

Increased Rate of Elective Cesarean Delivery and Neonatal Respiratory Disorders in Twin Pregnancies

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Abstract

We examined whether the incidence of neonatal respiratory disorders has increased with the increased rate of elective cesarean delivery in twin pregnancies. We reviewed the obstetric records of 292 twin deliveries with vertex presentation of the first twin after 37 weeks' gestation at our hospital from 2000 through 2008. The study period was divided into 3 parts as follows: period 1: 2000 through 2002 (n=76); period 2: 2003 through 2005 (n=104); and period 3: 2006 through 2008 (n=112). We compared the rate of elective cesarean delivery due to maternal request and the incidence of transient tachypnea of the newborn (TTN). There has been a significant increase in rate of elective cesarean delivery (period 1: 18%; period 2: 25%; period 3: 48%) over the past several years. This increase was observed to be due to an increase in maternal requests for elective cesarean delivery. However, there were no significant differences in the incidence of TTN in the 3 periods [period 1: 7.2%; period 2: 6.7%; period 3: 8.0%]. The recent increase in the rate of cesarean delivery did not cause the increase in the incidence of neonatal respiratory disorders in twin pregnancies.

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Key words: cesarean delivery rate, transient tachypnea of the newborn, twin pregnancy

Introduction

A marked increase in the overall cesarean delivery rate of twin pregnancies has recently been observed¹. This increase has been thought to be due to physician counseling and maternal requests for elective cesarean delivery to avoid perinatal asphyxia, especially in the second twin, or combined vaginal-cesarean delivery or both¹⁻³. However, it is recognized that cesarean delivery before labor onset is associated with an increased risk of neonatal

respiratory disorders. Therefore, in the present study we examined whether the incidence of neonatal respiratory disorders increased with the rate of elective cesarean delivery in twin pregnancies.

Materials and Methods

We reviewed the obstetric records of 292 twin deliveries with vertex presentation of the first twin after 37 weeks' gestation at Japanese Red Cross Katsushika Maternity Hospital from 2000 through

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2008. Demographic information and the characteristics of labor were extracted from patient charts. The exclusion criteria from this analysis were as follows: (1) intrauterine fetal demise of 1 twin; (2) severe complications, such as twin-twin transfusion syndrome; and (3) birth weight <1,500 g in 1 or both twins. In cases of elective cesarean delivery, the dates of scheduled cesarean section were decided to be 37 to 38 weeks' gestation (average: 37.4 ± 0.4 weeks), mainly by patients' request. The gestational age of the pregnancies was established with ultrasonographic examination of the fetal crown-rump length at 9 to 11 weeks' gestation in cases of spontaneous conception and embryo transfer dates when pregnancy was achieved by in vitro fertilization.

The study period (2000–2008) was divided into 3 parts as follows: period 1: 2000 through 2002 (n=76); period 2: 2003 through 2005 (n=104); and period 3: 2006 through 2008 (n=112), and we compared the rate of elective cesarean delivery due to maternal request and the incidence of neonatal respiratory disorders: respiratory distress syndrome (RDS) and transient tachypnea of the newborn (TTN). The diagnoses of RDS and TTN were made by neonatologists with clinical and radiology data and exclusion of other causes of respiratory distress. The criteria for TTN include: tachypnea immediately after birth or within 2 hours, with other predictable signs of respiratory distress; symptoms lasting from a few hours to 2 days; and a chest radiograph showing diffuse parenchymal infiltrates, a 'wet silhouette' around the heart, or intralobar fluid accumulation⁴⁵. In this study, potential risk factors for TTN, such as chorionicity, gestational age at delivery, mode of delivery, neonatal birth weight, and Apgar score of the neonates⁶⁻¹⁰, were also examined.

Cases and controls were compared by means of the χ^2 or Fisher's exact test for categorical variables. Student's *t*-test was used for the comparison of mean values. Odds ratios (ORs) and 95% confidence intervals (CIs) were also calculated. Differences with $P < 0.05$ were considered significant. Variables used in the multivariate model were those that on univariate analysis had shown statistical significance toward

association with increased risk of TTN.

Results

Table 1 summarized the changes in delivery mode and incidence of pregnancies in which 1 or both neonates had respiratory disorders and low Apgar scores (<7) at 1 minute from 2000 through 2008. In this study, there were no significant differences among these 3 periods in maternal age (period 1: 32 ± 4 years; period 2: 32 ± 4 years; and period 3: 33 ± 5 years); parity (period 1: 0.4 ± 0.7 ; period 2: 0.4 ± 0.6 ; and period 3: 0.5 ± 0.7); gestational age at delivery (period 1: 38.0 ± 1.1 weeks; period 2: 37.9 ± 1.0 weeks; and period 3: 37.7 ± 0.9 weeks); or neonatal birth weight (period 1: $2,492 \pm 323$ g; period 2: $2,513 \pm 354$ g; and period 3: $2,488 \pm 382$ g). No neonates had RDS. In 35 (12%) of 292 pregnancies TTN was diagnosed in 1 or both twins, and 43 (7.4%) of 584 neonates had TTN. Over the past several years the rate of elective cesarean delivery rate increased significantly in twin pregnancies and the rate of vaginal delivery has decreased significantly. This increase in the rate of elective cesarean delivery was observed to be due to an increase in maternal requests for elective cesarean delivery. There were no measurable differences in gestational age at elective cesarean delivery in the 3 periods (period 1: 37.6 ± 0.6 weeks; period 2: 37.4 ± 0.6 weeks [$p=0.32$ vs. period 1]; period 3: 37.3 ± 0.5 weeks [$p=0.52$ and 0.08 vs. period 1 and 2]). However, there were no significant differences in the incidence of TTN in the 3 periods (period 1: 10 pregnancies and 11 neonates [7.2%]; period 2: 12 pregnancies and 14 neonates [6.7%, $p=0.85$ vs. period 1]; period 3: 13 pregnancies and 18 neonates [8.0%, $p=0.96$ and 0.60 vs. period 1 and 2]).

