Contribution of ultrasonography to the prediction of the induction-delivery interval: The ECOLDIA prospective multicenter cohort study

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Title

Contribution of ultrasonography to the prediction of the induction-delivery interval: The ECOLDIA prospective multicenter cohort study.

Authors

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Highlights:

- Previous studies reported contradictory results that might be explained by heterogeneous populations
- We sought to evaluate a large population of women homogeneous for cervical status using a robust methodology. Thus, bishop score was an original inclusion criterion when selecting a population to study the prediction of induction-delivery interval.
- It is the largest cohort of women to evaluate the induction-delivery interval.
- Moreover, women undergoing induction of labor with a harmonized single-agent protocol in order to reduce heterogeneity of study population.
- Transvaginal ultrasound cervical length can significantly predict induction-delivery interval with parity.

ABSTRACT

Introduction: To evaluate the ability of preinduction ultrasonographic cervical length to predict the interval between induction and delivery in women at term with a Bishop score of 4 to 6 at induction.

Study design: This multicenter prospective observational cohort recruited 334 women from April 2010 to March 2014. Inclusion criteria were women with singleton pregnancies at a gestational age ≥37 weeks, with no previous caesarean, a medical indication for induction of labor, and a Bishop score of 4, 5, or 6. All women underwent cervical assessment by both transvaginal

ultrasound and digital examination (Bishop score). The induction protocol was standardized. The primary outcome measure was the induction-delivery interval. Hazard ratios (HR) and their 95% confidence intervals (95% CI) were used to assess potential predictors.

Results: Mean gestational age at induction was 40.1 weeks, 60.8% of the women were nulliparous, and the cesarean rate was 13.4%. The mean induction-delivery interval was 20.8 h (± 10.6). Delivery occurred within 24 h for 56.9% (n=190) of the women. An ultrasonographic cervical length measurement less than 25 mm (HR=1.50, 95% CI 1.18–1.91, P<0.01) and parity (HR=1.41, 95% CI 1.21–1.65, P<0.01) appeared to predict induction-delivery interval. The cervical length cutoff to reduce the induction-delivery interval was 25 mm.

Conclusion: A cervical length cutoff of 25 mm was associated with shorter induction-delivery interval in women at term with a Bishop score of 4 to 6.

Abbreviations

TVUS: transvaginal ultrasonography

INTRODUCTION

Induction of labor occurs in nearly 22% of pregnancies (1). An important challenge in induction of labor is predicting which patients will have vaginal deliveries and the time interval from induction to delivery. We believe that information about delay is an important clinical feature that can affect women's information and satisfaction when inducing labor. For this reason, we were focused on delay rather than outcome of the delivery. The Bishop score is

currently the standard method for evaluating local cervical ripening before induction (2). A Bishop score of six or more is considered favorable for induction of labor, so that oxytocin can be recommended to start induction (3). An intermediate Bishop score is interpreted to mean that the cervix is unfavorable, in which case it is recommended that women undergo cervical ripening before oxytocin administration. Their management thus relies on digital cervical examination, known to have a subjective measurement with high inter- and intra–observer variability and a poor predictive value for delivery outcome (4). It may thus be of limited value, especially in women with intermediate Bishop scores (4 to 6). Accordingly, other types of preinduction cervical evaluations have been suggested, such as ultrasound assessment, because they might be reproducible and more objective as well as more acceptable to women (5). In women with a low Bishop score, it could also be a useful tool for predicting time to delivery.

Previous studies comparing the Bishop score with transvaginal ultrasonography (TVUS) of the cervix to predict time to delivery or delivery outcome have reported contradictory results (6-17). Their differences might be explained by small samples (between 43 to 266 women included) and heterogeneous populations that further differ for their Bishop scores at inclusion, gestational age at induction, and main outcome. Moreover, induction methods were not standardized within studies and differed between them. Similarly, ultrasonographic measurements were not homogeneous and various parameters were evaluated: cervical length, width, dilatation, posterior cervical angle, and lower segment thickness. We sought to evaluate a large population

of women homogeneous for cervical status and undergoing induction of labor with a harmonized single-agent protocol.

Accordingly, the aim of this study was to evaluate if preinduction ultrasonographic cervical measurements is associated with the induction-delivery interval in women at term.

MATERIALS AND METHODS

The prospective multicenter cohort study ECOLDIA (Echographie du COL dans l'évaluation du Délai Induction Accouchement) took place from April 2010 through March 2014, in three tertiary hospital centers in France. Screening took place among all women for who induction of delivery was indicated whatever the indication. The inclusion criteria required that women be pregnant with a singleton live fetus in cephalic presentation at 37 to 42 weeks of gestation, and have a medical indication for labor induction, a Bishop score of 4 to 6 during the hour before induction, and no contraindication for dinoprostone. The Bishop score was assessed by digital examination by a midwife and was calculated according to the position, consistency, shortening and dilation of the maternal cervix and the station of the fetal presenting part (2). The exclusion criteria were: a previous cesarean delivery, any indication for an elective cesarean, cervical cerclage for this pregnancy, congenital uterine malformation, a history of uterine surgery, fetal abnormality, or an age younger than 18 years.

