Published in final edited form as:

Am J Obstet Gynecol. 2012 September ; 207(3): 210.e1–210.e6. doi:10.1016/j.ajog.2012.06.028.

The Pattern of Labor Preceding Uterine Rupture

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Abstract

Objective—To characterize the labor of women attempting trial of labor after cesarean (TOLAC) who experience uterine rupture.

Methods—Secondary analysis of a nested case-control study of women attempting TOLAC. Women experiencing uterine rupture (cases) were compared to 2 reference groups, successful TOLAC and failed TOLAC. Interval censored regression was used to estimate the median time to progress 1-cm in dilation and the total time from 4–10-cm.

Results—115 cases were compared to 341 successful TOLAC and 120 failed TOLAC. The time to progress 1-cm was similar between groups until 7-cm dilation. After 7-cm, cases of uterine rupture required longer to progress than successful TOLAC (median (95th percentile) (hrs) from 7–8-cm 0.38 (1.91) vs 0.16 (0.79), from 8–9-cm 0.28 (1.10) vs 0.10 (0.39)). Women with a uterine rupture had similar labor curves to those with a failed TOLAC.

Conclusion—Women with labor dystocia in the active phase of labor should be closely monitored for uterine rupture in TOLAC.

Introduction

Although trial of labor after cesarean (TOLAC) is considered an appropriate option in women with a prior low transverse cesarean, uterine rupture is a potentially devastating event that occurs in less than 1% of attempts.(1, 2) Several signs of uterine rupture have been identified, including non-reassuring fetal heart rate, loss of station, maternal pain, and maternal hemodynamic instability; however, a uterine rupture would ideally be diagnosed prior to the occurrence of maternal or fetal compromise.(3)

Some have proposed that labor dystocia is a risk factor for uterine rupture as a result of prolonged exposure of the hysterotomy scar to uterine contractions.(4) Unfortunately, the clinical course of labor leading up to uterine rupture has only rarely been described.(5, 6) Such information may aid in the management of labor in women with a prior cesarean. Therefore, we sought to characterize the pattern of labor in TOLAC associated with uterine

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Disclosure: None of the authors have a conflict of interest.

Presented as an oral presentation at the Annual Meeting of the Society for Maternal Fetal Medicine, February, 2012 (abstract #41)

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rupture. Additionally, we compared the pattern of labor observed in women who experienced a uterine rupture with two reference groups: those who had a successful TOLAC and those who had a failed TOLAC.

Materials and Methods

This is a secondary analysis of a nested case-control study conducted from 1996–2000 within a 17-center retrospective cohort study of pregnant women with at least 1 previous cesarean delivery. For the original study, to identify factors associated with uterine rupture, all cases (women who attempted TOLAC and experienced uterine rupture) were matched on hospital site with 5 control subjects, chosen by a random number generator, who attempted TOLAC but did not suffer a uterine rupture. Institutional review board approval was obtained from all study sites. A detailed description of the parent study has been published previously, but a brief description follows.(1)

International Classification of Disease, 9th Revision (ICD-9) codes for “previous cesarean delivery, delivered,” were used to identify subjects at each site and data were extracted from the paper-charted medical charts by trained research nurses using standardized, closed-end data collection forms. Three percent of charts were re-extracted for quality control. Data collected included maternal demographics, medical and obstetric history, antepartum course, labor and delivery events, complications, and maternal outcomes. Data for patients selected for the case-control study were re-extracted in further detail, including all procedures, medications, and examination details in 15-minute time increments throughout labor. Only women with one or more low transverse cesareans were included in the parent cohort; patients were excluded if their prior cesarean was not low transverse.

Uterine rupture was explicitly defined *a priori* as a full-thickness disruption of the uterine wall accompanied by at least one of the following clinical signs: non-reassuring fetal heart rate tracing immediately preceding surgery, hemoperitoneum identified intraoperatively, or signs of maternal hemorrhage (systolic blood pressure <70 mm Hg, diastolic blood pressure <40 mm Hg, or heart rate >120 beats/minute). This definition was used to distinguish a clinically significant uterine rupture from an asymptomatic or incidental finding of uterine scar separation or “uterine window.”

