Validity of Lamellar Body Count as a Fetal Lung Maturity Assessment in Twin Pregnancy

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Fetal lung maturity assessment in twin pregnancy has been discussed, but is still controversial. The purpose of this study is to predict the occurrence of respiratory distress syndrome (RDS) using lamellar body count (LBC) and analyze the validity of LBC for fetal lung maturity assessment in twin pregnancy. Three-hundred two amniotic fluid samples were obtained at cesarean section from 29 to 38 weeks of gestation. Samples were analyzed immediately with no centrifugation and the number of lamellar bodies was counted using a platelet channel on the Sysmex SF-3000. There were 18 neonates (6.0%) suffering from RDS. An LBC cut-off value of $2.95 \times 10^4/\mu L$ resulted in 91.5% sensitivity and 83.3% specificity for predicting RDS. This cut-off value for predicting RDS was the same as that in singleton pregnancy. Moreover, the median LBC value in RDS cases was significantly lower than in non-RDS cases ($1.50 \pm 1.1 \times 10^4/\mu L$ vs. $10.6 \pm 7.5 \times 10^4/\mu L$; $p < .001$). This is the first report on the validity of LBC in twin pregnancy and also the largest study on fetal lung maturity assessment in twin pregnancy. An LBC value of $>2.95 \times 10^4/\mu L$ means reassuring findings for RDS even in twin pregnancy. We believe the data in this study provide valuable, new information for the management of twin pregnancies.

∎ **Keywords:** amniotic fluid, lamellar body, fetal lung maturity, respiratory distress syndrome, twin pregnancy

Fetal lung maturity assessment in twin pregnancy has been discussed, but is still controversial. In singleton pregnancy, several studies have shown the lamellar body count (LBC) to be an accurate predictor of fetal lung maturity (Karcher et al., 2005; Piazze et al., 2005; Wijnberger et al., 2001). The LBC can be performed quickly and cheaply, so it is a more cost-effective predictor for the occurrence of respiratory distress syndrome (RDS) than the lecithin/sphingomyelin (L/S) ratio (Wijnberger et al., 2001). In a recent study, an LBC on gastric aspirates could also be used alone or in combination with the stable microbubble test as a predictor of RDS (Daniel et al., 2010). Nothing has been reported about the LBC values in twin pregnancies. Thus, in this study, we performed LBCs in twin pregnancies and analyzed the validity of LBC for fetal lung maturity assessment in twin pregnancy.

Materials and Methods

Data were collected from April 2006 to March 2010 at Nagara Medical Center, Gifu City, Japan. We registered 302 neonates (151 twin pairs) including 81 dichorionic twin (DCT) pairs and 70 monochorionic twin (MCT) pairs without any anomalies or complications such as twin–twin transfusion syndrome. Chorionicity was determined by early ultrasound findings and placental pathology following delivery. All amniotic fluid samples were obtained from each sac at cesarean section from 29 to 38 weeks of gestation with informed consent. Samples were analyzed immediately after arrival at the laboratory with no centrifugation, according to a standardized methodology for LBC reported by Neerhof et al. (Neerhof et al., 2001). Amniotic fluid samples contaminated with blood and meconium were excluded. The LBC was determined using a platelet channel on the Sysmex SF-3000 (Sysmex, Kobe, Japan). The diagnoses of RDS were established by the neonatologist based