The studied factor was the ultrasonographic cervical length assessed one hour before induction. TVUS was performed in all cases by an obstetrician blinded to the results of the clinical examination. All participants were blinded to the

cervical length. A junior or senior ultrasound certified obstetrician used a 5–9 MHz transvaginal probe and a Voluson E8 (GE Healthcare, Milwaukee, WI, USA) for the TVUS. A standardized procedure was used for cervical measurement: the woman had to have an empty bladder and was placed in a supine position with legs abducted. The operator placed the probe in the anterior vaginal fornix to obtain a sagittal view of the cervix, avoiding undue pressure on it to avoid false elongation of the images. He or she then identified the internal and external os, using the endocervical mucosa to define the level of the internal os, and checked for and noted any funneling at the internal os. The cervical canal was magnified to obtain at least 75% of the image. Three measurements of the distance between the internal and external os were taken over a period of about 3 minutes, and the shortest measurement of the cervical length was recorded. Width and dilatation of internal os were also evaluated.

The following data were also collected: age, body mass index, parity, term of pregnancy, weight gain, indication for induction, analgesia during labor, oxytocin, mode of delivery and, if a cesarean was performed, its indication, interval from the start of induction to delivery, Apgar score, arterial pH, and neonatal hospitalization in the intensive care unit.

Cervical ripening for all women was performed with the vaginal prostaglandin E2 slow-release system (Propess® 10 mg, Ferring, Gentilly, France), which releases the medication at 0.3 mg/h, for 24 hours. If labor had not started 24 hours after cervical ripening began, it was induced by artificial rupture of membranes and oxytocin administration, in accordance with French guidelines (18).

The primary outcome was the induction-delivery interval, defined as the period from the start of cervical ripening to delivery in hours.

Statistical analyses

It was difficult to formulate a quantitative hypothesis regarding the association between ultrasound variables and induction-delivery time because there were no data available in the literature. Based upon the rates of induction in the participating units, our aim was to include 400 women to be able to conduct the study with sufficient power and reasonable precision.

Continuous data are presented as medians with their interquartile ranges (1st quartile-3rd quartile) or means and their standard deviations, and categorical data as counts and percentages (normal distribution was verified by histograms). Receiver operating characteristic (ROC) curves were generated to identify the best cutoff values with maximum efficiency for TVUS cervical length as categorical predictors of the induction-delivery interval. To construct the ROC curve, the binary outcome was the delivery within 24 hours. We conducted survival analysis of the data with the Kaplan–Meier method and the log rank test.

Then, to take into account the competing risks between vaginal delivery and cesarean delivery occurs during labor, we used a Fine and Gray regression model. Indeed, a woman who had a C-section because she fails to progress at 6cm for example will delivery faster than a woman who starts labor quickly and had a vaginal delivery. The associations between the ultrasound measurement (functional cervical length and funnel width), parity, maternal age, gestational age at induction, BMI, indication for induction (PPROM versus other indications)

and induction-delivery interval are presented with hazard ratios (HR) and 95% confidence intervals (95% CI).

Analyses were conducted with R version 3.1.3. Differences were defined as significant when $P<0.05$.

Ethical approval

Written informed consent was obtained from all participants. The ethics committee approved this study. This clinical trial was registered as NCT02570620. The study follows the STROBE statement guidelines for reporting observational studies (19).

RESULTS

This study included 342 women and analyzed 334 (Figure 1); their characteristics and outcomes are shown in Table 1. Regarding neonatal outcomes, the median Apgar score was 9.7 (± 0.7), the arterial pH was 7.2 (± 0.08), and the venous pH was 7.3 (± 0.07). There was no difference in perinatal outcomes between women who delivered before or after 24 hours (p=0.846).

Among primiparous women, 43.8% (n=89) gave birth within 24 hours. The average functional cervical length before induction was 18 mm (±11 mm) for women who delivered before 24 hours and 24 mm (±12mm) for those who delivered with an interval of more than 24 hours. The results of ultrasound cervical length measurement compared with clinical assessment are shown in Table 2. There was a good correlation between the two measurements. Among women who gave birth within >24 hours, 96.5% received oxytocine after

dinoprostone. The mean induction-delivery interval for the entire population was 20.8 hours (± 10.6). Delivery occurred within 24 hours for 56.9% of the women (n=190) with a mean induction-delivery interval of 13.3 hours. For the remaining 43.1% of women (n=144) who gave birth more than 24 hours after induction began, the mean induction-delivery interval was 31.2 (±7.6) hours. This mean interval was 20.5 hours (± 10.6) for women who had a vaginal delivery, 25.4 hours (± 10.2) for those with a cesarean delivery (P=0.004; reference group “vaginal delivery”), and 31.2 hours (±8.9) for the cesareans indicated for "failure to progress" or "failed induction".

