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Elective Repeated Cesarean Delivery at Early Term Linked With Adverse Events **CME/CE**

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Release Date: January 7, 2009; **Valid for credit through January 7, 2010**

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Learning Objectives

Upon completion of this activity, participants will be able to:

1. Compare the neonatal morbidity and mortality rates associated with elective cesarean delivery at term, before 39 weeks of gestation, and after 39 weeks of gestation.
2. Describe neonatal morbidity and mortality rates associated with elective cesarean delivery after 40 weeks of gestation and at 39 weeks of gestation.

Authors and Disclosures

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Disclosure: Laurie Barclay, MD, has disclosed no relevant financial relationships.

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Disclosure: Laurie Scudder, MS, NP-C, has disclosed no relevant financial information.

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Disclosure: Brandi Nicole Martin has disclosed no relevant financial information.

January 7, 2009 — Elective repeated cesarean delivery before 39 weeks of gestation is common and is linked to adverse respiratory and other neonatal outcomes, according to the results of a cohort study reported in the January 8 issue of the *New England Journal of Medicine*.

"Because of increased rates of respiratory complications, elective cesarean delivery is discouraged before 39 weeks of gestation unless there is evidence of fetal lung maturity," write Alan T.N. Tita, MD, PhD, from the University of Alabama at Birmingham, and colleagues from the Eunice Kennedy Shriver National Institute of Child Health and Human Development (NICHD) Maternal-Fetal Medicine Units Network. "We assessed associations between elective cesarean delivery at term (37 weeks of gestation or longer) but before 39 weeks of gestation and neonatal outcomes."

From 1999 through 2002, the investigators studied consecutive patients undergoing repeated cesarean deliveries at 19 centers of the Eunice Kennedy Shriver NICHD Maternal-Fetal Medicine Units Network. Inclusion criteria were viable singleton pregnancy before 39 weeks of gestation, elective delivery before the onset of labor, and lack of recognized indications for delivery.

The main endpoint was a composite measure of neonatal death and any of several adverse events, including respiratory tract complications, treated hypoglycemia, newborn sepsis, and admission to the neonatal intensive care unit.

Of 24,077 repeated cesarean deliveries at term, 13,258 were elective. Of these elective cesarean sections, 35.8% occurred before 39 completed weeks of gestation (6.3% at 37 weeks and 29.5% at 38 weeks), and 49.1% were performed at 39 weeks. There was 1 neonatal death.

Risk for the main outcome measure was increased for births at 37 weeks and at 38 weeks vs births at 39 weeks. Adjusted odds ratio of the main outcome measure was 2.1 (95% confidence interval, 1.7 - 2.5) for births at 37 weeks; adjusted odds ratio for births at 38 weeks was 1.5 (95% confidence interval, 1.3 - 1.7; *P* for trend < .001).

For births at 37 weeks, rates of adverse respiratory outcomes, mechanical ventilation, newborn sepsis, hypoglycemia, admission to the neonatal intensive care unit, and hospitalization for 5 days or more were increased by a factor of 1.8 to 4.2. For births at 38 weeks, the risks for these outcomes were increased by a factor of 1.3 to 2.1.

"Elective repeat cesarean delivery before 39 weeks of gestation is common and is associated with respiratory and other adverse neonatal outcomes," the study authors write. "These findings support recommendations to delay elective delivery until 39 weeks of gestation and should be helpful in counseling."

Limitations of this study include lack of data about testing for lung maturity, inability to determine whether there was an increase in stillbirths that was associated with delaying delivery until at least 39 weeks, and sample size too small to evaluate an increase in neonatal deaths.

"Our results indicate that a high proportion of elective cesarean deliveries in the United States are performed before 39 weeks," the study authors conclude. "This may be driven by several factors, including a woman's desire to give birth once term is attained and an obstetrician's desire to schedule the procedure at a convenient time. These early deliveries are associated with a preventable increase in neonatal morbidity and admissions to the neonatal ICU [intensive care unit], which carry a high economic cost."

An accompanying editorial by Michael F. Greene, MD, from Massachusetts General Hospital in Boston, notes revealing differences between the women who delivered before 39 weeks of gestation and those who delivered at or after 39 weeks. The former group included women who were more likely to be private patients and to place a premium on their own clinician performing the delivery.

"Given the small risk of perinatal death at term (probably less than 1 in 1000), a randomized trial to demonstrate the elective delivery strategy resulting in the least risk of perinatal death and long-term complications would have daunting power and sample-size challenges," Dr. Greene writes. "Even if the optimal strategy could be defined, its implementation might require overcoming the dread of late stillbirth and convincing patients (and their doctors) that having 'their doctor' perform the delivery is less important than avoiding the complications associated with early term birth."

The NICHD supported this study. Dr. Tita is supported by an NICHD grant as a Women's Reproductive Health Research Scholar. The other study authors and Dr. Greene have disclosed no relevant financial relationships.

N Engl J Med. 2009;360:111-120, 183-184.

