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Postdates and Antenatal Testing

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The standard definition of a prolonged pregnancy is 42 completed weeks of gestation. The incidence of prolonged pregnancy varies depending on the criteria used to define gestational age at birth. It is estimated that 4 to 19% of pregnancies reach or exceed 42 weeks gestation. Several studies that have used very large computerized databases of well-dated pregnancies provided insights into the incidence and nature of adverse perinatal outcome such as an increased fetal and neonatal mortality as well as increased fetal and maternal morbidity in prolonged pregnancy. Fetal surveillance may be used in an attempt to observe the prolonged pregnancy while awaiting the onset of spontaneous labor. This article reviews the different methodologies and protocols for fetal surveillance in prolonged pregnancies. On the one hand, false-positive tests commonly lead to unnecessary interventions that are potentially hazardous to the gravida. On the other hand, to date, no program of fetal testing has been shown to completely eliminate the risk of stillbirth.
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Prolonged Pregnancy

The standard definition of a prolonged pregnancy is 42 completed weeks of gestation. This definition is endorsed by the American College of Obstetricians and Gynecologists, The World Health Organization, and the International Federation of Gynecology and Obstetrics.[1-3] In view of more recent perinatal mortality data that were derived from accurately dated pregnancies, it would be reasonable to conclude that prolonged pregnancy should be defined as gestational age at birth greater than or equal to 41 weeks of gestation.

The incidence of prolonged pregnancy varies depending on the criteria used to define gestational age at birth. It is estimated that 4 to 19% of pregnancies reach or exceed 42 weeks gestation and 2 to 7% complete 43 weeks of gestation.

Prolonged Pregnancy as an Indication for Fetal Testing

Several studies that have used very large computerized databases of well-dated pregnancies provide insights into the incidence and nature of adverse perinatal outcome in prolonged pregnancy. Divon and coworkers evaluated fetal and neonatal mortality rates in 181,524 accurately dated term and prolonged pregnancies.[4] Their study documented a small but significant increase in fetal mortality in accurately dated pregnancies that extend beyond 41 weeks gestation and demonstrated that fetal growth restriction is independently associated with a large increase in perinatal mortality in these pregnancies. These results were confirmed by other investigators.[5,6] Clausson and coworkers documented that perinatal mortality rates in small for gestational age fetuses had higher odds ratio for stillbirth and neonatal death.[6] The stillbirth rate did not change significantly when fetuses with congenital malformations were excluded. However, an 80% drop in neonatal deaths occurred when malformed neonates were excluded from the analysis. In addition, prolonged pregnancies were associated with an increased frequency of neonatal convulsions, meconium aspiration syndrome, and Apgar score of <4 at 5 minutes. Again, morbidity in postterm small for gestational age (SGA) infants was higher than in postterm AGA infants. Further support for the concept that the "small and old" fetus suffers from increased perinatal mortality was provided by Campbell and coworkers, who performed a multivariate analysis of factors associated with perinatal death among 65,796 singleton postterm ($\geq$294 days) births.[7] Three variables were identified as independent predictors of perinatal mortality. SGA and maternal age equal or greater than 35 years were associated with a significant increase in perinatal mortality. Interestingly, large for gesta-

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tional age status (ie, birth weight ≥90th percentile for gestational age) was associated with a modest protective effect for perinatal death. However, macrosomia was associated with a higher incidence of labor dysfunction, obstetrical trauma, shoulder dystocia, and maternal hemorrhage. Several studies have shown that the incidence of macrosomia increases with advancing gestational between 37 and 43 weeks. In addition, this increase also results in doubling the cesarean rate for protraction or descent disorders.[8-10]

There is good evidence to suggest that fetal and maternal morbidity are also increased as gestational age advances beyond term. Tunon and coworkers compared neonate intensive care unit (NICU) admission rates among 10,048 term pregnancies and 246 prolonged pregnancies (≥296 days by both scan and last menstrual period (LMP) dates).[11] Prolonged pregnancy was associated with a significant increase in NICU admissions (odds ratio, 2.05; 95% CI, 1.35 and 3.12).