For this analysis, subjects were included if they delivered at ≥37 weeks and at least 2 time points in their labor course were known (i.e. one cervical exam and time of complete). Two reference groups were formed. The first reference group was composed of women with a successful TOLAC (women who reached 10-cm and delivered vaginally) in order to provide a reference for a normal TOLAC. However, it is impossible to predict at the beginning of labor who will have a successful TOLAC and it is unclear what impact a failed TOLAC will have on labor curves. Therefore, a second reference group composed of women with a failed TOLAC (women who attempted a TOLAC but had a repeat cesarean) was used.

The three groups were compared with respect to baseline characteristics: χ^2 or Fisher’s exact tests, as appropriate, for dichotomous variables and ANOVA or Mann-Whitney *U* test, as appropriate, for continuous variables. Additionally, a sensitivity analysis of sociodemographics was performed, comparing the controls used for this analysis with the group of patients who did not experience a uterine rupture in the larger cohort to ensure that the controls chosen at random were representative of the entire cohort (data available upon request). Because controls for this analysis were representative of the larger cohort, weights for the final covariates were not used.

We analyzed the median time required for cervical dilation to progress from 4-cm to 10-cm in aggregate as well as by increments of 1-cm (eg, from 3-cm to 4-cm). It is not possible to

know the exact time that a level of cervical dilation is attained due to the variability of cervical dilation at first exam and subsequent timing of exams. Thus, we calculated a minimum and maximum time interval between each centimeter of cervical dilation that was reached. We calculated the time interval between each consecutive cervical dilation for all individuals giving them an interval censored value for each level of dilation(7). The time interval assumption fits a log normal distribution, and previous publications have demonstrated that the duration of labor often has a right skewed pattern(7). We used PROC LIFEREG of SAS 9.2 (Cary, NC) to fit a log normal distribution to the time interval and estimated median, 5th and 95th percentiles. Multivariate models were built to adjust for relevant confounding factors. Variables demonstrated to be historically relevant (prior vaginal delivery) as well as those identified in bivariable analyses (induction of labor, oxytocin use) were considered and selected based on the Wald chi-squared statistic using a p-value of 0.1.(8) These analyses were repeated to stratify by prior vaginal delivery, as well as by labor type (induced vs. spontaneous).

Results

Within the retrospective cohort of 25,005 patients with a history of at least one prior cesarean delivery, 13,706 attempted TOLAC, and, of those, 134 experienced a uterine rupture (cases). At random, 659 of the 13,706 patients who attempted TOLAC but did not experience a uterine rupture were selected as controls. Of these 659 controls, 341 women had a successful TOLAC and 120 had a failed TOLAC and met inclusion criteria for this analysis (70 excluded for preterm delivery, 128 for <2 time points). Of the 134 subjects experiencing uterine rupture, 115 cases met inclusion criteria for this analysis (7 excluded for preterm delivery, 12 for <2 time points). Cases and controls were similar with respect to age, gravidity, epidural use, diabetes, hypertension, type of hospital, birth weight, and gestational age at delivery. Cases were more likely to have been induced or have received oxytocin; cases were less likely to be Black or to have had a prior vaginal delivery.

Table 2 displays the number of subjects in the uterine rupture and failed TOLAC groups who reached a given dilation. This table is displayed because subjects could only be included in the interval censored regression if they reached the maximum dilation being studied. For example, of the 115 women who suffered a uterine rupture, 29 (25.2%) reached 10-cm and were included in the analysis from 9–10 cm.

After adjusting for prior vaginal delivery, the median for the overall length of time spent in labor (from 4- to 10-cm) was similar between those who experienced a uterine rupture and the two reference groups (Table 3). The time spent progressing each 1-cm of dilation is similar between the uterine rupture group and the failed TOLAC group; the labor patterns of these two groups cannot be distinguished.

The time required to progress 1-cm of dilation is similar between the uterine rupture group and both reference groups until 7-cm of dilation is reached. At 7-cm dilation, subjects who experienced uterine rupture spent significantly longer times progressing 1-cm in dilation compared to the successful TOLAC group (median time (hours) from 7–8 cm 0.38 vs 0.16, $p<0.01$, median time from 8–9 cm 0.28 vs 0.1, $p<0.01$). The difference in the median time to progress each centimeter of dilation is approximately 10–15 minutes. More noticeable is the difference in the 95th percentile of time to progress each 1-cm after 7-cm. In women who experience uterine rupture, the 95th percentile for time required to progress 1-cm after 7-cm is >1-hour, whereas the 95th percentile of time to progress for the successful TOLAC group is <1-hour. The difference in time to progress from 9-cm to 10-cm was not significantly different between cases and controls; however, as only 29 cases reached 10-cm, we had limited power to detect a difference between these two groups. A partogram was created for

cases and the successful TOLAC reference group showing the time to dilate 1-cm from admission (Figure 1).