First, we evaluated the parity and TVUS cervical length to predict the induction-delivery interval. Cutoff values for cervical length were obtained from the ROC curve (Figure 2). The AUC of the ROC curve was 0.65 for predicting induction-delivery interval based on functional cervical length. We found no difference between a Bishop score of 4, 5, or 6 and the induction-delivery interval (P=0.119). This result confirms the homogeneity of the study population. A cervical length less than 25 mm at induction was associated with a shorter induction-delivery interval (Log rank test, P<0.001) (Figure 3). We evaluated some others ultrasonographic measurements such as width and dilatation of internal os. Multiparity was also associated with a shorter induction-delivery interval (Figure 4).

Second, we evaluated the induction-delivery interval in a multivariable regression model, taking cesarean delivery into account as a competing risk, adjusted for TVUS cervical length, funnel width, parity, maternal age, gestational age at induction, BMI and indication for induction (PPROM versus

other indications). The cervical length and funnel width as measured by ultrasonographically, parity and induction for PPROM were the factors that were significant predictors of the induction-delivery interval (respectively, HR=1.32, 95% CI 1.03–1.69, P=0.03; 1.02 [1.01;1.04] p=0.01; HR=1.50, 95% CI 1.27–1.77, P<0.01; 2.02 [1.43;2.86] p<0.01) (Table 3).

COMMENT

Our results showed that measuring cervical length by ultrasound before induction improved the prediction of the induction-delivery interval in a large prospective cohort of women at term with a Bishop score of 4–6. The cervical length cutoff associated with a shorter induction-delivery interval was 25 mm. Funnel length was also associated with a reduced delay. Multiparity and PPROM were also predictive of a shorter induction-delivery interval.

These results are consistent with data from the literature, which find a significant association between the ultrasonographic measurement of the cervix and the induction-delivery interval, or the success of labor induction (6–12). Other studies, however, have not found that cervical ultrasound is more useful than the Bishop score for predicting time to delivery (13–17). Conflicting data from the literature can be explained by numerous biases in the studies.

First, the numbers included are generally small. Among the seven studies that calculated the required sample size and included more than 100 women, three showed that the Bishop score was more useful than TVUS. The main outcome criteria differed and were difficult to compare. Few studies considered the Bishop score (which was not initially created to predict issues of induction) as

an inclusion criterion, as we did. In addition, the populations are heterogeneous for gestational age, parity, and method of induction. All of this could lead to an underestimation of the value of TVUS in decisions about labor induction.

A meta-analysis including two small randomized controlled trials of 234 women that compared the Bishop score and TVUS for assessing preinduction cervical ripening (20) did not demonstrate that either method was superior to the other for determining the induction-delivery interval. In the first trial, this interval was 11.2 hours (IQR 7.8 to 15.9) for the Bishop score arm versus 9.5 hours (IQR 5.6 to 14.7) in the TVUS arm (21). In the second randomized controlled trial, the median induction-delivery interval reported was 10.3 hours (95% CI 7.0–13.5) in the Bishop score group, and 10.9 hours (95% CI 9.4–12.3) in the TVUS group (22). These differences were not significant. The median interval in the two randomized controlled trials was half of our interval (i.e., a mean induction-delivery interval of 20.5 hours (SD 10.6)), likely explained by the heterogeneous populations in those trials; 20% of the women had a Bishop score greater than 6. Our study included only women with a Bishop score of 4, 5, or 6; they were both nulliparous and parous, and received prostaglandins for no more than 24 hours before oxytocin infusion.

On the other hand, these two trials reported that cervical length cutoff values of 30 mm (21) and 28 mm by TVUS could reduce the need for intracervical prostaglandin treatment by 35% and 50% respectively, without affecting the success rate for induction. Thus, TVUS might change practices by identifying women who despite an intermediate cervix can undergo oxytocin administration to avoid unnecessary exposure to cervical ripening by prostaglandins. That is

the reason why the trial was designed to evaluate the delay and none the success of the delivery as a primary outcome. In our population, the cutoff to predict a shorter induction-delivery interval was 25 mm. Our results were consistent those of with other studies: Gabriel et al. found that women with an unfavorable Bishop score had a shorter duration of labor when their cervical length was less than 26 mm (8). A cutoff value at 28 or 30 mm may more precisely define a Bishop score less than 4 (21,22). The transvaginal cervical length measurement may be superior to the Bishop score in evaluating the ripened cervix. Several parameters TVUS could thus be useful supplementary information for obstetricians to evaluate the benefit of cervical ripening.