Several maternal and fetal complications were evaluated in a large (n = 45,673) retrospective, cohort study by Caughey and Musci.[12] The authors concluded "that risks to both mother and infant increase as pregnancy progresses beyond 40 weeks' gestation, and that antenatal fetal testing should begin sooner than current recommendation of 42 weeks of gestation." Olesen and coworkers evaluated a large computerized Danish database of singleton, live-born term and postterm (>42 weeks) deliveries to quantify maternal and fetal risks associated with postterm delivery.[13] Both perinatal and maternal complications were increased significantly in postterm deliveries.

Fetal Surveillance

Fetal surveillance may be used in an attempt to observe the prolonged pregnancy safely while awaiting the onset of spontaneous labor. On the one hand, false-positive tests commonly lead to unnecessary interventions that are potentially hazardous to the gravida. On the other hand, to date, no program of fetal testing has been shown to completely eliminate the risk of stillbirth.

Data presented earlier in this review indicate that perinatal mortality is significantly increased as early as 41 weeks gestation and possibly even earlier. The optimal gestational age for the initiation of fetal testing has not been established. Jazayeri and coworkers provided physiologic evidence of altered fetal oxygenation in patients at ≥41 weeks by demonstrating elevated plasma erythropoietin levels in these patients.[14] Thus, it would seem prudent to initiate fetal testing at 41 weeks of gestation.

Extensive experience with biophysical profile testing in high-risk populations indicates a perinatal mortality rate of 0.73 per 1000 tested pregnancies within 1 week of a normal test provided that the amniotic fluid volume is normal.[15] Twice-weekly testing with the biophysical profile was reported in a series of 307 patients followed beyond 42 weeks of gestation. When the profile score was normal, waiting for spontaneous labor resulted in healthy neonates and a much lower cesarean section rate. No stillbirths were observed in this small series.[16]

Several investigators have examined the efficacy of using a nonstress test (NST) as a primary testing modality with the addition of sonographic assessment of amniotic fluid. Clark and coworkers tested 279 prolonged pregnancies with this testing scheme. No stillbirths were recorded.[17] Miller and coworkers reported on the use of a similar protocol in 6390 prolonged pregnancies.[18] The false-negative rate of this test was 0.8 per 1000 women tested—a rate that favorably compares with those reported for the contraction stress test or the complete biophysical profile.[15,19] An analysis of all false-positive tests showed that the routine use of nonstress testing combined with the amniotic fluid index (AFI) resulted in a 60% false-positive rate in the prediction of intrapartum fetal compromise compared with a 40% false-positive rate using the complete biophysical profile. This increase in false-positive tests was felt to be partly due to the poor specificity of the AFI in predicting fetal compromise. Alfirevic and Walkinshaw compared the impact on perinatal outcome of two different protocols for antenatal fetal monitoring after 42 weeks.[20.] One hundred forty-five women with singleton, uncomplicated pregnancies after 42 weeks of gestation were randomly allocated to fetal monitoring by either a biophysical profile combined with computerized cardiotocography or a standard cardiotocography supplemented by measurement of the largest vertical pocket of amniotic fluid. Their results documented significantly more abnormal antenatal monitoring tests in the biophysical profile combined with the computerized cardiotocography group. There were no differences in cord blood gases, neonatal outcome, or outcomes related to labor and delivery between the two groups, but there was a trend toward more obstetric interventions in the biophysical profile combined with the computerized cardiotocography group. Amniotic fluid volume after 42 weeks was more likely to be labeled as abnormal with amniotic fluid index than with largest vertical pocket.

Sylvestre and coworkers evaluated the incidence of abnormal testing (NST and AFI) as a function of birth weight in 792 uncomplicated prolonged pregnancies (>41 weeks).[21] They showed an inverse relationship between abnormal testing and birth weight. In addition, small fetuses were more likely to require a cesarean delivery for non-reassuring fetal status during labor than were all other fetuses. Thus, it is reasonable to conclude that the small, postterm fetus is not only more likely to die in utero but is also more likely to fail antepartum fetal testing and to be delivered by nonelective cesarean section for an intrapartum diagnosis of non-reassuring fetal status.

The implicit assumption in the expectant management strategy is that the presence of an abnormal fetal test (such as oligohydramnios, low biophysical profile score, or spontaneous fetal heart rate decelarations) represents a change in fetal status that requires intervention in the from of prompt delivery. A novel view of the regulation of fetal homeostasis during late gestation was offered by Onyeije and Divon.[22] These