Outcomes in cephalic vs noncephalic presentation in the setting of preterm premature rupture of membranes

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OBJECTIVE: This study was conducted to determine whether fetal position at the time of preterm premature rupture of membranes (PPROM) diagnosis affects outcomes.

STUDY DESIGN: A retrospective study was designed to assess differences in outcomes between cephalic and noncephalic presentation at PPROM diagnosis between 24 and 34 weeks' gestation.

RESULTS: Five hundred sixty-six cases of PPROM were identified; 108 cases (19.1%) were noncephalic at time of PPROM diagnosis. The 2 groups were similar with regard to demographics. Although membrane rupture and delivery occurred earlier in the noncephalic group, there was no difference in latency between groups (cephalic group, 6.22 days vs noncephalic group, 7.85 days; $P = .07$). Noncephalic pregnancies were substantially more likely to be complicated by oligohydramnios, abruption, intrauterine fetal death, and infectious morbidity.

CONCLUSION: Noncephalic presentation at the time of diagnosis of PPROM independently and significantly increases the risk of maternal complications in such affected pregnancies.

Key words: abruption, oligohydramnios, outcome, PPROM, presentation

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Preterm premature rupture of the membranes (PPROM) is estimated nationally to complicate 3% of pregnancies and contributes to one-third of all preterm births.[1] Defined as rupture of the membranes before the onset of labor at <37 weeks' gestation, potential PPROM-related morbidity and death are significant for the fetus, neonate, and mother. Contributing to this are the increased risks of perinatal infection, abruption, cord prolapse, and stillbirth.[1,2] The reported risk of abruption-complicated PPROM is 4-12%, with the risk for abruption increasing 24 hours after membrane rupture, particularly in the presence of intrauterine infection or oligohydramnios.[3,4] Additionally, because most pregnancies that are complicated by PPROM deliver prematurely, those infants are at risk for neonatal complications such as respiratory distress syndrome (RDS), intraventricular hemorrhage (IVH), neurologic compromise, and necrotizing enterocolitis (NEC). Unique to those premature infants who are delivered in the presence of PPROM, the risk of infection is substantial and, if it occurs, appears to heighten the risks and severity of other morbidities that have been described. Clinically evident intraamniotic infection is reported to complicate 2-13% of PPROM cases, with the incidence of infection increasing with decreasing gestational age.[1] Maternal infectious risks from PPROM are also significant; an estimated one-third of women experience infections such as intraamniotic infection, endometritis, wound infection, or sepsis.[1,2] This increased risk of a complicated maternal and neonatal course is not unexpectedly linked to a prolonged hospital stay for both. Consequently, PPROM holds significant public health impact.

Birth within 1 week of membrane rupture is the most common outcome for pregnancies that are complicated by PPROM. *Latency*, defined as the time from rupture of membranes until delivery, has been described to be longer the earlier the gestational age at time of membrane rupture.[1,2] Oligohydramnios as a consequence of PPROM has been associated with shorter latency and increased neonatal morbidity (including RDS) but has not been associated with an increase in maternal or neonatal infections.[5] When presentation in PPROM is noncephalic, these risks appear increased when oligohydramnios is present, although differences in patterns of risk by fetal presentation have not been well studied to date.[6]

There is limited information available in the literature to guide management decisions in pregnancies that are affected by PPROM in conjunction with a noncephalic presentation. It has been reported that a noncephalic presentation of the fetus with PPROM negatively impacts antepartum, intrapartum, and neonatal risks, primarily with regard to cord prolapse risk.[6] However, whether expectant management should be varied according to fetal presentation is unclear. Thus, the purpose of this study was to determine whether fetal presentation at the time of diagnosis of PPROM affects maternal, fetal, and/or neonatal outcomes.

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Materials and Methods

With the approval of the University of Oklahoma Health Sciences Center institution review board, a 5-year database of all singleton consecutive deliveries with PPROM Jan. 1, 2006 to Jan. 1, 2011, at <34 weeks' gestation was established at the University of Oklahoma Health Sciences Center, a tertiary level center with approximately 5000 deliveries per year. We identified cases of PPROM by reviewing our delivery log book and running a query of our labor and delivery unit electronic medical record for that diagnosis. Data were extracted for identified cases from our electronic medical record, with paper chart review as needed for completion of our intended data collection. To compare outcomes on the basis of presentation, we proceeded with a retrospective analysis of all cases of PPROM in the database from 24-34 weeks' gestation. Multiple gestations and known lethal fetal anomalies were excluded.