Because parity has such a strong influence on the time spent in labor, we repeated the analysis excluding all women with a prior vaginal delivery (Table 4). Again, the time required to progress 1-cm in dilation is similar between cases and successful TOLAC controls until 7-cm, at which point cases (n=98) required longer times to progress in labor compared to controls (n=226). Women with a failed TOLAC (n=76) had a similar labor pattern to women with a uterine rupture throughout the course of labor. We were unable to perform the analysis in women with a prior vaginal delivery due to the small number of cases.

Because labor induction may significantly impact the course of labor, particularly early in labor, Table 5 displays the analysis excluding subjects undergoing an induction of labor. The results are similar to Tables 3 and 4; the time required to progress is similar between cases (n=57) and the successful TOLAC reference group (n=216) until 7-cm. From 7-cm until 9-cm, cases require significantly longer time to progress in labor compared to controls. Again, the uterine rupture group and failed TOLAC group (n=68) required a similar amount of time to progress throughout labor.

Based on our findings that the 95th percentile for progression in labor after 7-cm reached the definition of dystocia in the uterine rupture group but not the successful TOLAC group, we determined the sensitivity and specificity of labor dystocia after 7-cm for uterine rupture (Table 6). Of the 54 women who reached 7-cm and experienced uterine rupture, 15 had labor dystocia after 7-cm, giving a sensitivity of 27.8%. However, 284 of the 353 with a normal labor progression did not experience a uterine rupture, giving a specificity of 80.4%. The positive and negative predictive of labor dystocia was calculating using an incidence of uterine rupture of 1%, as supported by the parent cohort.(1) This resulted in a positive predictive value of 1% and a negative predictive value of 99%.

Comment

In conclusion, several important observations regarding the pattern of labor in uterine rupture compared to successful or failed TOLAC can be made. First of all, the pattern of labor in uterine rupture and the pattern of labor in a failed TOLAC were similar and could not be distinguished from one another at any point in labor. Secondly, at early dilations in labor, women with a uterine rupture and women with a successful TOLAC had similar patterns in labor. Protracted labor curves at early dilations (<6-cm) did not necessarily signify or predict uterine rupture or failed TOLAC, as women with a successful TOLAC could require 2-hours or more to progress 1-cm of dilation prior to 6-cm of dilation. Finally, women with a uterine rupture required longer times to progress 1-cm of dilation after 7-cm compared to women with a successful TOLAC. Although the differences in the median times to progress 1-cm are not likely to be clinically distinguishable (10–15 minutes), the differences in the 95th percentiles are. Women who experienced a uterine rupture had a 95th percentile greater than 1-hour to progress 1-cm, whereas women with a successful TOLAC had a 95th percentile less than 1-hour. This suggests that labor dystocia at advanced dilations in a TOLAC may be a sign of impending uterine rupture, warranting more intensive monitoring and more frequent exams. Prior studies suggest that the length of time spent in labor is similar between women undergoing TOLAC and women with no prior cesarean, particularly when stratified by prior vaginal delivery.(4, 9–11) However, as uterine rupture is a rare event, these studies primarily describe labor patterns among patients undergoing TOLAC without uterine rupture since observations specific to rupture will be diluted and masked by the rarity of the event.

Khan et al analyzed the labor pattern of 236 women undergoing a trial of labor after cesarean, 7 of whom experienced a uterine rupture.(5) Defining the active phase as 3-cm dilation with regular contractions and drawing an alert line at 1-cm/hour dilation, they determined that 5/7 uterine ruptures occurred beyond 2 hours after the alert line, suggesting that a trial of labor should be abandoned in favor of cesarean at this point in order to prevent uterine rupture. If this approach were taken, an additional 6 cesareans would be performed for every uterine rupture prevented. The definitions used for the active phase of labor and the alert line utilizes Friedman curves and does not stratify by parity; however, recent work in constructing labor curves in nulliparous women using interval censoring suggests that the active phase does not begin until 6-cm.(12) Defining active phase at 3-cm may have been the source of the low sensitivity and specificity of these alert values, as many subjects would actually have been in the latent phase of labor at this dilation. Hamilton et al performed a case control study using 19 uterine ruptures and women with no prior cesarean as their control group; they also found an association between labor dystocia and uterine rupture.(6)

Our study is unique in the detailed patient-level data available that enable us to conduct the time-dependent analyses necessary to characterize the course of labor in women attempting TOLAC. The nested case-control design enabled us to examine the risk of a rare outcome (uterine rupture), which was strictly defined a priori as a clinically significant event and excluded asymptomatic uterine windows. Additionally, the use of interval-censored regression enabled us to describe the progression of labor centimeter-by-centimeter and compare the uterine ruptures to two clinically important reference groups.