One strength of this study is its homogeneous population, defined by an inclusion criterion based on the Bishop score, intended to limit selection bias. Another is the standardization of the induction protocol for all women, and the large size of the cohort. The study's principal limitation is its observational nature. The cutoff value of sonographically measured cervical length to determine the value of cervical ripening must be validated.

CONCLUSION

A cervical length cutoff of 25 mm may help clinicians to predict the induction-delivery interval in women with an unripe cervix. We postulate that knowledge of this interval is a useful tool for clinicians to allow them to adapt management to the degree of urgency in obstetric care and to economic considerations. Further studies are needed to assess whether cervical ripening is necessary in this population.

Conflicts of interest

None

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References

1. Blanc-Petitjean P, Salomé M, Dupont C, Crenn-Hebert C, Gaudineau A, Perrotte F, et al. État des lieux des pratiques de déclenchement en France. Gynécologie Obstétrique Fertil Sénologie. 2019 Jul;47(7–8):555–61.

2. Bishop EH. PELVIC SCORING FOR ELECTIVE INDUCTION. Obstet Gynecol. 1964 Aug;24:266–8.

3. Eggebø TM, Økland I, Heien C, Gjessing LK, Romundstad P, Salvesen KÅ. Can ultrasound measurements replace digitally assessed elements of the Bishop score? Acta Obstet Gynecol Scand. 2009 Jan;88(3):325–31.

4. Hendrix NW, Chauhan SP, Morrison JC, Magann EF, Martin JN, Devoe LD. Bishop Score: A Poor Diagnostic Test To Predict Failed Induction Versus Vaginal Delivery: South Med J. 1998 Mar;91(3):248–52.

5. Tan PC, Vallikkannu N, Suguna S, Quek KF, Hassan J. Transvaginal sonographic measurement of cervical length vs. Bishop score in labor induction at term: tolerability and prediction of Cesarean delivery. Ultrasound Obstet Gynecol. 2007 May;29(5):568–73.

6. Boozarjomehri F, Timor-Tritsch I, Chao CR, Fox HE. Transvaginal ultrasonographic evaluation of the cervix before labor: Presence of cervical wedging is associated with shorter duration of induced labor. Am J Obstet Gynecol. 1994 Oct;171(4):1081–7.

7. Daskalakis G, Thomakos N, Hatziioannou L, Mesogitis S, Papantoniou N, Antsaklis A. Sonographic Cervical Length Measurement before Labor Induction in Term Nulliparous Women. Fetal Diagn Ther. 2006;21(1):34–8.

8. Gabriel R, Darnaud T, Chalot F, Gonzalez N, Leymarie F, Quereux C. Transvaginal sonography of the uterine cervix prior to labor induction: Uterine cervix prior to labor induction. Ultrasound Obstet Gynecol. 2002 Mar;19(3):254–7.

9. Pandis GK, Papageorghiou AT, Ramanathan VG, Thompson MO, Nicolaides KH. Preinduction sonographic measurement of cervical length in the prediction of successful induction of labor: Cervical length and successful induction. Ultrasound Obstet Gynecol. 2001 Dec;18(6):623–8.

10. Rane SM, Guirgis RR, Higgins B, Nicolaides KH. The value of ultrasound in the prediction of successful induction of labor: Ultrasound and induction of labor. Ultrasound Obstet Gynecol. 2004 Oct;24(5):538–49.

11. Verhoeven CJM, Opmeer BC, Oei SG, Latour V, van der Post JAM, Mol BWJ. Transvaginal sonographic assessment of cervical length and wedging for predicting outcome of labor induction at term: a systematic review and meta-analysis: Cervical length in induction of labor. Ultrasound Obstet Gynecol. 2013 Nov;42(5):500–8.

12. Ware V, Raynor BD. Transvaginal ultrasonographic cervical measurement as a predictor of successful labor induction. Am J Obstet Gynecol. 2000 May;182(5):1030–2.

13. Jwatson W, Stevens D, Welter S, Day D. Factors predicting successful labor induction. Obstet Gynecol. 1996 Dec;88(6):990–2.

14. Chandra S. Transvaginal ultrasound and digital examination in predicting successful labor induction. Obstet Gynecol. 2001 Jul;98(1):2–6.

15. Gonen R, Degani S, Ron A. Prediction of successful induction of labor: comparison of transvaginal ultrasonography and the Bishop score. Eur J Ultrasound. 1998 Aug;7(3):183–7.

16. Rozenberg P, Chevret S, Chastang C, Ville Y. Comparison of digital and ultrasonographic examination of the cervix in predicting time interval from induction to delivery in women with a low Bishop score. BJOG Int J Obstet Gynaecol. 2005 Feb;112(2):192–6.

