

# VBAC In Women Undergoing IOL With Dinoprostone Versus Spontaneous Labor

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## Citation

J Alves, C Vilhena, C Tomás, I L Antunes, J Metello, I Natário, M Puga, E Casal. *VBAC In Women Undergoing IOL With Dinoprostone Versus Spontaneous Labor*. The Internet Journal of Gynecology and Obstetrics. 2015 Volume 19 Number 1.

DOI: [10.5580/IJGO.28478](https://doi.org/10.5580/IJGO.28478)

## Abstract

**OBJECTIVE:** To compare the rate of vaginal birth in women attempting vaginal birth after caesarean delivery (VBAC) through labour induction with dinoprostone versus a trial of spontaneous labour.

**METHODS:** A 10-year retrospective cohort study in a tertiary care hospital of women with one prior caesarean delivery. Women who attempted VBAC with labour induction with dinoprostone were compared with women undergoing spontaneous labour. Logistic regression analyses were performed to assess the relationship between VBAC success and labour induction taking into account confounding variables. Both maternal and neonatal safety were studied to find a difference between the group with spontaneous labour versus the group labour induction.

**RESULTS:** A total of 1076 women in the cohort attempted VBAC (649 with spontaneous labour and 427 with induced labour). Women who were given a trial of spontaneous labour were more likely to have a successful VBAC (70.3% compared with 48.7%, odds ratio (OR) 2.49, 95% confidence interval (CI) 1.93–3.21). If women have had a previous vaginal delivery they were more likely to have a successful VBAC, OR of 2.98, 95% CI 2.08-4.27. The risk of uterine rupture (0.5% for induced labour compared with 0.6% for spontaneous labour) or overall morbidity (2.7% compared with 2.1%) was not significantly increased in the women with labour induction.

**CONCLUSION:** Women with a previous caesarean section have a lower VBAC rate with labour induction versus spontaneous labour. If they have a previous vaginal delivery, the chance of a vaginal delivery increases. Overall, vaginal birth is safe and effective in women with one caesarean section with labour induction with dinoprostone.

## INTRODUCTION

The rate of caesarean section has been increasing worldwide, to a overall caesarean rate of 30.5% described in the USA in 2010, leading to an increase in the number of women with a segmental uterine scar (1, 2). Pregnant women with a previous caesarean delivery who choose a trial of labour after a previous cesarean section (TOLAC) are faced with two options: either they enter in spontaneous labour or there is a labour induction.

A Vaginal Birth After Caesarean Section (VBAC) has less complications and faster recovery compared to an elective caesarean section (3) (4). These complications are associated not only with significant morbidity but also an increase in mortality rates (5) (6). A TOLAC when there is labour

induction associated with a known risk of uterine rupture from 3.3 to 8.1% (7) (8) with success rates of between 59-67% being described on several series (6, 9). Uterine rupture after spontaneous labour in VBAC has a described uterine rupture rate of 0.8%. Considering VBAC, there is a lack of studies about labour induction with PGE2 (6) with misoprostol not used in most countries after uterine rupture rate of 9% described in some series. Latest review from Cochrane concludes that there is no evidence in favour of any method over other in what concerns labour induction in women with a previous cesarean section (10).

Our goal is to study the rate of successful vaginal birth after caesarean comparing pregnant women submitted to labour induction with PGE2 versus women with spontaneous labour. Our hypothesis is that women with spontaneous

labour have a bigger chance of vaginal delivery with less morbidity.

### **MATERIALS AND METHODS**

This is a retrospective cohort of patients with one previous cesarean section and term labour, singleton vertex pregnancy, and intact membranes at admission attending between January 2004 and December 2013. In our Hospital by protocol there are no cesarean sections at maternal request, and an elective cesarean section after a previous cesarean section has to have fetal or maternal health indications in order to be scheduled other than a term pregnancy with a previous cesarean section. If the cervix Bishop score is lower than 7 than, between 40 and 41 weeks of gestational age, labour induction is programmed. We excluded pregnancies with an elective cesarean section for maternal or fetal indications (e.g. breech presentation or prior vertical cesarean section or unknown type of uterine incision). Local institutional board review approved this study. Clinical records from the general database of all pregnant women admitted to the Hospital Garcia de Orta were retrieved.

Two groups were compared: pregnant women with one previous cesarean section and labour induction with PGE2 versus pregnant women with one previous cesarean section and spontaneous labour.

