24 Labor outcomes of immediate versus delayed oxytocin administration after amniotomy, a randomized controlled trial

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OBJECTIVE: To compare duration of labor, mode of delivery, maternal satisfaction and early neonatal outcomes following immediate (within 15-30 minutes) versus delayed (2 hours) oxytocin administration after amniotomy among low risk women in labour.

STUDY DESIGN: Pragmatic randomized single blind two armed clinical trial in which women in labour at term who had hypotonic uterine contractions were assigned to immediate (within 15-30 minutes) versus delayed (at 2 hours) oxytocin administration after amniotomy at Kenyatta National Hospital in Nairobi, Kenya. We compared the duration of time from amniotomy to second stage, vaginal delivery and decision to cesarean delivery between the two arms. Secondary outcomes were mode of delivery, early neonatal outcomes, maternal satisfaction and actual need of oxytocin. We used intent-to treat analysis for all outcomes.

RESULTS: A total of 209 low risk women at a cervical dilation of 4-5 cm and with hypotonic uterine contractions were enrolled between February and July 2018 and randomized to immediate and delayed oxytocin administration after amniotomy. Labor was monitored using a partograph. The baseline characteristics were similar between the two groups. The average time to delivery was 4.6 (standard deviation [SD] 2.6) hours versus 4.9 hours (SD 2.7) following immediate versus delayed oxytocin administration respectively and was similar between the two groups (relative risk [RR] 1.02, 95% confidence interval [CI] 0.97−1.08, P=0.403). The cesarean section rate was not different following immediate (16%) versus delayed (22%) oxytocin administration RR 1.4 95% CI 0.8-2.5, p=0.263. The maternal satisfaction on a visual numerical rating scale (median [interquartile range]) was 4 [3−5] and was similar between the two arms. Time to second stage, decision to cesarean delivery, fetal hears rate patterns, APGAR score at one minute and birthweights were similar between the two arms. In the delayed arm, oxytocin infusion was not required for 28% of women.

CONCLUSION: Immediate or delayed oxytocin administration for hypotonic uterine contractions after amniotomy does not significantly alter the duration of labor, mode of delivery, early neonatal outcomes or maternal satisfaction.

25 Duration of latent phase of labor induction and maternal and neonatal outcomes in full-term nulliparas

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OBJECTIVE: The relationship of duration of latent phase (LP) in induced labor (IOL) to pregnancy outcomes remains controversial. We quantified the association between duration of LP of IOL and cesarean delivery (CD) and maternal and perinatal morbidity in healthy nulliparas at term.

STUDY DESIGN: Planned secondary analysis of a multicenter RCT of IOL at $39^{0/7}$ wks vs. EM until at least $40^{5/7}$ wks but no later than $42^{2/7}$ in singleton low-risk nulliparas. All those with viable non-anomalous neonates who underwent IOL with oxytocin were included regardless of study arm and receipt of cervical ripening. Duration of LP (time from initiation of oxytocin to first reaching at least 5cm dilation) was examined by 3-hr intervals from <12 to 24+ hrs in relation to CD, and both a maternal and perinatal composite of adverse outcomes. Categorical variables were compared using Cochran-Armitage trend or Chi-Square tests, and continuous variables using the Jonckheere- Terpstra test of trend. Poisson regression was used for multivariable adjustments.

RESULTS: Of 6,106 women in parent trial, 3045 who underwent IOL met criteria for this analysis. The median duration was 19.6 hours (IQ range 9.5-30.2), with 33% lasting <12, 25% 12-23 and 42% ≥24 hrs (Table 1). Presence of modified Bishop score <5 increased as LP duration increased from 28% if <12 hrs to 66% if ≥24 hrs. The frequency of CD (range 16%-30.5%) and the maternal composite (range 14.5 to 26.1%), but not the neonatal composite, increased with LP duration (Table 1). After multivariable adjustment (Table 2) LP duration was associated with increased odds of CD after 15 hrs and increased odds of the maternal composite after 18 hrs; there was no association between LP duration and the neonatal composite. Bishop score at the time of IOL did not modify these findings.

CONCLUSION: In low-risk nulliparas who underwent IOL, LP duration was associated with increased risk for CD after 15 hrs and maternal morbidity after 18 hrs. Duration of LP was not associated with neonatal morbidity.

