OBSTETRICS

Labor patterns in women attempting vaginal birth after cesarean with normal neonatal outcomes

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OBJECTIVE: We sought to describe labor patterns in women with a trial of labor after cesarean (TOLAC) with normal neonatal outcomes.

STUDY DESIGN: In a retrospective observational study at 12 US centers (2002 through 2008), we examined time interval for each centimeter of cervical dilation and compared labor progression stratified by spontaneous or induced labor in 2892 multiparous women with TOLAC (second delivery) and 56,301 nulliparous women at 37 0/7 to 41 6/7 weeks of gestation. Analyses were performed including women with intrapartum cesarean delivery, and also limiting only to women who delivered vaginally.

RESULTS: Labor was induced in 23.4% of TOLAC and 44.1% of nulliparous women ($P < .001$). Cesarean delivery rates were 57.7% in TOLAC vs 19.0% in nulliparous women ($P < .001$). Oxytocin was used in 52.4% of TOLAC vs 64.3% of nulliparous women with spontaneous labor ($P < .001$) and 89.8% of TOLAC vs 91.6% of nulliparous women with induced labor ($P = .099$); however, TOLAC had lower maximum doses of oxytocin compared to nulliparous women: median (90th percentile): 6 (18) mU/min vs 12 (28) mU/min, respectively ($P < .001$). Median (95th percentile) labor duration for TOLAC vs nulliparous women with spontaneous labor from 4-10 cm was 0.9 (2.2) hours longer ($P = .007$). For women who entered labor spontaneously and achieved vaginal delivery, labor patterns for TOLAC were similar to nulliparous women. For induced labor, labor duration for TOLAC vs nulliparous women from 4-10 cm was 1.5 (4.6) hours longer ($P < .001$). For women who achieved vaginal delivery, labor patterns were slower for induced TOLAC compared to nulliparous women.

CONCLUSION: Labor duration for TOLAC was slower compared to nulliparous labor, particularly for induced labor. By improved understanding of the rates of progress at different points in labor, this new information on labor curves in women undergoing TOLAC, particularly for induction, should help physicians when managing labor.

Key words: first stage of labor, trial of labor after cesarean, vaginal birth after cesarean

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TABLE 1
Maternal and obstetrical characteristics

Characteristic	TOLAC[a] (n = 2892)	Nulliparous (n = 56,301)	*P* value
Age, y, mean ± SD	28.3 ± 5.7	24.9 ± 5.9	< .001
Race, %			< .001
White	43.0	49.7	
Black	23.7	21.0	
Hispanic	20.3	16.7	
Asian/Pacific Islander	5.3	5.2	
Other/unknown	7.6	7.4	
Prepregnancy BMI, kg/m^2, mean ± SD	26.5 ± 6.7	24.2 ± 5.6	< .001
Admission BMI, kg/m^2, mean ± SD	31.9 ± 6.5	30.1 ± 5.9	< .001
Gestational age at delivery, wk, mean ± SD	39.1 ± 1.1	39.4 ± 1.3	< .001
Preexisting diabetes, %	1.6	0.7	< .001
Gestational diabetes, %	4.9	3.6	< .001
Chronic hypertension, %	2.1	1.1	< .001
Gestational hypertension, %	1.8	3.7	< .001
Preeclampsia/HELLP, %	3.4	5.0	< .001
Eclampsia, %	0.1	0.1	.439
Cervical dilation at admission, cm, median (10th, 90th percentile)	3 (0.5, 6)	3 (1, 6)	.004
Cervical effacement at admission, %, median (10th, 90th percentiles)	80 (30, 100)	80 (50, 100)	< .001
Station at admission, %, median (10th, 90th percentiles)	−2 (−3, 0)	−2 (−3, 0)	< .001
Epidural, %	47.9	58.6	< .001
Induction, %	23.4	44.1	< .001
Oxytocin for spontaneous labor, %	52.4	64.3	< .001
Oxytocin for induced labor, %	89.8	91.6	.099
Cesarean delivery, %	57.7	19.0	< .001
Estimated blood loss, mL, mean ± SD	574 ± 273	426 ± 304	< .001

"Term" was defined as delivery between 37–41 wks of gestation. Antepartum stillbirths, women with uterine rupture, and neonates with fetal anomalies, 5-min Apgar score <7, sustained birth injury, or admission to neonatal intensive care unit were excluded.

BMI, body mass index; *HELLP*, hemolysis, elevated liver enzymes, and low platelets syndrome; *TOLAC*, trial of labor after cesarean.

[a] Women (parity = 1) with 1 prior cesarean delivery and no prior vaginal deliveries attempting vaginal birth after cesarean.

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Cesarean delivery accounted for 32.8% of deliveries in 2012.[1] In a prior Consortium on Safe Labor (CSL) study, the most common reason for cesarean was elective repeat due to a previous uterine scar, accounting for 30.9% of all cesarean deliveries.[2] There has been a national interest in increasing the vaginal birth after cesarean (VBAC) rate in women with a prior low transverse cesarean delivery to decrease the overall cesarean rate. The rate of VBAC started to decline in 1996, prompting a 2010 consensus conference by the National Institutes of Health.[3] After review of the available data, the conference concluded that VBAC was a safe option for many women with a prior low transverse cesarean delivery. A recent American Congress of Obstetricians and Gynecologists (ACOG) practice bulletin has revisited VBAC and emphasized the importance of discussing VBAC with all patients who meet criteria for it.[4] Prior cesarean delivery may be a marker of dysfunctional labor, so it is important to understand labor patterns in subsequent deliveries. Exploring labor patterns among these women may be clinically useful for counseling as well as to guide clinical management during the course of labor among women attempting a VBAC.

Data on labor patterns for trial of labor after cesarean (TOLAC) are limited to single institutions with small numbers, with the older studies conducted prior to the use of modern statistical methods.[5-8] In addition, labor patterns in women undergoing induction of labor with prior uterine scar have not been studied. The objectives of this study were to compare spontaneous and induced labor characteristics for women with normal neonatal outcomes undergoing TOLAC who had 1 prior cesarean and no vaginal deliveries to nulliparous women in labor, and to compare the course of labor for women who achieved vaginal delivery (eg, having a successful VBAC).

Materials and Methods

The CSL was a *Eunice Kennedy Shriver* National Institute of Child Health and Human Development multicenter collaborative study designed to characterize labor and delivery in a contemporary US obstetrical clinical practice.[2,9] The CSL included 12 clinical centers (19 hospitals) spanning 9 ACOG districts from 2002 through 2008. Detailed information was obtained from electronic medical records on maternal demographics, medical history, reproductive and prenatal history, labor and delivery summary, and postpartum and newborn information. Newborn records were linked to information from the neonatal intensive care unit (NICU). Labor progression data including date and time of repeated cervical exams were extracted