The diagnosis of ruptured membranes was made by conventional means, with the performance of sterile speculum examination and observation of pooled fluid, ferning, and nitrazine pH determination. Once the diagnosis of PPROM was confirmed, patients were treated in a conventional way, and in accordance with current ACOG clinical management guidelines, which were inclusive of those managed before publication.[1] A detailed ultrasound scan was performed, which included documentation of presentation and amniotic fluid volume and a review of dating criteria. *Oligohydramnios* was defined as an amniotic fluid index of ≤5 that was obtained by the sum of the largest vertical pockets in each of the 4 quadrants. On admission, a single course of antenatal glucocorticoids to induce fetal lung maturity and prophylactic latency antibiotics for 7 days were instituted. Latency antibiotics used were an initial 48-hour course of intravenous ampicillin and erythromycin followed by a 5-day course of oral amoxicillin and erythromycin. Tocolytics during the first 48 hours of diagnosis during corticosteroid and latency antibiotic administration were at the discretion of the attending Maternal Fetal Medicine specialist.

All patients were treated in the hospital; in the absence of labor, fetal heart rate abnormality, chorioamnionitis, or other indication for expedient delivery (such as cord prolapse, death, or abruption) was treated expectantly until 33 completed weeks of gestation. Maternal and fetal statuses were monitored closely for the development of labor, chorioamnionitis, or fetal compromise. *Clinical chorioamnionitis* was defined as antepartum temperature of ≥100.4°F, the presence of uterine tenderness, fetal tachycardia, maternal tachycardia, and/or foul-smelling discharge. Cesarean delivery was performed for standard indications. All noncephalic presentations at the time of delivery were delivered by cesarean section.

Maternal demographics, historic factors (such as tobacco abuse, illicit substance abuse, and bleeding), medical history, obstetric history, presence of cerclage, estimated gestational age at diagnosis and delivery, latency in days, presentation at diagnosis and delivery, mode of delivery and indications, postpartum complications, intrauterine and postpartum infections, and maternal duration of stay were documented. Amniotic fluid index at the diagnosis of PPROM, incidence of oligohydramnios, anomalies, and estimated fetal weight on initial ultrasound scan were also recorded. Other fetal and neonatal outcomes that were assessed were length of stay, 1- and 5-minute Apgar scores, RDS, infections/sepsis, jaundice, anemia, retinopathy of prematurity, NEC IVH, intrauterine fetal death (IUFD), neonatal death, and hospital stay in days.

Two groups were identified: cephalic and noncephalic presentations at the time of PPROM diagnosis. The primary outcome defined for sample size determination was clinical abruption. Based on approximately 5000 deliveries per year, we estimated 500 were preterm deliveries, with 150-200 deliveries complicated by PPROM at 24-34 weeks' gestation. Given an alpha-error of .05 and assuming an incidence of abruption in PPROM cases of 5%, 110 patients per group were determined to be needed to provide a power of 0.8 to detect a 20% difference between groups. Therefore, 5 years of record review were estimated to be required. Statistical comparisons were made between the 2 groups with *t*-tests, Wilcoxon rank sum tests, χ^2 tests, and Fisher exact tests, as appropriate. A probability value of $< .05$ was considered statistically significant. To compare the risk of selected outcomes between cephalic and noncephalic groups, risk ratios (RRs) were calculated with 95% confidence intervals (CIs) with the use of a generalized estimating equation method to estimate modified Poisson regression models with robust standard errors.

Neonatal outcomes (NEC, IUFD, neonatal death, RDS, IVH) and maternal outcomes (intraamniotic infection, abruption, oligohydramnios) were assessed individually and in composite. Neonatal models were controlled for age, race, cerclage, gestational age, tobacco, cesarean delivery, and abruption. Models for maternal outcomes were controlled for age, race, cerclage, gestational age, tobacco, and abruption (when abruption was not the outcome variable or a component of the composite outcome). Additionally, Kaplan-Meier survival curves for latency were created for both groups. Analysis was performed with SAS (version 9.2; SAS Institute Inc, Cary, NC) and SPSS software (SPSS Inc, Chicago, IL).

Results

Between Jan. 1, 2006, and Jan. 1, 2011, 566 cases of PPROM that occurred between and including 24-34 weeks' gestational age were identified. Of those, 458 cases were cephalic presentations (80.9%), and 108 cases (19.1%) were noncephalic presentations at time of PPROM diagnosis. The cephalic and noncephalic groups were similar with respect to race/ethnicity, but the noncephalic group was slightly older and had higher gravidity (Table 1). There was a high frequency of tobacco and illicit substance abuse overall, but no statistically significant difference between groups (Table 1). There was no difference between groups for history of preterm delivery (cephalic group, 27%, vs noncephalic group, 25%; $P = .57$) or