Table 2 shows the analysis of dichotomous variables by the incidence of TTN. In neonates with TTN the rate of elective cesarean delivery and the incidence of low Apgar scores at 1 minute were significantly higher than in neonates without TTN. Logistic regression showed that TTN was also significantly more likely in neonates with a low Apgar score at 1 minute (adjusted OR, 5.5; 95% CI, 1.9–16; $P < 0.01$) and elective Cesarean delivery

Cesarean and TTN in Twins

Table 1 Delivery mode and incidence of pregnancies in which one or both neonates were diagnosed with respiratory disorders and low Apgar score at 1 minute

Period (Year)	Period 1 (2000–2002)	Period 2 (2003–2005)	Period 3 (2006–2008)	P1	P2	P3
Number	76	104	112			
Mode of delivery						
Vaginal delivery	44 (58)	49 (47)	28 (25)	0.15	<0.01	<0.01
Elective Cesarean delivery	14 (18)	26 (25)	54 (48)	0.57	<0.01	<0.01
Emergency Cesarean delivery	15 (20)	25 (24)	29 (26)	0.49	0.33	0.75
Vaginal-Cesarean delivery	3 (4)	4 (4)	1 (1)	0.94	0.15	0.15
Indication for elective Cesarean						
Maternal request	12 (16)	22 (21)	49 (44)	0.36	<0.01	<0.01
Others	3 (4)	4 (4)	5 (4)	0.97	0.86	0.82
Neonatal respiratory disorders*						
RDS	0 (0)	0 (0)	0 (0)	-	-	-
TTN	10 (13)	12 (12)	13 (12)	0.82	0.72	0.98
Apgar score at 1 minute <7*	7 (9)	6 (6)	3 (3)	0.38	0.26	0.05

Abbreviations: RDS, respiratory distress syndrome; TTN, transient tachypnea of the newborn.

*Neonatal respiratory disorders or Apgar score at 1 minute <7 in one or both twins.

Values are presented as number (%).

P1: difference between Period 1 and Period 2 by unpaired *t*-test.

P2: difference between Period 1 and Period 3 by unpaired *t*-test.

P3: difference between Period 2 and Period 3 by unpaired *t*-test.

Table 2 Analysis of dichotomous variables by the incidence of transient tachypnea of the newborn

Transient tachypnea of the newborn	(+)	(-)	P
Number	43	541	
Monochorionic twins	7 (16)	136 (25)	0.19
Second twin	19 (44)	273 (50)	0.43
Gestational age at delivery (weeks)			
37 weeks	32 (74)	342 (63)	0.14
≥39 weeks	8 (19)	84 (16)	0.59
Delivery mode			
Emergency Cesarean delivery	8 (19)	137 (25)	0.33
Elective Cesarean delivery	25 (58)	163 (30)	<0.01
Neonatal sex			
Male	29 (67)	289 (54)	0.05
Birth weight			
<2,000 g	5 (12)	44 (8.1)	0.43
<2,500 g	21 (49)	283 (52)	0.66
Apgar score at 1 minute <7	6 (14)	11 (2.0)	<0.01

Values are presented as number (%).

(adjusted OR, 2.8; 95% CI, 1.5–5.5; *P*<0.01).

Discussion

In this study, the recent increase in the rate of cesarean delivery was not seen to be responsible for the increase in the incidence of neonatal respiratory disorders in twin pregnancies. Although we were relieved by the current results, the reason for the

results is not clear.

TTN has been reported to occur frequently, not only after cesarean delivery before labor onset but in cases of perinatal asphyxia⁶. Delayed resorption of pulmonary fluid has been accepted as the central problem of TTN. This condition associated with asphyxia has been suggested to be due to dysfunctional catecholamine regulation, mild pulmonary capillary leak syndrome, and myocardial

dysfunction with elevated filling pressure⁶⁻⁸. For example, in our earlier study examining the risk factors for TTN in infants delivered vaginally at 37 weeks or later⁸, a low Apgar score (<7) at 1 minute was the factor most strongly associated with the incidence of TTN. As shown in **Table 1**, the incidence during period 3 of pregnancies in which 1 or both neonates had low Apgar scores tended to be lower than that the incidence during period 1, although it did not reach the level of statistical significance ($p=0.05$). In some previous reviews^{2,3}, for twins in vertex presentation at or near term, the rate of neonatal death, due to such causes as asphyxia, RDS, and trauma, was higher if delivery was vaginal rather than by cesarean section, especially in second twins. In this study, in addition, 46% (16 of 35) of the pregnancies with 1 or both twins having TTN were not delivered by elective cesarean section. Therefore, recent trends in the mode of twin delivery might have decreased the incidence of TTN associated with asphyxia instead of increasing the incidence of TTN associated with elective cesarean delivery. The present analysis of dichotomous variables by the incidence of TTN may also support this speculation.

The sample size of this study was small; however, the recent increase in the rate of cesarean delivery was not responsible for the increase in the incidence of neonatal respiratory disorders in twin pregnancies.

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