17. Rozenberg P, Goffinet F, Hessabi M. Comparison of the Bishop score, ultrasonographically measured cervical length, and fetal fibronectin assay in predicting time until delivery and type of delivery at term. Am J Obstet Gynecol. 2000 Jan;182(1):108–13.

18. HAs. Les recommandations pour la pratique clinique. Déclenchement artificiel du travail à partir de 37 semaines d'aménorrhée. Available:

https://www.has-sante.fr/jcms/c_666473/fr/declenchement-artificiel-du-travail-à-partir-de-37-semaines-d'aménorrhée.

19. Cuschieri S. The STROBE guidelines. Saudi J Anaesth. 2019;13(5):31.

20. Ezebialu IU, Eke AC, Eleje GU, Nwachukwu CE. Methods for assessing pre-induction cervical ripening. Cochrane Pregnancy and Childbirth Group, editor. Cochrane Database Syst Rev [Internet]. 2015 Jun 12 [cited 2020 Feb 14]; Available from: http://doi.wiley.com/10.1002/14651858.CD010762.pub2

21. Bartha JL, Romero-Carmona R, Martínez-del-Fresno P, Comino-Delgado R. Bishop score and transvaginal ultrasound for preinduction cervical assessment: a randomized clinical trial: Bishop score and TVS for preinduction cervical assessment. Ultrasound Obstet Gynecol. 2005 Feb;25(2):155–9.

22. Park KH, Kim SN, Lee SY, Jeong EH, Jung HJ, Oh KJ. Comparison between sonographic cervical length and Bishop score in preinduction cervical assessment: a randomized trial. Ultrasound Obstet Gynecol. 2011 Aug;38(2):198–204.

Legends of figures and tables

Figure 1: Flow chart of the study

Figure 2: ROC curve of cervical length as a function of induction-delivery interval (< or >24h).

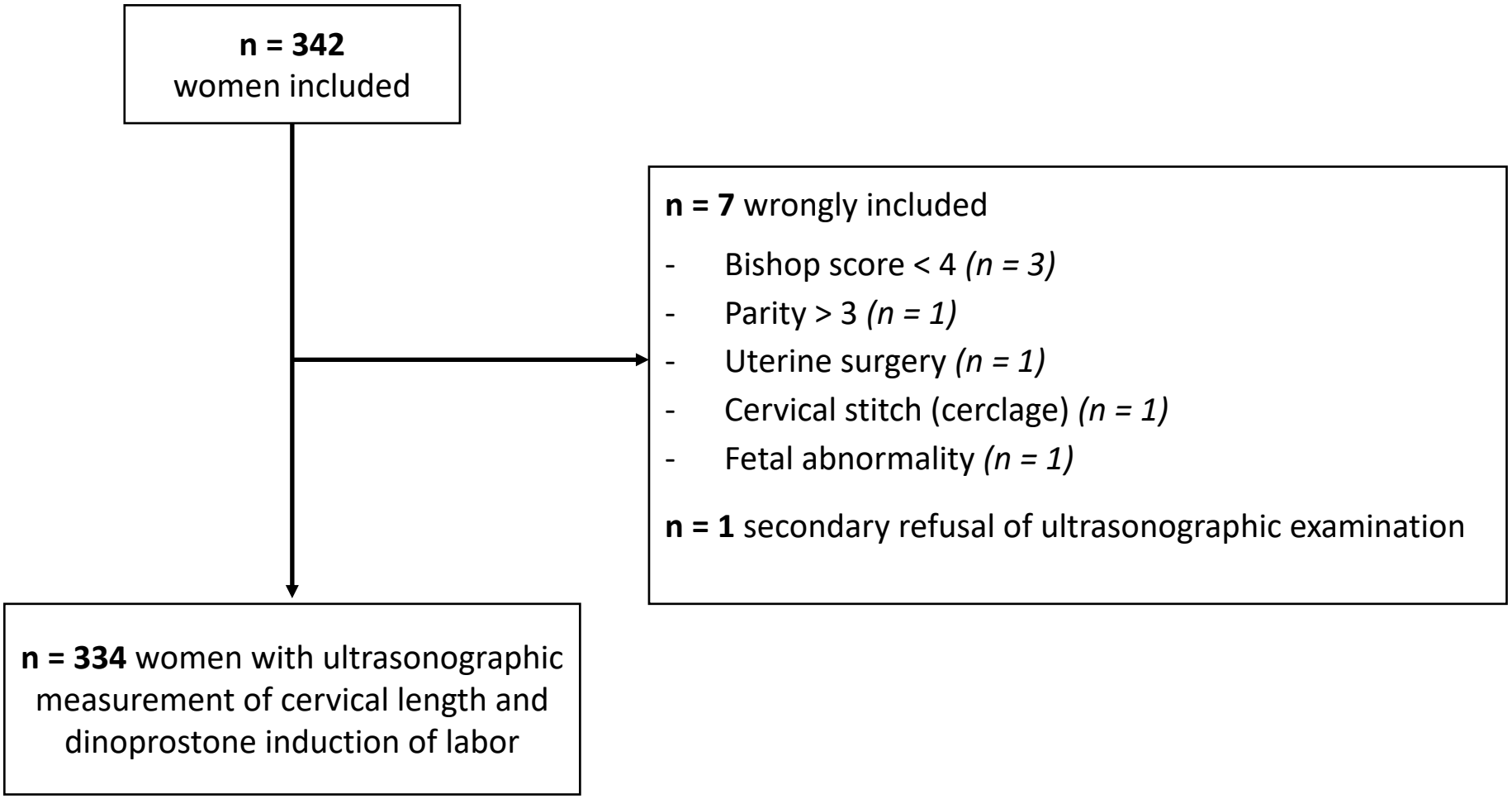
Figure 3: Kaplan-Meier survival curves of induction-delivery interval according to TVUS cervical length measurement before induction. The solid line represents a cervical length < 25 mm. The dotted line represents a cervical length ≥ 25 mm. Log rank test $p<0.01$.