Table 1 Duration of latent phase and outcome frequency (N=3045)

	<12 n=998	12-14.9 n=227	15-17.9 n=208	18-20.9 n=177	21-23.9 n=161	24+ hrs n=1274	P for trend
Maternal outcomes							
Cesarean delivery	162 (16.2)	40 (17.6)	55 (26.4)	50 (28.2)	36 (22.4)	388 (30.5)	<.001
Maternal composite*	145 (14.5)	41 (18.1)	39 (18.7)	46 (26.0)	42 (26.1)	304 (23.9)	<.001
Operative vaginal delivery	81 (8.1)	24 (10.6)	17 (8.2)	8 (4.5)	10 (6.2)	92 (7.2)	.20
Neonatal outcomes							
Neonatal composite	73 (7.3)	17(7.5)	14 (6.7)	11 (6.2)	12 (7.4)	117 (9.2)	.10
NICU admission	116 (11.5)	24 (10.6)	24 (11.5)	22 (12.4)	24 (14.9)	178 (14.0)	.04

*Composite of peripartum infection,3rd or 4th degree laceration, blood transfusion, B-lynch, uterine/hypogastric artery ligation, embolization, hysterectomy, ICU admission, or death
Composite of perinatal death, the need for respiratory support within 72 hours after birth, 5 minute Apgar score ≤3, hypoxic ischemic encephalopathy, seizure, infection (confirmed sepsis or pneumonia), meconium aspiration syndrome, birth trauma (bone fracture, neurologic injury, or retinal hemorrhage), intracranial or subgaleal hemorrhage, hypotension requiring vasopressor support, shoulder dystocia or neonatal hypoglycemia

Table 2: Association of duration of latent phase and outcomes*

**Referent: <12 hrs	12-14.9 hrs RR (95%CI)	15-17.9 hrs RR (95%CI)	18-20.9 hrs RR (95%CI)	21-23.9 hrs RR (95%CI)	24+ hrs RR (95%CI)
Maternal					
CD	1.07 (0.82, 1.39)	**1.31 (1.04, 1.67)**	1.10 (0.84, 1.43)	1.06 (0.80, 1.40)	**1.35 (1.16, 1.57)**
Composite	1.24 (0.90, 1.72)	1.18 (0.85, 1.65)	**1.54 (1.12, 2.11)**	**1.71 (1.24, 2.35)**	**1.53 (1.26, 1.86)**
Operative VD	1.44 (0.91, 2.27)	1.24 (0.74, 2.07)	0.66 (0.31, 1.43)	0.88 (1.43, 1.80)	1.03 (0.75, 1.43)
Neonatal					
Composite	1.04 (0.63, 1.74)	0.89 (0.51, 1.57)	0.52 (0.24, 1.12)	0.87 (0.44, 1.71)	1.26 (0.93, 1.71)
NICU admission	0.91 (0.59, 1.40)	0.92 (0.61, 1.42)	**0.91** (0.57, 1.45)	1.23 (0.78, 1.92)	1.15 (0.90, 1.47)

*Adjusted for bishop score<5 at admission, race/ethnicity, maternal BMI, original trial treatment arm, and GA at induction;

Bolded if significantly different

26 Elective induction of labor at 39 weeks versus expectant management in low-risk multiparous women

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OBJECTIVE: The ARRIVE Trial demonstrated lower cesarean delivery rates, decreased hypertensive disorders of pregnancy and potentially improved perinatal outcomes in low-risk nulliparous women undergoing elective induction of labor (eIOL) at 39 weeks as compared to expectant management (EM). Our objective was to compare maternal and neonatal outcomes between eIOL and EM in low-risk multiparous women.

STUDY DESIGN: A retrospective cohort study of low-risk multiparas (previous delivery ≥20 weeks with no prior cesarean) delivering non-anomalous singletons between 39^{0}-42^{0} weeks from 2014-2017 at our institution. Women were considered eIOL if they delivered

between 39^0 - 39^4 weeks following an IOL without an obstetric or medical indication and EM if they delivered between 39^5 to 42^0 weeks. The primary outcome was a neonatal composite of perinatal death, neonatal respiratory support, Apgar score $\leq$ 3 at 5 minutes, and shoulder dystocia. Secondary outcomes included rate of cesarean, select maternal/neonatal outcomes, and number of medical visits >39 weeks as proxy for health care utilization (Table 2). Groups were compared using Chi-square, Fisher's exact, two sample Student t-test, and Wilcoxon rank-sum tests as appropriate. Multivariable logistic regression models were used to adjust for potential confounders.

RESULTS: Of the 1,987 low-risk multiparas meeting inclusion criteria, 555 (28%) underwent eIOL and 1,432 (72%) had EM. Women who underwent eIOL were more likely to be non-Hispanic, married and have private insurance (Table 1). eIOL was associated with decreased risk of neonatal composite morbidity (aOR 0.57, 95% CI: 0.34 – 0.93) compared to EM. Specifically, there was decreased risk of shoulder dystocia in the eIOL group (aOR 0.57, 95% CI: 0.33 – 0.99). There were no perinatal deaths in either group. Cesarean delivery rate was similar among groups (7% eIOL vs. 8.1% EM, aOR 0.77, 95% CI: 0.52 – 1.14). There was no difference between groups with respect to chorioamnionitis, preeclampsia or medical visits > 39 weeks (Table 2).

CONCLUSION: In our patient population, elective induction of labor at 39 weeks among low-risk multiparous women was associated with decreased perinatal morbidity without an increase in cesarean delivery rate. Prospective studies measuring true intent are needed to inform policies regarding eIOL in these women.

