

Elective delivery and the neonatal respiratory distress syndrome

J.-C. LE GUENNEC,* MD; H. BARD, MD; F. TEASDALE, MD; B. DORAY, MD

A prospective study was carried out to determine how often moderate or severe respiratory distress syndrome in infants delivered electively after 32 weeks' gestation or more is avoidable. During a 9-month period 64 such newborns were evaluated. The disease was considered avoidable in 14 (22%) since the indication for elective delivery was questionable. The mean birth weight and gestational age of these 14 infants were 2550 ± 430 g and 36.3 ± 1.7 weeks, and the mortality was 14%. This study demonstrated that elective delivery can produce severe neonatal complications, that despite their availability diagnostic tests of fetal age and maturity of the fetal lungs are not being used universally, and that the indications for elective delivery in cases of premature rupture of the membranes must be re-evaluated.

On a mené une étude prospective durant 9 mois chez des enfants nés au cours d'un accouchement provoqué après une gestation de 32 semaines ou plus. Soixante-quatre de ces nouveau-nés ont présenté une maladie des membranes hyalines de caractère sévère à modéré; on en a fait l'analyse afin de déterminer quelle proportion de cette maladie pourrait être évitée. Elle s'avéra de 22% (14 cas) puisque les indications de provoquer l'accouchement y étaient discutables. Ces 14 nouveau-nés avaient un poids moyen de 2550 ± 430 g et un âge gestationnel moyen de 36.3 ± 1.7 semaines. La mortalité était de 14%. Cette étude a démontré que la mortalité et la morbidité néonatales consécutives à l'accouchement provoqué restent élevées. Malgré la disponibilité des tests d'évaluation de l'âge gestationnel et de la maturité des poumons foetaux, ceux-ci ne sont pas entrés dans l'usage courant. On doit examiner de nouveau les indications de provoquer l'accouchement lors d'une rupture prématurée des membranes.

Most of the attention in neonatal intensive care has been focused on the respiratory distress syndrome in infants born before 32 weeks' gestation. However, there is a significant mortality and morbidity due to the respiratory distress syndrome in infants born after 32 weeks' gestation, and in a good proportion of the cases the delivery was elective.

To determine how often moderate or severe respiratory distress syndrome is avoidable we carried out a prospective study during a 9-month period at the neonatal intensive care unit of Sainte-Justine Hospital, Montreal, which admits 1300 newborns per year.

Patients and methods

During the study period 94 newborn infants were

admitted to the neonatal intensive care unit of Sainte-Justine Hospital with the diagnosis of respiratory distress syndrome. The diagnosis was based on the typical clinical criteria in association with a reticulogranular pattern and air bronchograms on the chest roentgenograms. The syndrome was defined as moderate when the infant needed to breathe more than 50% oxygen with or without the use of continuous negative pressure, severe when intubation and ventilation with positive end-expiratory pressure were required, and avoidable when elective cesarean section or induced vaginal delivery had been done without a clear indication.

The infants' gestational age was assessed from their physical characteristics¹ and neurologic features² as well as from the mother's menstrual history. Only the 64 who were born after 32 weeks or more of gestation (68% of those with moderate or severe respiratory distress syndrome) were included in the study. In each case the obstetric events leading up to delivery were reviewed from the mother's chart or by communicating with the physician responsible for the delivery. Of the 64 infants 71% had not been born at Sainte-Justine Hospital, which is the referral centre for 50 hospitals in the eastern area of the province of Quebec. At these hospitals there are approximately 35 000 deliveries per year. None of the infants had a proven infection or a diabetic mother.

Results

The mean birth weight and gestational age (\pm one standard deviation) of the 64 infants were 2266 ± 530 g and 34.9 ± 2 weeks. Of the 28 cesarean sections (44% of the deliveries) 9 (32%) were repeat procedures; the gestational age of the 28 infants varied from 35 to 38 weeks (mean 36.2 ± 1.3).