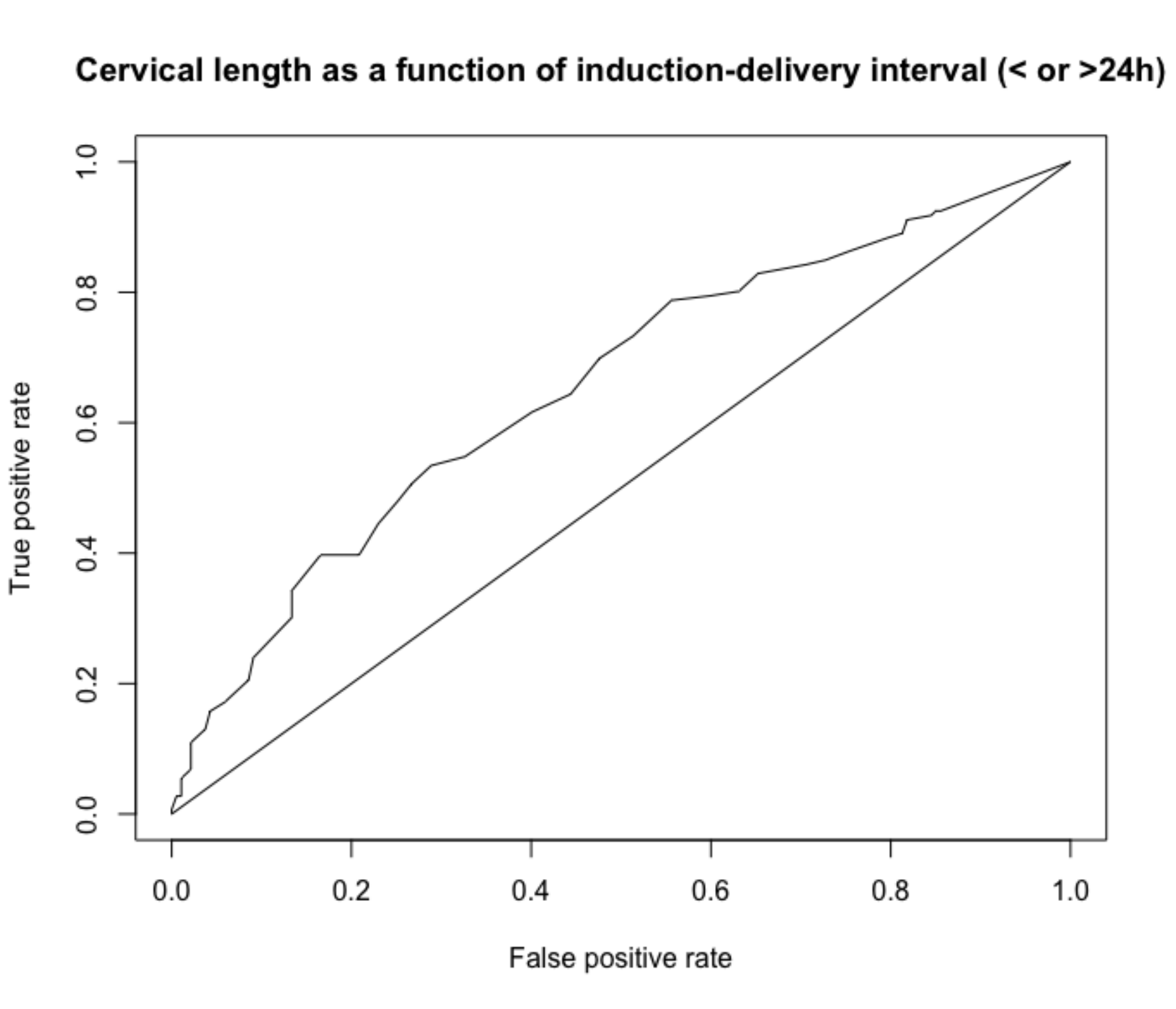
Figure 4: Kaplan-Meier survival curves of induction-delivery interval according to TVUS cervical length measurement before induction. The solid line represents nulliparous women. The dotted line represents parous women. Log rank test $p<0.01$.

