—Short Communication—

Timing of Elective Cesarean Singleton Delivery and Neonatal Respiratory Outcomes at a Japanese Perinatal Center

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Abstract

The present study examined the relation between the timing of elective cesarean delivery at term and neonatal respiratory outcomes at our institution. From 2005 through 2013, 1,951 elective cesarean singleton deliveries were performed at term. Of the neonates, 141 (7%) had respiratory disorders requiring oxygen supplementation. In comparison to the incidence of respiratory disorders in neonates delivered at full term (39–40 weeks), the incidences in neonates delivered at ≤38+1/7 weeks' and at 41 weeks' gestation were significantly higher. Uncomplicated elective cesarean singleton delivery should be avoided at 38+1 weeks or earlier, and we also pay attention to the respiratory outcomes of neonates delivered by elective cesarean section at 41 weeks' gestation.
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Key words: elective cesarean singleton delivery, term, neonatal respiratory disorders, oxygen supply

Recently, the American College of Obstetricians and Gynecologists, National Institutes of Health, and National Institute of Child Health and Human Development[1–4] have recommended that elective cesarean delivery be performed after 39 weeks' gestation to decrease the rates of neonatal respiratory complications. In Japan, on the other hand, elective cesarean delivery is recommended in the first half of the 38th week of gestation, because the rate of labor onset or rupture of membranes or both requiring emergency cesarean section have seemed to be higher after 39 weeks' gestation[5–9]. In Japan, emergency cesarean delivery, especially at night, is associated with a higher rate of perinatal complications than is planned cesarean delivery, because about half of all deliveries in Japan are performed at private clinics without anesthesiologists[5,6,10]. Although some reports in Japan support the safety of elective cesarean delivery at 38 weeks' gestation[5–9], few large studies have examined these problems. Our institution is a large perinatal center in Tokyo (about 2,000 deliveries per year). The present study examined the relation between the timing of elective cesarean delivery at term and neonatal respiratory outcomes at our institution.

Methods

The protocol for this study was approved by the Ethics Committee of the Japanese Red Cross

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We retrospectively analyzed cases of elective cesarean singleton delivery, performed at term at our institution from 2006 through 2013, without labor pains; rupture of membranes; perinatal complications, such as pregnancy-induced hypertension, fetal anomalies, and fetal growth restriction (neonatal birth weight less than −1.5 SD of the reference range in Japan); or inaccurate gestational age. At our institution, we do not perform cesarean sections upon maternal request. The gestational age was established with ultrasonographic examination of the fetal crown-rump length at 9 to 11 weeks' gestation in cases of spontaneous conception and with embryo transfer dates when pregnancy was achieved with in vitro fertilization. Demographic information and the characteristics of the elective cesarean singleton deliveries were extracted from patient charts to examine factors suggested by previous studies[1–4,11] to be associated with an increased risk of neonatal respiratory disorders at term: nulliparity, maternal age, indication for elective cesarean delivery, gestational age at delivery, neonatal sex, neonatal birth weight, Apgar score at 1 minute, and umbilical artery pH.

The diagnoses of neonatal respiratory disorders, such as respiratory distress syndrome and transient tachypnea of the neonate requiring oxygen supplementation or respiratory support, such as intermittent mandatory ventilation and continuous positive airway pressure, were made by neonatologists with clinical and radiology data and the exclusion of other causes of respiratory distress[11,12]. To examine the association between gestational age at delivery and the risk of neonatal respiratory outcomes, we compared the incidence of neonatal respiratory disorders at each gestational age to those at full term (39+0/7 weeks' through 40+6/7 weeks' gestation), which has been identified in the United States as the optimal time for delivery in uncomplicated pregnancies.

Data are presented as the number (%) or mean± SD. For statistical analysis, Student's *t*-test was used for continuous variables, whereas the χ^2 test or Fisher's exact test was used for categorical variables. Odds ratios and 95% confidence intervals were also calculated. Differences with $p<0.05$ were considered significant.

Results

During the study period, 1,951 elective cesarean singleton deliveries were performed at term. The mean gestational age at delivery was 37.9±0.6 weeks. Of these deliveries, 892 (46%) were performed at a gestational age of 37 weeks, 911 (47%) were at 38 weeks, 105 (5%) were at 39 to 40 weeks, and 43 (2%) at 41 weeks. Respiratory disorders requiring oxygen supplementation was diagnosed in 141 neonates (7%). Of these neonates, 51 (36%) required respiratory support and 3 (2%) had persistent pulmonary hypertension of the newborn (PPHN).