Labour induction protocol after cesarean section is well defined in our department, using a vaginal gel formulation of PGE2 analogue dinoprostone (Prostin®, from Pfizer ®) available in two different dosages (1 and 2mg). If cervix evaluation shows a Bishop score equal or less than 6 then the gel is inserted on the posterior vaginal fornix respecting a maximum daily dosage of 3mg (2mg+1mg), with at least 6 hours between each dosage. All women are under continuous medical monitoring and intermittent cardiotocographic monitoring (1h after and before gel insertion and in the presence of painful uterine contractions). Once the woman is in active labour use of oxytocin is allowed (if six hours after dinoprostone use) for augmentation of labour if necessary, not exceeding dosage of 2-6 mU/min, always under continuous electronic fetal monitoring and maternal surveillance on the labour ward. Labour induction, using dinoprostone was used when Bishop score was equal or less than 6. Labour induction maximum duration was two days, after which if not in active labour a CS was done.

Maternal intrinsic factors including the body mass index

(BMI) and history of previous vaginal births were considered, as well as delivery variables such as description of birth, application of PGE2, use of oxytocin, total time spent in the hospital, maternal complications (e.g. uterine rupture or dehiscence, bladder injury and others), need for blood transfusion, need for intensive care unit for the newborns, and birth weight, Apgar index and blood pH of the newborns. In our registry we did not have information regarding previous or current cesarean section indication, Bishop score previous to induction and use of oxytocin.

Uterine rupture was defined, as is described in the literature (11), as a complete separation of the uterine muscle demonstrated at laparotomy in association with either maternal compromise (signs or symptoms of acute bleeding or haemoperitoneum) or fetal compromise (nonreassuring fetal heart rate patterns). Uterine dehiscence was classified as a complete separation of the uterine muscle demonstrated at laparotomy without maternal or fetal compromise. These variables were recorded from the medical records by the two authors independently (JA, CV) and reviewed by another investigator (CT) to ensure accurate classification.

The primary outcome was the success of VBAC in the group with spontaneous labour versus the group undergoing labour induction. Secondary outcome was to establish if any of the above variables affect the probability of VBAC. Finally, we investigated the influence of labour induction in maternal and perinatal morbidity and mortality.

We made the analysis in 3 stages, including descriptive statistics, an unadjusted statistical analysis, and multivariate modelling. When the sample sizes were too small for the application of the traditional asymptotic tests for the second step, randomized tests were used instead. To assess the independent effect labour induction on VBAC, we developed multivariate logistic regression models to estimate odds ratios (OR) adjusted for confounding variables. We included in each model those independent variables that were statistically significant in the univariate analysis or deemed clinically relevant. A stepwise automatic variable selection procedure was used until an appropriate model was set to assess the independent association between labour induction and the outcome of interest. To study eventual associations between type of labour and maternal and perinatal morbidity and mortality, other logistic regression model on these variables was further considered. Nominal two-sided and right-sided p-values are reported, assuming statistical significance if p-value<0.05. We performed all statistical analyses with R-project software

(version 3.1.1 , <http://www.r-project.org/>).

### RESULTS

During the study period we had 33,491 pregnant women delivering in our hospital. Of which, 1076 (3.2%) women met our inclusion criteria, including 649 (60.3%) with a spontaneous labour (Figure 1).

The characteristics of the pregnant women with a previous caesarean section, in each type of labour group are shown in table 1. The body mass index, preeclampsia, and also newborns gestational age and birth weight were significantly different between the groups with spontaneous labour and with labour induction. The group with spontaneous labour had significantly more previous vaginal deliveries than the group with labour induction.

The cesarean section rate and the length of hospital stay were significantly higher in the group with labour induction, Table 2. There were no significant differences regarding uterine rupture/dehiscence, blood transfusions, Apgar score <7 at 5 minutes, newborn in the ICU or peripartum mortality. The only case of peripartum mortality was a foetus with abruptio placentae. Regarding uterine rupture we found one case in the group of pregnant women with labour induction and two cases in the group with spontaneous labour. Oxytocin use was not found related to morbidity or uterine rupture rate.