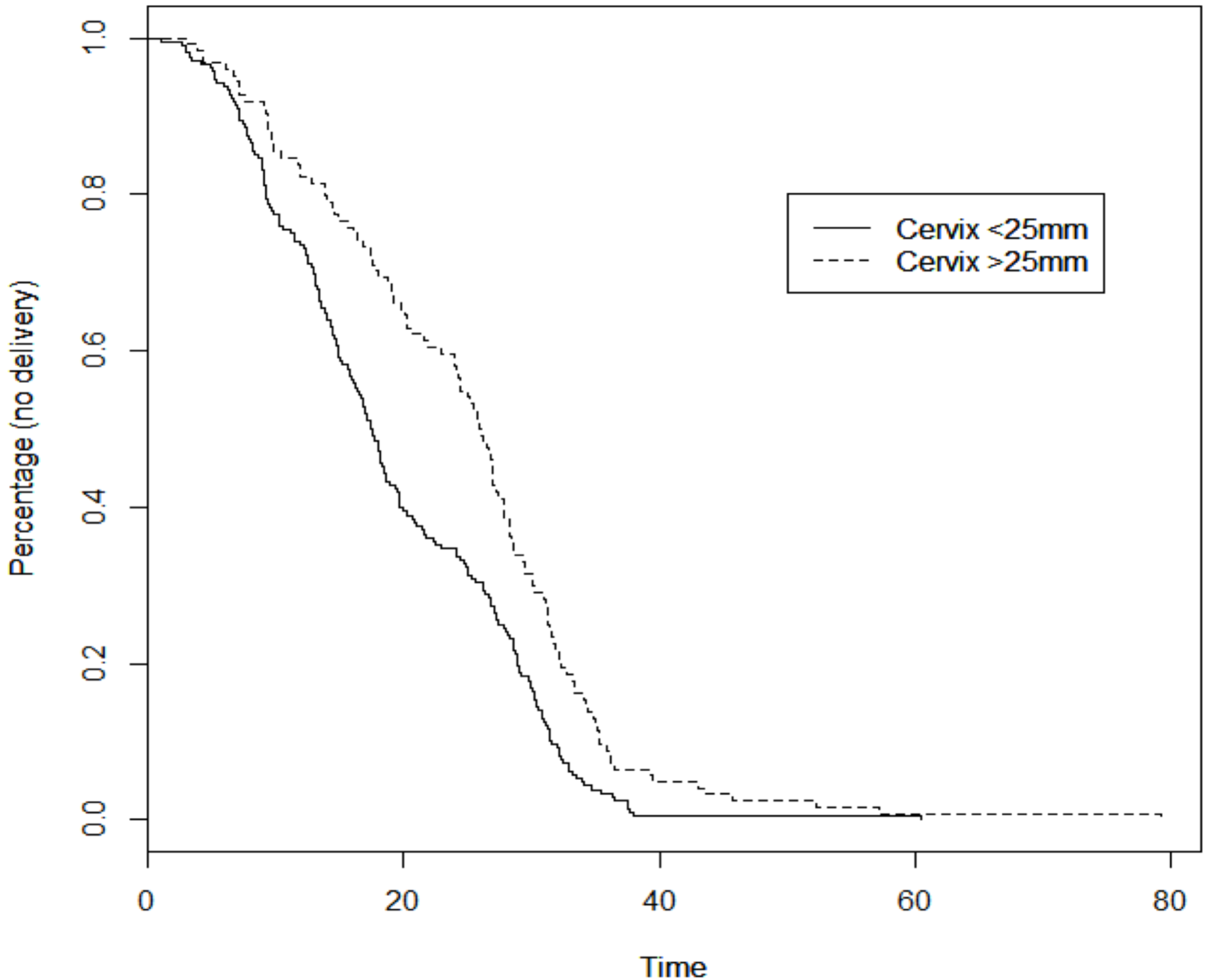
Table 1: Characteristics of 334 women analyzed.

Table 2: Clinical cervical length in comparison to the cervical length measured by transvaginal ultrasound without and with uterus pressure.