The 64 infants were divided into two groups: those with unavoidable (78%) and those with avoidable (22%) respiratory distress syndrome. The mode of delivery of the infants in the two groups is summarized in Table I.

Among the 50 cases of unavoidable respiratory distress syndrome were 23 in which premature labour had preceded spontaneous vaginal delivery; the mean gestational age of the 23 infants was 34 ± 2 weeks. There had been an attempt to inhibit labour in only four of these cases.

Among the 14 infants with avoidable respiratory distress syndrome the gestational ages as estimated by the two methods were within 2 weeks in 10 infants but differed by 3 to 4 weeks in 4 infants considered to have been born at term, the estimate from the menstrual history having been excessive. The mean birth weight and gestational age of the 14 infants were 2550 ± 430

From the perinatal service, pediatric research centre, hôpital Sainte-Justine, Montreal, and the department of pediatrics, université de Montréal

*Fellow of the Inter-Service Clubs Council Foundation

Reprint requests to: Dr H. Bard, Centre de recherche pédiatrique, Hôpital Sainte-Justine, 3175, chem Côte Ste-Catherine, Montréal, PQ H3T 1C5

g and 36.3 ± 1.7 weeks. In no case had pulmonary maturation been assessed before delivery. An unfortunate example is the following case: A 21-year-old woman pregnant for the second time had previously undergone cesarean section because of pelvic dystocia; the infant had died of the respiratory distress syndrome within 24 hours after birth. The second pregnancy was considered normal. Ultrasonography was performed at what was believed to be 38 weeks' gestation according to the menstrual history; the biparietal diameter of the infant's skull corresponded to 36 weeks' gestation. Cesarean section was performed 2 days later. The infant's birth weight was 3100 g and examination revealed the gestational age to be 36 weeks. Severe respiratory distress syndrome necessitated intubation and mechanical ventilation, and the infant died at 9 days of age.

Of the 14 infants whose delivery had been elective 11 had moderate respiratory distress syndrome; the mean stay in the neonatal intensive care unit was 6 days and all 11 survived. The three infants with severe respiratory distress syndrome had a mean stay in the unit of 15 days, and two of the three died.

The overall mortality in the 64 infants was 14%. Two of the nine infants had avoidable respiratory distress syndrome. Eight of the nine infants had been transferred from another hospital, four suffering from perinatal asphyxia and having a low Apgar score. Two of the infants with unavoidable respiratory distress syndrome had been delivered by emergency cesarean section because of placenta previa.

Of the 10 infants delivered after premature rupture of the membranes 4 had avoidable respiratory distress syndrome; 2 had been delivered vaginally after induction within 24 hours following the premature rupture, and 2 had been delivered by cesarean section when labour could not be induced (Table II). In none of the four cases were there signs of maternal or fetal distress or evidence of infection at the time it was decided to deliver the infant or after the delivery. Three of the infants had moderate disease and survived; the other, who was delivered by cesarean section at 33 weeks' gestation, 1 month after the membranes had ruptured, died of severe hyaline membrane disease. The two infants delivered vaginally after the spontaneous onset of labour that died were born at 32 weeks' gestation 36 and 48 hours after the membranes had ruptured. In addition to severe respiratory distress syndrome one of the other infants delivered vaginally after the spontaneous onset of labour had severe bronchopulmonary dysplasia with pulmonary heart disease, but survived; the interval between rupture of the membranes and delivery in that case was 28 days.