As this is a retrospective study, we are unable to distinguish the reason for the difference in time spent in active labor between cases and the successful TOLAC reference group. While the difference may be attributed to an impending uterine rupture, it may also be that a slower labor curve prompts the use of oxytocin, which then contributes to creating a uterine rupture. Ideally, we would have excluded subjects who received oxytocin as this may have altered the labor curve and is a risk factor for uterine rupture; however, this would have excluded two-thirds of cases and left too few subjects to analyze. Additionally, oxytocin is commonly used and exclusion of these subjects may have decreased the generalizability of our results. Oxytocin use was considered in the regression model and did not remain significant or have a clinically significant impact on the median and 95th percentile values for time spent to progress 1-cm in labor.

Our study is not without limitations. Case-control studies by design are at risk for selection bias; however, we attempted to minimize this by randomly selecting controls nested within a large, well-characterized retrospective cohort. Additionally, the failed TOLAC reference group is confounded by informative censoring. In other words, the act of a physician deciding which patients underwent cesarean and at what time point altered the observed labor patterns in this group. Depending on the patient and physician preferences and the indications for cesarean, this could alter the observed labor patterns in the failed TOLAC reference group in a variety of directions. Finally, the number of subjects reaching advanced dilations and experiencing a uterine rupture is limited. Although the findings of labor dystocia at later dilations do not aid in the management of the uterine ruptures that occur prior to 6-cm, these findings may aid in identifying the impending uterine ruptures that will occur at later dilations, which compose nearly ½ of uterine ruptures in this cohort. Further studies are needed to determine the appropriate labor management in women attempting TOLAC who experience labor dystocia at advanced dilations. The retrospective nature of the study precludes definitive commentary on the use of oxytocin, intrauterine pressure catheters, or the timing of proceeding with cesarean for arrest of dilation. However, given the potential catastrophic nature of uterine rupture, the clinician should always be aware of

potential signs of uterine rupture, and labor dystocia after 7-cm should now be considered one of those signs.

In summary, women who experience a uterine rupture during a TOLAC spend similar amounts of time in labor compared to controls up to 7-cm. A prolonged latent phase (<6-cm of dilation) does not necessarily signify an impending uterine rupture nor does it necessarily represent a failed TOLAC as these women may still reach 10-cm of dilation. After 7-cm, women who experienced a uterine rupture spent longer times progressing 1-cm in dilation; labor dystocia at advanced dilations in a TOLAC should raise suspicion for uterine rupture. After 7-cm, women attempting a TOLAC experiencing a labor dystocia should be evaluated for uterine rupture and the risks and benefits of continuing labor should be re-assessed frequently in these patients.

Acknowledgments

Funding: This work was supported by a grant from NICHD (RO1 HD 35631; to GAM). Dr. Harper is supported by T32HD055172 (to GAM), and UL1RR024992 (PI Bradley Evanoff).