Table 1: Baseline characteristics of low-risk multiparous women at or beyond 39 weeks gestation

	Elective induction n = 555	Expectant management n = 1432	P-value
Maternal Age (y), mean (SD)	27.5 (5.0)	27.9 (5.3)	0.11
Race, n (%)			0.028
African American	272 (49.0)	614 (42.9)	
Caucasian	263 (47.4)	774 (54.1)	
Other	20 (3.6)	44 (3.1)	
Ethnicity, n (%)			<0.001
Hispanic	91 (16.4)	461 (32.2)	
Non-Hispanic	464 (83.6)	971 (67.8)	
Gravidity, median (IQR)	3.0 (2.0 – 4.0)	3.0 (2.0 – 4.0)	0.023
Parity, median (IQR)	2.0 (2.0 – 3.0)	2.0 (2.0 – 3.0)	0.002
Parity, n (%)			0.14
One previous delivery	36 (6.5)	69 (4.8)	
More than one previous delivery	517 (93.5)	1357 (95.2)	
Gestational age at delivery (wks), mean (SD)	39.3 (0.2)	40.4 (0.5)	<0.001
Single, n (%)	324 (58.5)	908 (63.5)	0.037
Payer status			<0.001
Public	306 (57.0)	997 (71.1)	
Private	217 (40.4)	310 (22.1)	
Other	14 (2.6)	95 (6.8)	
Number of prenatal visits, median (IQR)	11.0 (8.0 – 12.0)	11.0 (9.0 – 13.0)	<0.001
Female infant sex	249 (45.0)	739 (51.6)	0.008

Table 2: Outcomes in low-risk multiparous women undergoing elective induction of labor (eIOL) at 39 weeks versus expectant management (EM)

	eIOL n = 555	EM n = 1432	p-value	AOR (95% CI)
Neonatal composite*	20 (3.6)	96 (6.7)	0.008	0.57 (0.34 – 0.93)
Neonatal respiratory support	4 (0.7)	11 (0.8)	>0.99	0.89 (0.28 – 2.81)
Apgar ≤ 3 at 5 minutes	1 (0.2)	3 (0.2)	>0.99	0.87 (0.09 – 8.39)
Shoulder dystocia	16 (2.9)	86 (6.0)	0.005	0.57 (0.33 – 0.99)
NICU admission	14 (2.5)	41 (2.9)	0.68	0.75 (0.40 – 1.42)
Birthweight	3375 (3.4)	3515 (400.6)	<0.001	1.00 (1.00 – 1.00)
Cesarean delivery	39 (7.0)	116 (8.1)	0.42	0.77 (0.52 – 1.14)
Chorioamnionitis	8 (1.4)	30 (2.1)	0.34	0.74 (0.34 – 1.62)
Preeclampsia	3 (0.5)	21 (1.5)	0.09	0.34 (0.08 – 1.47)
Triage visits >39 weeks gestation	210 (37.8)	555 (38.8)	0.71	0.89 (0.72 – 1.10)
Office visits > 39 weeks gestation	385 (69.4)	1073 (74.9)	0.012	0.80 (0.63 – 1.00)

* There were no cases of perinatal death in either group.

27 Externally validated induction score from a prospective population-based cohort study in 94 maternity units

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OBJECTIVE: No induction score has emerged as a standard to substitute the Bishop score, especially in case of cervical ripening. The objective of our study was to build a score to predict the risk of cesarean section, from a population-based dataset especially designed for induction analysis purpose.

STUDY DESIGN: We used the dataset from the prospective multicenter observational French population-based cohort study MEDIP (Methods of Induction of Labor and Perinatal outcomes), which had for objective to collect national data about labor induction practices. For the present study, we excluded all patients with twin pregnancies, non-cephalic presentations, previous c-section, premature deliveries, and cases of induction without cervical ripening. A total of 1 692 patients were analyzed and randomly split in a derivation dataset of 1 024 patients (60%) and an internal validation set of 668 patients (40%).

Statistical analyses were performed by using a Bayesian approach. Variables with a probability of being associated with cesarean delivery (Prob OR > 1) greater than 0.90 (*i.e.* indicating an increased risk of cesarean delivery) were entered in the multivariate model, and then maintained in the final model depending on the Deviance Information Criterion. When available, results from previous studies from literature were used to build informative prior distributions on the log(OR).

The score was validated using the internal validation set, and an external dataset from the Consortium for Safe Labor database (NIH database that includes labor and delivery information collected from 19 hospitals across the US from 2002 through 2008). The validation of the model was assessed using AUC and a graphical representation of the calibration.

RESULTS: The multivariate model for prediction of c- section in case of induction after cervical ripening is reported in Table 1. The 50 points induction score is displayed in Figure 1. On the external validation set, the AUC for the present score, the Levine score (*Levine et al., AJOG 2017*), and the modified Bishop score are respectively 0.81 [0.79-0.82], 0.76 [0.75-0.78] and 0.71 [0.70-0.73].

CONCLUSION: We developed an easy-to-use, externally validated and efficient score to predict c-section after labor induction with cervical ripening.