Table 3: Evaluation of induction-delivery interval in multivariable regression model taking cesarean delivery into account as a competing risk, adjusted for Bishop score, ultrasound cervical length, and parity


n = 342
women included
n = 7 wrongly included
- Bishop score < 4 *(n = 3)*
- Parity > 3 *(n = 1)*
- Uterine surgery *(n = 1)*
- Cervical stitch (cerclage) *(n = 1)*
- Fetal abnormality *(n = 1)*
n = 1 secondary refusal of ultrasonographic examination
n = 334 women with ultrasonographic measurement of cervical length and dinoprostone induction of labor


Cervical length as a function of induction-delivery interval (< or >24h)
True positive rate
False positive rate
0.0
0.2
0.4
0.6
0.8
1.0


Percentage (no delivery)
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
Time
Cervix <25mm
Cervix >25mm

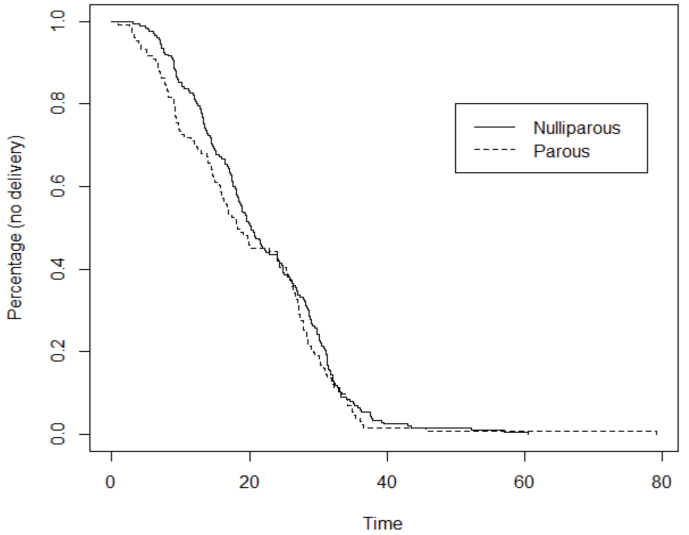

Percentage (no delivery)
0.0
0.2
0.4
0.6
0.8
1.0
0
20
40
60
80
Time
Nulliparous
Parous

Table 1: Means prenatal characteristics of 334 women analyzed.

	Women (n=334)
Age (years)	29.0 (± 5.5)
Gestation at delivery (weeks' gestation)	40.1 (± 1.5)
BMI	25.5 (± 6.3)
BMI >30	37 (11.1)
BMI >35	29 (8.7)
Weight gain (kg)	13.7 (± 5.6)
Parity	
Nulliparous	203 (60.8)
Parous	131 (39.2)
Indication for induction of labor	
Prolonged pregnancy	87 (26)
Premature rupture of membranes	69 (20.6)
Gestational diabetes mellitus	44 (13.2)
Oligoamnios	37 (11)
Polyhydramnios	7 (2.1)
Decreased fetal movement activity	19 (5.6)
Maternal indication*	26 (7.8)
Fetal indication**	13 (3.9)
Hypertensive disease in pregnancy, preeclampsia, or IUGR	33 (9.9)
Bishop score	
4	133 (39.8)
5	146 (43.7)
6	55 (16.5)
Mode of delivery	
Spontaneous vaginal delivery	220 (65.9)
Instrumental delivery	59 (17.7)
Cesarean delivery	55 (16.5)
Ultrasonography	
Functional cervical length	20.4 (± 12.3)
Funnel length	4.7 (± 7.5)

Table 2: Clinical cervical length in comparison to the cervical length measured by transvaginal ultrasound without and with uterus pressure.

Bishop score	Cervical length measurement (in mm), without uterus pressure	Cervical length measurement (in mm), with uterus pressure
Long	32 (± 8.5) [20-52]	30.9 (± 8.8) [21-53]
Half-long	29.3 (± 8.7) [9-54]	26.7 (± 8.5) [7-52]
short	23.3 (± 8.1) [8-45]	21.1 (± 7.6) [7-41]
Wipe out	19.5 (± 4.9) [14-25]	17.5 (± 3.1) [13-20]

Mean ± satndard-deviation [min-max]

Table 3: Evaluation of induction-delivery interval in multivariable regression model taking cesarean delivery into account as a competing risk, adjusted for ultrasound measurement of cervical length and funnel width, and clinical characteristics that have been identified as potentially modifying the time to delivery.

Outcome	*induction-delivery interval HR (95% IC)*	**P value**
Functional cervical length	1.32 [1.03;1.69]	**0.03**
Funnel length	1.02 [1.01;1.04]	**0.01**
Parity	1.50 [1.27;1.77]	**<0.01**
Maternal age	0.98 [0.96;1.01]	0.35
Gestational age at induction	1.05 [0.96;1.14]	0.25
BMI	0.98 [0.96;1]	0.14
Indication for induction PPROM or other	2.02 [1.43;2.86]	**<0.01**