References

1. Macones GA, Peipert J, Nelson DB, Odibo A, Stevens EJ, Stamilio DM, et al. Maternal complications with vaginal birth after cesarean delivery: a multicenter study. *American Journal of Obstetrics & Gynecology*. 2005; 193(5):1656–62. [PubMed: 16260206]
2. Landon MB, Hauth JC, Leveno KJ, Spong CY, Leindecker S, Varner MW, et al. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. *The New England journal of medicine*. 2004 Dec 16; 351(25):2581–9. [PubMed: 15598960]
3. ACOG Practice bulletin no. 115: Vaginal birth after previous cesarean delivery. *Obstetrics and gynecology*. 2010 Aug; 116(2 Pt 1):450–63. [PubMed: 20664418]
4. Omole-Ohonsi A, Muhammad Z, Iliyasu Z. Value of partogram in vaginal birth after caesarean section. *J Obstet Gynaecol*. 2007 Apr; 27(3):264–6. [PubMed: 17464807]
5. Khan KS, Rizvi A. The partograph in the management of labor following cesarean section. *International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics*. 1995 Aug; 50(2):151–7. [PubMed: 7589750]
6. Hamilton EF, Bujold E, McNamara H, Gauthier R, Platt RW. Dystocia among women with symptomatic uterine rupture. *American journal of obstetrics and gynecology*. 2001 Mar; 184(4):620–4. [PubMed: 11262462]
7. Zhang J, Troendle J, Mikolajczyk R, Sundaram R, Beaver J, Fraser W. The natural history of the normal first stage of labor. *Obstet Gynecol*. Apr; 115(4):705–10. [PubMed: 20308828]
8. Hosmer, DW.; Lemeshow, S. *Applied logistic regression*. 2. New York: Wiley; 2000.
9. Chazotte C, Madden R, Cohen WR. Labor patterns in women with previous cesareans. *Obstetrics and gynecology*. 1990 Mar; 75(3 Pt 1):350–5. [PubMed: 2304706]
10. Harlass FE, Duff P. The duration of labor in primiparas undergoing vaginal birth after cesarean delivery. *Obstetrics and gynecology*. 1990 Jan; 75(1):45–7. [PubMed: 2296421]
11. Graseck AS, Odibo AO, Tuuli M, Roehl KA, Macones GA, Cahill AG. Normal first stage of labor in women undergoing trial of labor after cesarean delivery. *Obstetrics and gynecology*. Apr; 119(4):732–6. [PubMed: 22433336]
12. Zhang J, Landy HJ, Branch DW, Burkman R, Haberman S, Gregory KD, et al. Contemporary patterns of spontaneous labor with normal neonatal outcomes. *Obstetrics and gynecology*. 2010 Dec; 116(6):1281–7. [PubMed: 21099592]

Figure 1.
Partogram of Uterine Rupture versus Successful TOLAC

Table 1

Characteristics of cases (uterine rupture) and controls

	Uterine Rupture (n=115)	Successful TOLAC (n=341)	Failed TOLAC (n=120)	p
Age	31.7 ± 5.1	30.7 ± 5.4	30.6 ± 6.0	0.19
Gravidity	3.1 ± 1.4	3.3 ± 1.6	3.5 ± 1.6	0.11
Prior Vaginal Delivery	17 (16.4%)	115 (34.7%)	44 (38.6%)	<0.01
Black Race	32 (27.8%)	122 (35.8%)	59 (49.2%)	<0.01
Epidural	103 (89.6%)	284 (83.3%)	95 (79.2%)	0.09
Diabetes	4 (3.9%)	12 (3.6%)	6 (5.3%)	0.74
Hypertension	5 (18.9%)	9 (2.7%)	4 (3.5%)	0.57
University Hospital	52 (60.5%)	195 (67.5%)	73 (69.5%)	0.38
Labor Induction	48 (46.2%)	96 (29.0%)	52 (45.6%)	<0.01
Prostaglandins	28 (24.4%)	20 (5.9%)	13 (10.8%)	<0.01
Oxytocin (Any)	70 (67.3%)	137 (41.4%)	52 (45.6%)	<0.01
Oxytocin Augmentation (Not Induced)	34 (29.6%)	77 (22.6%)	24 (20.0%)	0.37
Number of Vaginal Exams (Median, Interquartile Range)	5 (4–6)	5 (4–7)	5 (3–6)	0.39
Birthweight (g)	3550 ± 501	3729 ± 1183	3763 ± 1152	0.26
Gestational Age at	39.3 ± 1.3	39.2 ± 1.2	39.6 ± 1.3	0.03
Delivery (wks)				

Table 2

Maximum dilation reached in patients experience uterine rupture

Maximum Dilation (cm)	Number of Patients with Uterine Rupture	Number of Patients with Repeat Cesarean
1	5	5
2	7	8
3	7	17
4	12	11
5	14	16
6	15	23
7	3	12
8	9	15
9	14	13
10	29	0

Table 3
Duration of labor in women experiencing uterine rupture, successful TOLAC, and failed TOLAC

