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Total phospholipid choline concentration of amniotic fluid in the assessment of foetal gestational and lung maturity. II. Correlation study

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Summary

Analysis of total phospholipid choline concentration was carried out on amniotic fluid samples obtained from 20 pregnant Nigerian women in established labour to determine the correlation of amniotic fluid phospholipid choline concentration with the gestational ages and maturity of the infants. There was a positive correlation between phospholipid choline concentration and gestational age. All infants whose gestational ages were estimated to be over 36 weeks had a total phospholipid concentration greater than 50 μmol/l. Four infants whose gestational ages were less than 36 weeks had total phospholipid choline concentration less than 30 μmol/l. None of these infants showed any evidence of Respiratory Distress Syndrome.

Résumé

L'analyse du concentré total de phospholipid choline a été faite sur l'échantillon de liquor amnii prélevé sur 20 femmes nigérianes enceintes, en train de s'accoucher, afin de déterminer la corrélation de l'échantillon de liquor amnii avec l'âge de gestation et de maturité des bébés. On a trouvé que le concentré phospholipid choline correspond à l'âge de gestation. Tous les bébés dont l'âge de gestation était estimé à plus de 36 semaines avaient le concentré phospholipid total plus que 50 μmol/l. Quatre bébés dont l'âge de gestation était moins que 36 semaines avaient le concentré total de phospholipid choline moins que 30 μmol/l. Aucun des bébés ne souffrait du syndrome de douleur respiratoire (RDS).

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Introduction

Prematurity and the Respiratory Distress Syndrome (RDS) are major neonatal problems which may sometimes be prevented by judicious delay of delivery of the infant [1]. A reliable assessment of gestational or lung maturity would usually be required by the obstetrician. Methods currently available for the objective assessment of foetal gestational or lung maturity include the determination of the lecithin/sphingomyelin (L/S) ratio of amniotic fluid [2], amniotic fluid phospholipid profile [3], radiography or ultrasonography of the foetus *in utero* [4,5]. The determination of the L/S ratio remains the most used index of foetal lung maturity despite its poor predictive value when an immature ratio (< 2:1) is obtained [6]. Determination of the L/S ratio is labor intensive, requiring about 3 h of a skilled technologist's time to perform. The multiple analytical steps in the L/S ratio determination are possible sources of error leading to imprecision of the assay. Using a new enzymic method for the determination of phospholipid choline content of amniotic fluid [7] we have studied the correlation of amniotic fluid total phospholipid choline concentration with foetal gestational and lung maturity in pregnant women.

Subjects and methods

Twenty pregnant Nigerian women admitted into the labour ward in established labour or for elective Caesarean section were studied. The

women's ages ranged from 14 to 35 years, and their parity ranged from 0 to 5. Amniotic fluid samples were collected in plain universal bottles either by amniocentesis at Caesarean section or *per vaginam* following artificial rupture of the membrane. Only amniotic fluid free of meconium or blood contamination was used. Each amniotic fluid sample was centrifuged at 4000 r.p.m. for 10 min to remove cellular debris, immediately after collection. Analysis of the total phospholipid choline concentration of the amniotic fluid was carried out as previously described [7]. Each sample was analysed within 1 h of collection. All analyses were carried out in duplicate with aqueous lecithin standards serving as controls. All the women delivered within 6 h of collection of amniotic fluid samples. Each infant delivered was weighed at birth, and assessed for gestational maturity by the Dubowitz's criteria [8]. Each infant was observed for evidence of respiratory distress until discharge from the hospital.

Results

Figure 1 shows the distribution of total phospholipid choline concentrations in relation to the gestational ages of the pregnancies. There is a positive correlation between phospholipid choline concentrations and gestational ages of the pregnancies represented by the regression line $y = 0.0723x + 30.2786$, with a correlation coefficient (r) of 0.65 ($P < 0.001$). Figure 2 shows the distribution of total choline concentration in relation to gestational maturity by the Dubowitz's criteria. Four infants had a total phospholipid choline concentration below 30 μmol/l but were assessed to be between 33 and 36 weeks gestational maturity. All other infants assessed to be 36 weeks and above in maturity had total phospholipid choline concentration greater than 50 μmol/l. None of the infants showed any evidence of RDS.

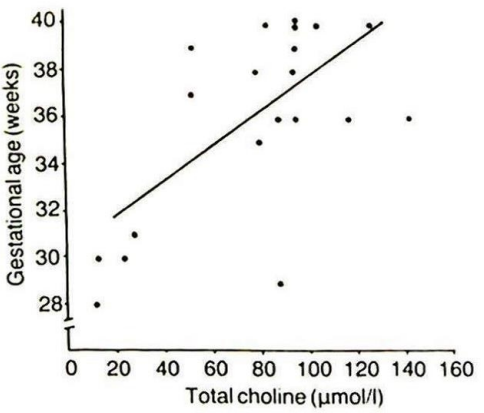


Fig. 1. Distribution of total phospholipid choline concentration in relation to gestational age. Regression equation: $y = 0.0723x + 30.2786$ ($P < 0.001$).

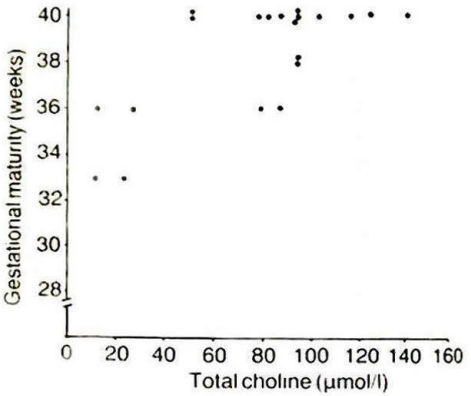


Fig. 2. Distribution of total phospholipid choline concentration in relation to gestational maturity (Dubowitz)

Discussion

Lecithin and sphingomyelin are choline-containing phospholipids which constitute the largest proportion of mature lung surfactant phospholipids released into the amniotic fluid [2]. Total phospholipid choline concentration is equivalent to the molar sum of lecithin and sphingomyelin in amniotic fluid [7]. The result of the limited number of pregnancies studied shows a clear correlation between gestational age and amniotic fluid concentration of phospholipid choline. The absence of RDS even in infants with amniotic fluid phospholipid choline concentrations below 30 μmol/l in this study is consistent with the documented low incidence of RDS in premature infants of negroid mothers [9,10]. This, however, makes it impossible to demonstrate a correlation between amniotic fluid phospholipid choline concentration and foetal lung maturity. Olowe and

Akinkugbe [10] showed, in a study of L/S ratio of amniotic fluid of pregnant Nigerian women from the 23rd to the 42nd week of gestation, that there is an earlier attainment of a mature 2:1 ratio in Nigerian women than in Caucasians. Together with other possible factors, Olowe and Akinkugbe [10] suggested that this may be responsible for the apparent protection that negroid infants have against RDS. Our result is further evidence that the negroid infant is protected from RDS in spite of low concentration of surfactant phospholipids in amniotic fluid. We suggest that studies similar to ours in non-negroid populations, where the incidence of RDS is high, may demonstrate a correlation between amniotic fluid phospholipid choline and foetal lung maturity.

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