THE MODIFIED FETAL BIOPHYSICAL PROFILE IN PREGNANCY

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Identification of patients at increased risk for perinatal morbidity is a part of modern obstetrical program. This study was effectuated in the period 1998-2002. 14 high-risk patients received the modified biophysical profile testing protocol as primary surveillance. A total of 32 tests (modified biophysical profile, CST and biophysical profile) were performed on these patients. A modified biophysical profile was interpreted as negative, if there were two or more accelerations of the FHR of at least 15 beats per minute within 10 minutes (a reactive NST) and AFI of at least 5.0 cm. This study reports the association of a negative last test and subsequent adverse perinatal outcome for the CST and the modified biophysical profile.

1. INTRODUCTION

Various means of fetal surveillance are used to determine which pregnancy is at increased risk for compromise and to allow appropriate continuation of pregnancy in an otherwise high-risk setting. The tests used most commonly include antepartum fetal heart rate (FHR) monitoring, ultrasound assessment of fetal growth, fetal biophysical characteristics and amniotic fluid volume.

2. MATERIALS AND METHODS

The study was effectuated in the period 1998 – 2002. 14 consecutive high-risk patients received the modified biophysical profile testing protocol as primary surveillance. A total of 32 tests (modified biophysical profile, CST and biophysical profile) were performed on these patients, for an average of 5 ± 2 tests per patient. Equivocal tests were repeated in one day unless delivery was elected.

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A modified biophysical profile was interpreted as negative if there were two or more accelerations of the FHR of at least 15 beats per minute within 10 minutes (a reactive NST) and AFI of at least 5.0 cm. If accelerations were not present spontaneously after 10 minutes of monitoring, we used fetal sound stimulation [1-3]. The patients were randomized to either a CST or a biophysical profile if the FHR failed to meet reactivity criteria or had significant variable, or late decelerations, or if the AFI was less than 5.0 cm. All patients with abnormal modified biophysical profiles were randomized and received a test before delivery.

This study includes only those whose last tests was a negative modified biophysical profile performed within 3-4 days of delivery. Positive tests were individualized, complete data on testing results; labor, delivery and neonatal course were collected prospectively from all subjects. The data were analysed with the X² and Fisher method [4-6]. The CST was the initial form of antepartum FHR testing and has been used as a means of comparing the perinatal outcomes reported with various protocols for fetal surveillance. Incorporating both FHR (NST) and ultrasound (AFI) characteristics, the test was termed a modified biophysical profile. Using acoustic stimulation when necessary, testing time was shorter and the test was less expensive.

3. RESULTS

This study reports the association of a negative last test and subsequent adverse perinatal outcome for the CST and the modified biophysical profile. The studied patients had similar distributions of indications for testing, and there were no differences in maternal age, parity, gestational age at delivery, or average birth weight between the groups of the patients followed with biweekly modified biophysical profiles, seven had negative tests 4 or 3 days before delivery. There were 9 adverse outcomes following a negative last test in this group. Two deaths occurred; one on day 7 from a major SNC abnormality. The incidence of an adverse perinatal outcome following a negative modified biophysical profile was significantly less than that following a negative CST (p=0.4; 95%, confidence interval 1.03-1.90).

The majority of adverse outcomes were caesarean delivery for fetal distress within the first two hours of labor. Overall, caesarean delivery occurred in 32% of the CST group and in 35% of the modified biophysical profile group.

4. DISCUSSIONS

The collaborative Perinatal Project based upon births occurring over 30 years ago, reported an overall perinatal mortality rate over 17 per 1000 births. The rate was increased several fold in women with pregnancies complicated by problems such as maternal hypertension. Although there are likely many different reasons for the reduction, the use of fetal surveillance for identification and close monitoring of patients at increased risk for uteroplacental insufficiency is widely held to be of value. It is not ethically permissible to randomize high-risk patients to either a protocol of fetal surveillance or no monitoring to determine the actual benefit of antepartum fetal monitoring.

The value of such monitoring is supported by observations that women with
high-risk conditions who receive antepartum fetal surveillance have a significantly lower perinatal mortality rate than low-risk patients who do not receive antepartum monitoring.

However, because of several limitations including time, cost, patient inconvenience and discomfort, and the high frequency of equivocal results, we elected to evaluate an alternative form of fetal surveillance. Incorporating both FHR (NST) and ultrasound (AFI) characteristics, the test was termed a modified biophysical profile. Using acoustic stimulation when necessary, testing time was shorter and the test was consequently less expensive. However, in addition to improving time, cost and patient convenience, we wanted to ensure that there was no significant deterioration or fetal or neonatal survival. We selected a narrow definition of reactivity (two 15-beat accelerations in 10 rather than 20 minutes). In addition, the frequency of testing was twice weekly.

The value of the negative last test as a predictor of normal outcome is a critical measure of test value because it is both the most common test result and it also should have a very high predictive value. The specific predictive value will depend upon how one defines adverse outcome. Various measures of morbidity can be used, and there is understandable disagreement over their relative values. The most common of these morbidities was early cesarean delivery for fetal distress. The four measures of morbidity in this study were chosen because of their significance in both the short and long term for both mother and neonate.

In this study, there was one potentially preventable death in both groups of patients following a negative last-test. The incidence of adverse outcome was at least as infrequent, if not rare, following a negative modified biophysical profile as following a negative CST performed as the last test. Because the subjects were not randomized to CST or modified biophysical profile as the primary surveillance test, but instead a recent historical group used for comparison, one cannot conclude that a negative modified biophysical profile is necessarily a better test than a negative CST.

Identification of patients at increased risk for perinatal morbidity and mortality is a basic part of any modern obstetric program. Various means of fetal surveillance are used in an effort to determine which pregnancy is at increased risk for compromise and to allow appropriate continuation of pregnancy in an otherwise high-risk setting.

The tests used most commonly in this effort include antepartum fetal heart rate (FHR) monitoring, ultrasound assessment of fetal growth, fetal biophysical characteristics, and amniotic fluid volume. The weekly contraction stress test (CST) was the primary method of antepartum fetal surveillance used for high-risk pregnancies.

In response to concerns including test length, frequency of equivocal results requiring repeat testing, cost of the test, and patient inconvenience, we initiated biweekly modified biophysical profile testing to replace the CST as the primary means of fetal surveillance in all high-risk pregnancies. Manning (1980) (cited in [1]) proposed the combined use of five fetal biophysical variables as a more accurate means of assessing fetal health than any single variable used alone. They concluded that consideration of five variables could significantly reduce both false-positive and false-negative single test rates. Required equipment included a real-time ultrasound
device and Doppler ultrasound to record fetal heart rate. Five biophysical variables were assessed in complicated pregnancies. There were: 1) fetal heart rate acceleration; 2) fetal breathing; 3) fetal movements; 4) fetal tone; 5) amniotic fluid volume.

Normal variables were assigned a score of two each and abnormal variables a score of zero. The highest score possible for a normal foetus was 10. Manning and coll. (1990) analysed abnormal infant outcomes associated with higher biophysical profile scores. The incidence of adverse outcomes increased as the scores decreased from six to zero. The non-stress test, fetal breathing movements and amniotic fluid volume components, were more predictive of pregnancy outcomes than fetal tone or fetal movements.

5. CONCLUSIONS

The frequency of adverse perinatal outcome following a negative modified biophysical profile was no greater than that following a negative CST. This study reports the association of a negative last test and subsequent adverse perinatal outcome for the CST and modified biophysical profile. A modified biophysical profile is a combination of a non-stress test (NST) and an amniotic fluid index (AFI).

REFERENCES