Cervical Dilation (cm)	Successful TOLAC (n=341)	p	Uterine Rupture (n=115)	p*	Failed TOLAC (n=120)
3-4	0.63 (0.13, 3.11)	0.46	0.48 (0.10, 2.37)	0.26	0.48 (0.16, 3.81)
4-5	0.48 (0.09, 2.63)	0.53	0.59 (0.11, 3.21)	0.26	0.89 (0.16, 4.89)
5-6	0.32 (0.05, 1.87)	0.42	.42 (0.07, 2.45)	0.89	0.44 (0.08, 2.60)
6-7	0.16 (0.03, 0.93)	0.30	0.24 (0.04, 1.40)	0.95	0.39 (0.07, 2.24)
7-8	0.16 (0.03, 0.79)	<0.01	0.38 (0.08, 1.91)	0.44	0.27 (0.06, 1.36)
8-9	0.10 (0.02, 0.39)	<0.01	0.28 (0.07, 1.10)	0.48	0.29 (0.07, 1.14)
9-10	0.16 (0.03, 0.82)	0.83	0.14 (0.03, 0.74)	-	-
4-10	2.61 (0.87, 7.84)	0.37	3.16 (1.05, 9.50)	-	-

Adjusted for prior vaginal delivery

Data are median (5th, 95th percentile) in hours

p compares successful TOLAC to uterine rupture,

p* compares failed TOLAC to uterine rupture

Table 4
Duration of labor by uterine rupture, successful TOLAC and failed TOLAC, excluding patients with prior vaginal delivery

Cervical Dilation (cm)	Successful TOLAC (n=226)	p	Uterine Rupture (n=98)	p*	Failed TOLAC (n=76)
3-4	0.60 (0.11, 3.43)	0.39	0.41 (0.07, 2.34)	0.49	0.61 (0.11, 3.43)
4-5	0.47 (0.08, 2.69)	0.45	0.60 (0.10, 3.47)	0.52	0.79 (0.14, 4.55)
5-6	0.32 (0.05, 1.90)	0.39	0.43 (0.07, 2.56)	0.88	0.40 (0.07, 2.37)
6-7	0.17 (0.03, 1.01)	0.57	0.23 (0.04, 1.32)	0.44	0.12 (0.02, 0.67)
7-8	0.17 (0.03, 0.84)	0.02	0.39 (0.08, 1.94)	0.15	0.10 (0.02, 0.51)
8-9	0.08 (0.03, 0.21)	0.03	0.38 (0.14, 1.02)	0.88	0.11 (0.04, 0.30)
9-10	0.16 (0.03, 0.82)	0.82	0.14 (0.03, 0.73)	-	-
4-10	2.66 (0.95, 7.41)	0.43	3.16 (1.13, 8.82)	-	-

Data are median (5th, 95th percentile) in hours

p compares successful TOLAC to uterine rupture,

p* compares failed TOLAC to uterine rupture

Table 5
Duration of labor by uterine rupture, successful TOLAC and failed TOLAC, excluding patients undergoing an induction

Cervical Dilation (cm)	Successful TOLAC (n=245)	p	Uterine Rupture (n=67)	p*	Failed TOLAC (n=68)
3-4	0.52 (0.08, 3.38)	0.59	0.37 (0.06, 2.41)	0.44	0.67 (0.10, 4.33)
4-5	0.39 (0.06, 2.49)	0.78	0.45 (0.07, 2.86)	0.75	0.57 (0.09, 3.65)
5-6	0.34 (0.06, 1.82)	0.11	0.63 (0.12, 3.38)	0.66	0.39 (0.07, 2.12)
6-7	0.19 (0.03, 1.27)	0.47	0.27 (0.04, 1.77)	0.82	0.29 (0.04, 1.90)
7-8	0.16 (0.03, 0.81)	0.02	0.42 (0.08, 2.11)	0.69	0.36 (0.07, 1.84)
8-9	0.10 (0.02, 0.40)	0.04	0.26 (0.07, 1.07)	0.73	0.52 (0.13, 2.12)
9-10	0.15 (0.03, 0.82)	0.53	0.10 (0.02, 0.52)	-	-
4-10	2.68 (0.82, 8.80)	0.90	2.57 (0.78, 8.46)	-	-

Adjusted for prior vaginal delivery

Data are median (5th, 95th percentile) in hours

p compares successful TOLAC to uterine rupture,

p* compares failed TOLAC to uterine rupture

Table 6

Test Characteristics of Labor Dystocia after 7-cm for Detecting Uterine Rupture

	Uterine Rupture	No Uterine Rupture
Labor Dystocia after 7-cm	15	69
No Labor Dystocia after 7-cm	39	284
	Sensitivity: 27.8%	Specificity: 80.4%