Discussion

A high incidence of iatrogenic respiratory distress syndrome³⁻⁵ has been observed in several American centres. Hack and colleagues⁴ found an incidence of 12%, and Goldenberg and Nelson⁵ found that physician intervention that was unwarranted or untimely, or both, was responsible for 15% of 100 consecutive

cases of the respiratory distress syndrome. However, it was thought to be important to evaluate a region where medical services are easily available as well as the known methods of determining fetal maturity, particularly of the lungs.⁶ Our data showed that 22% of the cases of respiratory distress syndrome in infants born after 32 weeks or more of gestation might have been avoided. However, if, because of the controversial indications for elective delivery after premature rupture of the membranes, we exclude such cases, the proportion of cases of the syndrome that were avoidable is 16%. The data show that, depending on the gestational age, delivery before term after premature rupture of the membranes can result in severe respiratory distress syndrome. The relation of the interval

Table I—Mode of delivery of 64 infants with the respiratory distress syndrome

Mode of delivery	No. of infants in whom syndrome was	
	Unavoidable (n = 50 [78%]*)	Avoidable (n = 14 [22%]†)
Vaginal		
Spontaneous	34	-
Premature labour	23	-
Premature rupture of the membranes	6	-
Induction indicated because of pre-eclamptic toxemia	5	-
Induced	-	2
Premature rupture of the membranes	-	2
Cesarean section		
Indicated	16	-
Dystocia	6	-
Placenta previa or abruptio placenta	5	-
Pre-eclamptic toxemia	3	-
Maternal leukemia	1	-
Repeat after onset of labour	1	-
Elective	-	12
Repeat	-	8
Primary	-	2
Old primipara	-	2
Premature rupture of the membranes	-	2

*Seven (14%) of these infants died.

†Two (14%) of these infants died.

Table II—Features of the 10 cases in which there was premature rupture of the membranes

Type of delivery	Gestational age (wk)	Interval between rupture of the membranes and delivery	Status of syndrome	Outcome
Induced (n=4)				
Vaginal	35	12 h	Moderate	Survived
	35	18 h	Moderate	Survived
Cesarean	34	5 d	Moderate	Survived
	33	30 d	Severe	Died
Spontaneous (n = 6)				
	32-35	0.5-28 d	Moderate in one Severe in five	Survived Two died

between rupture of the membranes and delivery and the development of the respiratory distress syndrome has been controversial,⁷⁻¹⁰ and the management of premature rupture of the membranes and premature labour has differed greatly from one obstetric unit to another;¹¹⁻¹³ the best form of management is unclear. The indications for and the timing of delivery after premature rupture of the membranes in pregnancies lasting 32 weeks or more must be re-evaluated; controlled studies should be able to determine the conditions under which premature rupture is an indication for immediate delivery. It is questionable as the sole indication for immediate delivery before 35 weeks' gestation in the absence of maternal infection; inhibition of labour must be considered in such cases.

Although routine amniocentesis before elective cesarean section is controversial, it should be performed when the maturity of the fetal lungs is in doubt or the menstrual history is not reliable. Ultrasonography should be performed at about 18 to 20 weeks of pregnancy whenever elective cesarean section is planned. Cesarean section has been shown to increase the risk of respiratory distress syndrome after 34 weeks' gestation.⁹ Iatrogenic respiratory distress syndrome after elective cesarean section is no longer acceptable with the availability of tests of fetal age and maturity of the fetal lungs.

Conclusion

This prospective study has demonstrated that 22% of cases of respiratory distress syndrome in infants born after 32 weeks or more of gestation occurred after elective delivery. Although the maturity of the fetal lungs can be assessed, this is not always done. A single ultrasonographic measurement of the biparietal diameter of the fetal skull does not help toward the end of gestation.

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Gestation

Unquestionably the ordinary term of utero-gestation is that which we believe was kept in the womb of his mother by our Saviour Christ, of men the most perfect; counting, viz. from the festival of the Annunciation, in the month of March, to the day of the blessed Nativity, which we celebrate in December (275 days). Prudent matrons, calculating after this rule, as long as they note the day of the month in which the catamenia usually appear, are rarely out of their reckoning; but after 10 lunar months have elapsed, fall in labour,

and reap the fruit of their womb the very day on which the catamenia would have appeared, had the impregnation not taken place.

— William Harvey, from "On Parturition", reprinted in "Familiar Medical Quotations", Maurice B. Strauss (ed), Little, Brown & Co., Boston, 1968, p 448