Additional associations between VBAC rates and factors other than the type of labour were further considered. The corresponding odd ratios (OR) and significance are shown in the second and third columns of Table 3. In order to simultaneously account for all the relevant factors for VBAC rates and eventual confounding effects, a multivariate logistic regression model was fitted to data. A stepwise automatic variable selection procedure, based on the measure AIC (20) of model fit, was used, indicating for the final model that including as independent variables type of labour, maternal age, body mass index, birth weight of newborns and previous vaginal delivery. The variables maternal age, gestational age and preeclampsia were not included in the final model as they did not improve the predictive capacity of the model. The corresponding results are depicted in the two rightmost columns of Table 3.

Previous vaginal delivery and spontaneous labour are the most associated and relevant variables for VBAC, corresponding to OR's of 2 and more. These findings still hold after accounting for eventual confounders through the logistic model.

Finally, in relation to maternal and perinatal morbidity and mortality, labour induction was not significantly associated with any of the measures of these quantities, detailed in Table 2.

### DISCUSSION

The results of our study show that women with a previous cesarean section have a higher chance of VBAC if: no induction is done, spontaneous labour is achieved (70.3% versus 48.7%) and if there has been a previous vaginal delivery (79.9% versus 57.2%). These results are consistent with others described in the literature (12) (13) (14). Through a MEDLINE search with "labour induction previous caesarean dinoprostone" we could not find a larger single center study of a group with previous CS and labour induction with dinoprostone. Al-Shaikh et al (9) described a group of 320 women of whom only 52 with labour induction and both Landon et al (15) and Lydon-Rochelle (8) et al described large groups (14925 and 20095 women) with previous cesarean section but these were multicentric studies. In our institution the global cesarean section rate is 20%, one of the lowest in all institutions in Portugal and this rate is similar to the rate found in the group of women with previous vaginal delivery (20.1%). In our study all the inductions were made with dinoprostone gel, giving homogeneity to the group, unlike others that mixed mechanical with pharmacological methods (9). Current evidence is not in favour of a specific method of induction in women with previous cesarean section and the success rate found is similar to the described by others (9, 10). Even if ACOG guidelines of 2010 (16) state that induction of labour remains an option for women with previous cesarean section the lower success rates should be kept in mind as well as the history of a previous vaginal delivery that increases the chance of a successful vaginal delivery (17, 18).

Regarding complications only longer stays in the hospital were found for women whose labour was induced (5.8 days versus 4.4 p<0.001). We did not find any difference regarding uterine rupture/dehiscence with a rate of 0.5% (with induction) and 0.6% (spontaneous labour) both within the rate ranges described by others (19, 20). A higher rate of

uterine rupture in relation to the use of PGE2 has been described (21), which we did not find. Lastly, any significant association of labour induction with maternal and perinatal morbidity and mortality was not found. In fact, we found more transfusions in the group with spontaneous labour, although not statistically significant results. This can be explained by a cautious approach to women with labour induction, as described above, and can also be a possible explanation for the higher rate of cesarean sections in the induction group - a lower threshold in making the decision of performing a caesarean section. Oxytocin use in low dose and only 6 hours after PGE2 by protocol in our institution possible explains why we did not found related complications that others described (15,22).

Despite the fact that this is a retrospective study we have large sample of women induced with PGE2 gel. We were also able, to gather important data regarding obstetrical morbidity such as transfusion rates. The biggest limitation of our study is the lack of data regarding the cervix before the induction and the reason of both previous and new caesareans. Unfortunately it is not possible to retrieve this information in a systematic way from our registries. A potential bias could have been that we induced more favorable cervix and did elective CS in women with unfavorable cervix conditions but in our institution we have a protocol encouraging women with unfavorable cervix and previous CS to do a trial of vaginal labour, eventually with labour induction.

Women with a previous caesarean had a considerable high rate of vaginal delivery. The spontaneous labour seems to be the best alternative compared to labour induction and should be encouraged. If induction of labour is needed, the induction with PGE2 can achieve at least 50% success with an adequate safety profile, decreasing the caesarean rate. The antecedent of a vaginal delivery constitutes a strong factor associated with the success of vaginal delivery regardless of the nature of labour initiation. A trial of labour after previous CS should be considered only at facilities capable of emergency deliveries because of potential serious complications.

Funding: Isabel Natário was partially supported by national funds through Fundação Nacional para a Ciência e Tecnologia, Portugal - FCT, project PEst-OE/MAT/UI0006/2014. No other funding was received.

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