Learning Objectives for This Educational Activity

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2. Describe neonatal morbidity and mortality rates associated with elective cesarean delivery after 40 weeks of gestation and at 39 weeks of gestation.

Clinical Context

Elective cesarean delivery before 39 weeks of gestation is discouraged because of adverse respiratory outcomes associated with fetal lung maturity. For the past 10 years (1996-2006), the rate of cesarean delivery in the United States has increased from 20.7% to 31.1%, with 40% of 1.3 million of these procedures attributable to repeated cesarean delivery. In addition, 25% of elective cesarean deliveries for previous cesarean delivery occur before 38 weeks of gestation.

This is a large prospective cohort study of women in a registry consisting of deliveries from 19 US centers to examine the neonatal outcomes associated with elective cesarean delivery at term, before 39 weeks of gestation, and after 39 weeks of gestation.

Study Highlights

- Included were women from a fetal-maternal medicine network of 19 centers who delivered between 1999 and 2002 by elective cesarean delivery of a viable infant at 37 weeks of gestation or later.
- Excluded were those with multiple gestations of infants with congenital anomalies or serious medical or obstetric conditions.
- Gestational age was determined by standard criteria with use of clinical information from the last menstrual period, clinical examination, and the earliest ultrasound examination.
- Neonatal outcomes examined included death, adverse respiratory outcomes, hypoglycemia, newborn sepsis, seizures, hypoxic encephalopathy, low arterial cord blood pH, low Apgar score, prolonged hospitalization, and admission to the neonatal intensive care unit.
- The primary outcome was a composite of neonatal death and adverse outcomes.
- Infants were observed until hospital discharge or for 120 days after birth, whichever came first.
- Small for gestational age was defined as birth weight at or below the 10th percentile, and large for gestational age was defined as birth weight at or above the 90th percentile.
- 28,867 women who underwent cesarean delivery were enrolled, and 13,258 had undergone cesarean delivery at term.
- The week of gestation at delivery was known by first- or second-trimester ultrasound examination in 76.8% of pregnancies.
- Mean age of the women was 30 years, mean body mass index was 32.8 kg/m², 51% were white, and 19% were black.
- 70% were married, and 11% were current smokers.
- 6.3% underwent elective cesarean delivery at 37 weeks, 29.5% at 38 weeks, 49.1% at 39 weeks, and just slightly more than 15% at 40 weeks of gestation or later.
- Thus, 35.8% of women had undergone cesarean delivery before 39 weeks of gestation.
- Women who delivered before 39 weeks were older, more likely to be white, have insurance, and to be married.
- Large-for-gestational age infants increased with increasing gestational age.
- There was 1 neonatal death in an infant delivered at 39 weeks.
- 10.5% of infants had the composite primary outcome.
- The risk for the composite outcome was higher for gestational age before 39 weeks vs 39 weeks of gestation (P for trend < .001).
- The rate was 15.3% at 37 weeks and 8.0% at 39 weeks.
- There was also a trend toward an increased risk for the primary outcome for infants delivered by cesarean delivery after 40 weeks (P for trend < .001).
- Similar trends were seen for respiratory tract complications for both the early and the later delivery groups.
- The adjusted odds ratios for the primary outcome were 1.8 to 4.2 at 37 weeks of gestation, 1.3 to 2.1 at 38 weeks of gestation, and 1.0 at 39 weeks of gestation at delivery.
- Other variables associated with the primary outcome were ethnicity, number of previous cesarean deliveries, insurance payor, gestational diabetes, and maternal age.
- Adjusting for infants 2500 g or less did not change the results.
- The attributable risk for the primary outcome from delivery before 39 weeks of gestation was 48% at 37 weeks. If delivery had been postponed to 39 weeks, 48% of cases of the adverse outcome might have been prevented.
- The attributable risk for 38 weeks of gestation was 27%.
- The authors concluded that the risks for individual adverse neonatal outcomes were higher for delivery at 37 and 38 weeks of gestation vs 39 weeks of gestation and that delaying delivery after 40 weeks was also associated with adverse neonatal outcomes.
- They recommended delaying elective delivery until 39 weeks of gestation.

Pearls for Practice

- Elective cesarean delivery at term and before 39 weeks of gestation is associated with an increased risk for neonatal adverse outcomes.
- Elective cesarean delivery after 40 weeks of gestation vs 39 weeks of gestation is associated with an increased risk for adverse neonatal outcomes.

Which of the following *best* describes the adjusted odds ratio for adverse neonatal outcomes for elective cesarean delivery at 38 weeks of gestation vs 39 weeks of gestation?

- 1.0
- 1.3 to 2.1
- 2.2 to 3.0
- 3.1 to 3.8

Which of the following *best* describes the risk for adverse neonatal outcomes with elective cesarean delivery at 41 weeks of gestation vs 39 weeks of gestation?

- No difference in risk
- Reduced risk
- Increased risk
- Reduced risk in small-for-gestational-age infants only

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Disclosure: Brandi Nicole Martin has disclosed no relevant financial information.

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