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(a) DCT

LBC ($10^4/\mu$L)
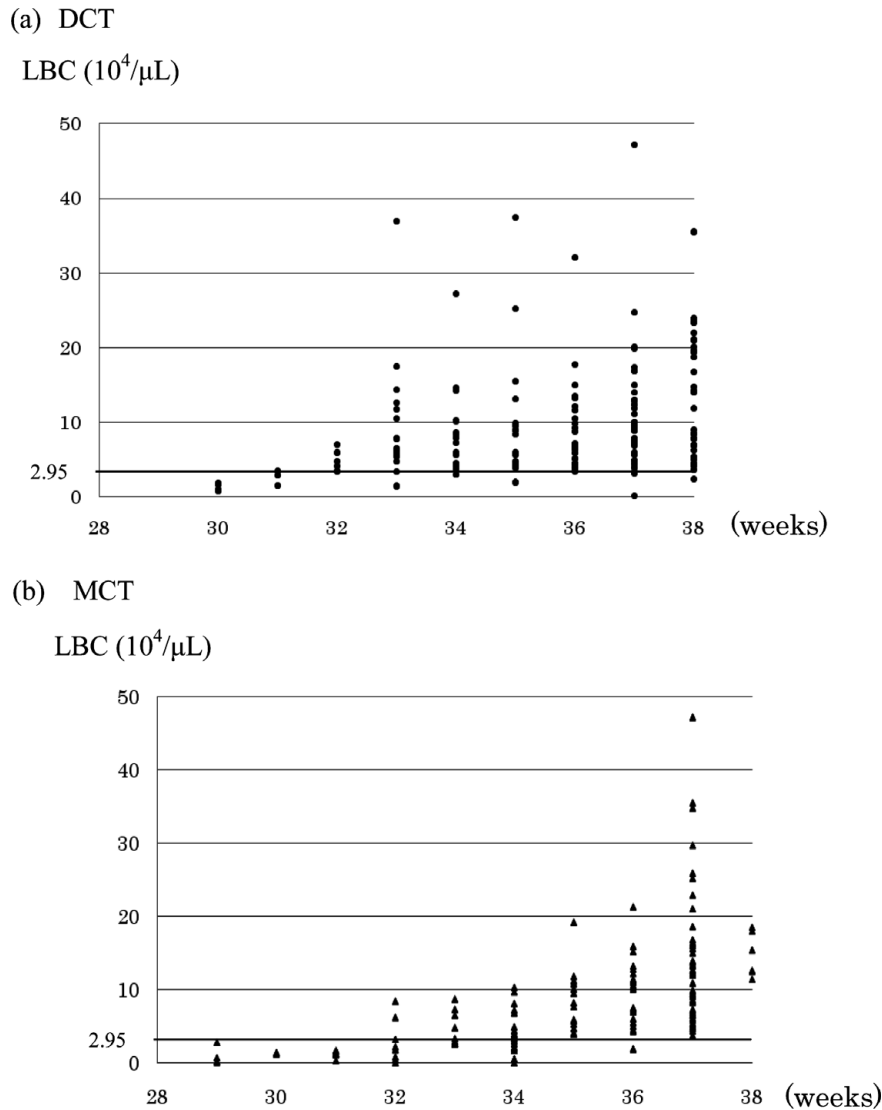

(b) MCT

LBC ($10^4/\mu$L)

FIGURE 1

Correlation between lamellar body count (LBC) and gestational weeks at delivery. Solid horizontal lines in the figure indicate the cut-off value of LBC for predicting RDS.

on the combination of clinical signs, chest X-ray findings, and clinical course; the neonatologist was unaware of the LBC data. The data were collected and entered on a computerized spreadsheet (Excel spreadsheet, Microsoft, Tokyo, Japan). The data were statistically analyzed with Dr. SPSS II (SPSS Inc., Tokyo, Japan) using Student's t-test, Mann–Whitney U test, and an ROC curve. A p-value of less than .05 was considered significant.

Results

There were 18 neonates (6.0%) suffering from RDS. The rate of RDS was not different between DCT and MCT (4.3% vs. 7.9%; $p = .196$). Maternal outcomes were as follows: delivered before 34 weeks of gestation ($n = 29$, 19.2%); pregnancy-induced hypertension ($n = 27$, 17.9%); diabetes

mellitus ($n = 4$, 2.6%); and preterm rupture of membrane ($n = 12$, 7.9%). There were no significant differences between DCT and MCT. We analyzed the cut-off value of LBC for predicting RDS using an ROC curve. An LBC cut-off value of 2.95 $\times 10^4/\mu$L resulted in 91.5% sensitivity, 83.3% specificity, and area under the ROC curve of 96.1%. In singleton pregnancy, the same LBC cut-off value of 2.95 $\times 10^4/\mu$L resulted in 94.0% sensitivity, 82.4% specificity, and area under the ROC curve of 92.7% for predicting RDS, as we reported previously ($n = 365$) (Tsuda et al., 2010). Moreover, the median LBC value in RDS cases was significantly lower than in non-RDS cases (1.50 $\pm$ 1.1 $\times 10^4/\mu$L vs. 10.6 $\pm$ 7.5 $\times 10^4/\mu$L; $p < .001$). The correlation between the LBC value and gestational weeks at delivery is shown in Figure 1.

Discussion

There is currently no consensus regarding whether fetal lung maturation differs between singleton and twin pregnancies because some factors such as gender, birth weight, first- or second-born, and vaginal or cesarean delivery can affect the incidence rates of RDS (Marttila et al., 2004; McElrath et al., 2000). Moreover, there is also no consensus regarding whether fetal lung maturity assessment differs between singleton and twin pregnancies. Leveno et al. reported that lung maturity, as indicated by a L/S ratio >2, was reached in twin pregnancies at an average of 32 weeks' gestation, compared with 36 weeks' gestation for singleton pregnancies (Leveno et al., 2000). Further, beyond 31 weeks' gestation, twin pregnancies appeared to have a TDx fetal lung maturity value that was 22 mg/g higher than that in singleton pregnancies (McElrath et al., 2000). However, the underlying cut-off values for RDS in twin pregnancy were not considered in these studies. Our results in this study can answer this question, and the cut-off value for predicting RDS with LBC was the same for singleton and twin pregnancies.

Our results showed that the LBC cut-off value for predicting RDS in twin pregnancy had a high sensitivity rate (91.5%) and high specificity rate (83.3%) using the ROC curve. But we should be careful for the interpretation of these data because high sensitivity and specificity rates may in part be due to the fact that the incidence of RDS was very low. Then, there are some limitations in this study. We don't compare the LBC values between the twin pairs and the gender in this study. We need further studies about these questions.

This is the first report on the validity of LBC in twin pregnancy and also the largest study on fetal lung maturity assessment in twin pregnancy. We conclude that we can use the same cut-off value for predicting RDS even in twin pregnancy. Therefore, an LBC value of >2.95 × 10^4/μL means reassuring findings for RDS even in twin pregnancy. Our data in this study may have some limitations, but we believe this provides valuable, new information for the management of twin pregnancies.

Acknowledgment

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