Other than gestational age at delivery, the characteristics of elective cesarean singleton deliveries did not differ between those with and those without neonatal respiratory disorders (**Table 1**). However, in comparison with deliveries at full term (39–40 weeks), both deliveries at ≤38+1/7 weeks' gestation and at 41 weeks' gestation showed significantly higher incidences of neonatal respiratory disorders requiring oxygen supplementation, whereas deliveries at ≤38+0/7 weeks' gestation showed a significantly higher incidence of the need for respiratory support (**Table 2**).

Discussion

The present results suggest that elective cesarean delivery without perinatal complications or complications should be performed at 38+2/7 weeks' gestation or later.

Several studies have documented a high incidence of respiratory disorders and of neonatal intensive care unit admissions of infants born by cesarean delivery before the onset of spontaneous labor[13,14]. Although most infants initially have no respiratory disorder or have mild tachypnea of the neonate with minimal requirement for oxygen supplementation and chest x-ray films suggestive of retained lung

Table 1 Clinical characteristics of elective cesarean singleton deliveries at term with and without neonatal respiratory disorders

	No respiratory disorders (n=1,810)	Respiratory disorders (n=141)	*P*-value
Maternal age (years)	33.8 ± 4.8	34.0 ± 4.9	0.63
Nulliparity	471 (26%)	32 (23%)	0.38
Indication for cesarean delivery			
Previous cesarean delivery	1,181 (65%)	99 (70%)	0.23
Breech presentation	209 (12%)	21 (15%)	0.24
Placenta previa/Low-lying placenta	121 (6.7%)	6 (4.3%)	0.26
Gestational age at delivery (weeks)	38.0 ± 0.6	37.7 ± 0.4	<0.01
Neonatal sex: male	925 (51%)	83 (59%)	0.08
Neonatal birth weight (g)	2,815 ± 341	2,757 ± 358	0.06
Apgar score at 1 minute<7	19 (1.0%)	4 (2.8%)	0.06
Umbilical artery pH<7.1	12 (0.7%)	0 (0%)	0.33

Data are presented as the number (%) or mean ± SD.

Table 2 Incidence of neonatal respiratory disorders in cases of elective cesarean singleton deliveries at each gestational age

Gestational age at delivery (weeks)	Total	Oxygen supplementation					Respiratory support		
	N	N	%	*P*-value	Crude OR	95% CI	N	%	*P*-value
37+0/7	50	11	22	<0.01	29.3	3.66–235	4	8.0	<0.01
37+1/7	67	16	24	<0.01	32.6	4.21–253	6	9.0	<0.01
37+2/7	88	10	11	<0.01	13.3	1.67–106	5	5.7	0.01
37+3/7	104	12	12	<0.01	13.6	1.73–106	4	3.8	0.04
37+4/7	145	10	22	0.02	7.70	0.97–51.1	4	2.8	0.09
37+5/7	195	9	4.6	0.09	5.03	0.63–40.3	7	3.6	0.09
37+6/7	243	21	8.6	<0.01	9.84	1.31–74.1	4	1.6	0.19
38+0/7	230	15	6.5	0.03	7.26	0.95–55.7	9	3.9	0.04
38+1/7	203	13	6.4	0.03	7.12	0.92–55.2	6	3.0	0.08
38+2/7	186	8	4.3	0.11	4.67	0.58–37.9	1	0.5	0.45
38+3/7	116	4	3.4	0.21	3.71	0.41–33.8	1	0.9	0.34
38+4/7	82	1	1.2	0.86	1.28	0.08–20.8	0	0	—
38+5/7	47	1	2.1	0.56	2.26	0.14–36.9	0	0	—
38+6/7	32	1	3.1	0.37	3.35	0.20–55.2	0	0	—
39+0/7 to 40+6/7	105	1	1.0	Reference	1	-	0	0	Referene.
41+0/7 to 41+6/7	43	3	7.0	0.04	7.80	0.79-77.2	0	0	—

Data are presented as the number (%) or mean ± SD.
N, number; OR, odds ratio; CI, confidence interval

fluid, a subset of infants have a gradual increase in the requirement for oxygen supplementation and subsequent evidence of PPHN[13]. In the current study, 36% of cases of neonatal respiratory disorders required respiratory support, while 2% were diagnosed as PPHN. Therefore, the present results may support these previous[12,13] reports and the recent American College of Obstetricians and Gynecologists Committee Opinion[4] that neonatal outcomes, especially respiratory morbidity, vary depending on the timing of delivery within the 5-week gestational age range of "term". Because, the incidence of respiratory disorders in neonates delivered at early term (37 to 38 weeks) or late term (41 weeks) was significantly higher than that at full term. Therefore, we should avoid uncomplicated elective cesarean singleton delivery at 38+1/7 weeks' gestation or earlier, and we also pay

attention to the respiratory outcomes of neonates delivered by elective cesarean section at late-term.

Conflict of Interest: The authors declare no conflict of interest.

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