palsy. However, the false positive rate was extremely high. Since cesarean section is often performed when such abnormalities are noted and is associated with risk to the mother, our findings arouse concern that, if these indications were widely used, many cesarean sections would be performed without benefit and with the potential for harm. (N Engl J Med 1996; 334:613-8.)
The New England Journal of Medicine

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Electronic Fetal Monitoring Does Not Improve Outcome

Laurie Barclay, MD

Feb. 6, 2003 — Electronic fetal monitoring does not improve outcome, according to the results of a prospective, randomized trial reported in the Feb. 8 issue of The Lancet.

"The findings of this trial demonstrate that a widespread and expensive practice is largely unjustified," lead author Lawrence Impey, from John Radcliffe Hospital in Headington, Oxford, says in a news release.

Admission cardiotocography, or electronic assessment of fetal heartbeat, is widely used to identify fetal distress and other high-risk pregnancies that might benefit from more invasive continuous electronic fetal monitoring.

At the National Maternity Hospital in Dublin, Ireland, 8,580 women admitted to the delivery ward received either admission cardiotocography for 20 minutes or the unit’s usual care consisting of intermittent auscultation of the fetal heart beat using a stethoscope. There was no difference between groups in the primary outcome of perinatal death or moderate to severe neonatal morbidity (1.3% in each group; relative risk [RR], 1.01; 95% confidence interval [CI], 0.70 - 1.47).

Although the cardiotocography group had increased use of continued cardiotocography (RR, 1.39; 95% CI, 1.33 - 1.45) and of fetal blood sampling (RR, 1.30; 95% CI, 1.14 - 1.47), there was no difference between groups in the rates of caesarean delivery, instrumental delivery, or episiotomy.

"By concentrating our attention on the pattern of the baby's heart-beat in labor we are seeing only a fraction of the causes of stillbirth and neonatal handicap," Impey says. "We need better research to understand the processes behind these. Only then can we improve things in the years to come, rather than play catch-up by evaluating what we have done in years past."

Lancet. 2003;361:465-70
Electronic fetal monitoring has failed as a public health screening program. Nevertheless, most of the four million low-risk women giving birth in the United States each year continue to undergo this screening. The failure of this program should have been anticipated and thus avoided because of the principles of screening being considered before its introduction. All screening tests have poor positive predictive value when searching for rare conditions such as fetal death in labor or cerebral palsy. This problem is aggravated when the screening test does not have good validity as is the case with electronic fetal monitoring. Because of low-prevalence target conditions and mediocre validity, the positive predictive value of electronic fetal monitoring for fetal death in labor or cerebral palsy is near zero. Stated alternatively, almost every positive test result is wrong. To avoid such costly errors in the future, the prerequisites for any screening program must be fulfilled before the program is begun.
Intrapartum Fetal Heart Rate Monitoring

In 2002, approximately 3.4 million fetuses (85% of approximately 4 million live births) in the United States were assessed with electronic fetal monitoring (EFM), making it the most common obstetric procedure (1). Despite its widespread use, there is controversy about the efficacy of EFM, interpretation of fetal heart rate (FHR) patterns, reproducibility of its interpretation, and management algorithms for abnormal or nonreassuring patterns. Moreover, there is evidence that the use of EFM increases the rate of cesarean and operative vaginal deliveries. The purpose of this document is to review nomenclature for FHR assessment, review the data on the efficacy of EFM, delineate the strengths and shortcomings of EFM, and describe the management of nonreassuring FHR patterns.

Background

Even though the fetus is efficient at extracting oxygen from the maternal compartment, a complex interplay of antepartum complications, suboptimal uterine perfusion, placental dysfunction, and intrapartum events may be associated with adverse outcome. Known obstetric conditions, such as hypertensive disease, fetal growth restriction, and preterm birth, predispose fetuses to poor out-

Given that the available data do not clearly support EFM over intermittent auscultation, either option is acceptable in a patient without complications. Logistical issues may make it feasible to adhere to guidelines for
Intrapartum Fetal Heart Rate Monitoring: Nomenclature, Interpretation, and General Management Principles

In the most recent year for which data are available, approximately 3.4 million fetuses (85% of approximately 4 million live births) in the United States were assessed with electronic fetal monitoring (EFM), making it the most common obstetric procedure (1). Despite its widespread use, there is controversy about the efficacy of EFM, interobserver and intraobserver variability, nomenclature, systems for interpretation, and management algorithms. Moreover, there is evidence that the use of EFM increases the rate of cesarean deliveries and operative vaginal deliveries. The purpose of this document is to review the evidence for fetal heart rate monitoring.

Given that the available data do not show a clear benefit for the use of EFM over intermittent auscultation, either option is acceptable in a patient without complications. 

A complex interplay of antepartum complications, suboptimal uterine perfusion, placental dysfunction, and intrapartum events can result in adverse neonatal outcome. Known obstetric conditions, such as hypertensive disease, fetal distress, and preterm labor, necessitate EFM for maternal or fetal protection. The use of EFM to stratify patients without known complications remains controversial. This practice bulletin reviews the current evidence for fetal heart rate monitoring and provides guidance for obstetricians-gynecologists on how to manage fetal heart rate monitoring in the absence of antepartum complications.
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“A Useless Pile of Microchips”
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A Great, Advanced Anatomy/Physiology Lesson
Number of Retarded Children?