

# The results of different labour induction approaches: A Cross sectional study

## Abstract

**Background and Purpose:** To evaluate the use of prostaglandins and oxytocin in labour induction according to different indications. Perinatal outcomes, rate of vaginal delivery and completion of labour were studied and compared.

**Methods:** Cross-sectional descriptive study from January 2012 to December 2012. 530 women who required labour induction were included. Seven groups were created according to the methods of induction. Women with twin pregnancies, induction of dead foetus, two previous caesarean sections or an incomplete clinical history were excluded.

**Results:** The rate of vaginal deliveries in women that only received prostaglandins the first day was 84.6%; similar in women with prolonged pregnancies, 85.2%. The induction with oxytocin directly showed the highest rate of caesarean section. The rate of vaginal deliveries was 50% in women with previous caesarean section.

**Conclusions:** A high rate of vaginal deliveries with a single dose of prostaglandin and within 24 hours of beginning induction. Administration of prostaglandins must be used when cervix is unfavorable and previous to oxytocin stimulation.

**Keywords:** labour induction, vaginal dinoprostone, prostaglandin, oxytocin, cervical ripening and vaginal delivery

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## Introduction

Labour induction is a process of artificial stimulation of uterine contractions before the spontaneous onset of natural labour with the aim to achieve a vaginal delivery. It is one of the most common obstetric interventions, occurring in up to 30% of pregnancies.<sup>1-3</sup> In 2004 and 2005, one in every five deliveries in the UK was induced.

The most common method of labour induction when the status of the cervix is unfavourable involves intravaginal insertion of prostaglandin, whereas when the cervix is ripe, oxytocin may be administered intravenously.<sup>4,5</sup>

The use of induction among nulliparous women is of particular interest, where induction is six times more likely to fail than in multiparous women.<sup>7-9</sup> Moreover, induced delivery could be associated with instrumental births (15% of cases) and emergent caesarean sections (22% of cases).<sup>3,6</sup>

Aim of study was to know perinatal outcomes according to method used for labor induction.

## Materials and methods

Cross-sectional descriptive study from January 2012 to December 2012. Our population was 530 women that required labour induction according to common, routine indications and after being informed, written consent was obtained.

There were women who were eligible for labour induction with prostaglandins, others after the second day of induction with a new dose of prostaglandins depending on the Bishop Test score, and in other cases, if the cervix had changed or was favourable within the first day or two, induction with oxytocin was performed.

We created 7 groups. Group A started the induction with 10 mg of vaginal dinoprostone and they gave birth during that day. Group B started with 10 mg of vaginal dinoprostone, but the second day

they needed another dose of 10 mg of vaginal dinoprostone. Group C: started with 10 mg of vaginal dinoprostone but for 24 hours the cervix was favourable and women continued the induction with oxytocin intravenously until the childbirth. Group D started with 10mg of vaginal dinoprostone the first day, the second they received another dose of 10mg of dinoprostone, and if the cervix was favourable oxytocin was administered. Group E started with 10mg of vaginal dinoprostone and continued with oxytocin the second day. Group F started with 10 mg of vaginal dinoprostone the first day, the second day they needed another dose of dinoprostone, and the third day they continued with oxytocin until the childbirth. Group G: started with oxytocin from the first day, either because the cervix was unfavourable (Bishop Score  $\geq 6$ ), there was a risk of uterine hyperstimulation or because there were contraindications to administer prostaglandins.

The inclusion criteria were pregnancy with one or more of the common indications for labour induction, including post term pregnancy (41 weeks and three days in our study), premature rupture of membranes (24 hours of evolution), pre-eclampsia or higher blood pressure, oligohydramnios, hepatic cholestasis, diabetes, Intrauterine growth restriction, chorioamnionitis or causes of maternal and foetal interest.

Exclusion criteria were twin induction, induction of dead foetus, two previous caesarean sections or an incomplete clinical history.

A comparison between the different options of intervention was performed using the Chi-Square Test. In some cases, the probability of an event related to an exposure was calculated using percentages and the relative risk (RR). The SPSS 15.0 software programme was used for statistical analysis.

## Results

A total of 530 women were included in the study and all of them underwent induced labour. The weeks of pregnancy were between 32 and 42 weeks, with an average of 40 weeks and a standard deviation

of 1.6. The result of induction was: 26.4% caesarean sections, 60.9% normal deliveries and 12.6% instrumental deliveries (a total of 73.6% of vaginal deliveries). Among them, there were 308 nulliparous, 174 with previous vaginal deliveries and 48 with previous caesarean section. Table 1 shows the rate of vaginal deliveries and caesarean section according to the methods of induction. We can see in Table

2 the rate of vaginal deliveries and caesarean section according to the weeks of pregnancy. In week 39 there is a higher rate of vaginal deliveries in woman with term labour, 84.3%; while with women with pre-term birth we attain 100% of vaginal delivery in week 34 and 80% in week 35, although we have a small sample size in these weeks.

**Table 1** The rate of vaginal deliveries and caesarean section according to the methods of induction

Different treatments	Total	Vaginal delivery	Caesarean section
A: Prostaglandins 1st day	234	198 (84.6%)	36 (15.4%)
B: Prostaglandins 1st + 2nd day	68	55 (80.9%)	13 (19.1%)
C: Prostaglandins 1st day + Oxytocin 1st day	10	8 (80%)	2 (20%)
D: Prostaglandins 1st and 2nd day + Oxytocin 2nd day	8	5 (62.5%)	3 (37.5%)
E: Prostaglandins 1st day + Oxytocin 2nd day	58	34 (58.6%)	24 (41.4%)
F: Prostaglandins 1st and 2nd day + Oxytocin 3rd day	131	80 (61.1%)	51 (38.9%)
G: Oxytocin 1st day	21	10 (47.6%)	11 (52.4%)
Total	530	390	140

**Table 2** The rate of vaginal deliveries and caesarean section according to the weeks of pregnancy

Weeks	32	33	34	35	36	37	38	39	40	41
Vaginal delivery	1 (50%)	0 (0%)	6 (100%)	4 (80%)	4 (66.6%)	15 (78.9%)	52 (78.7%)	70 (84.3%)	66 (70.9%)	172 (66%)
Caesarean section	1	1	0	1	2	4	14	13	27	77
Total	2	1	6	5	6	19	66	83	93	249

If we calculate the rate of vaginal deliveries in women treated with prostaglandins for one day as opposed to women with other treatments, we can see that the rate of vaginal deliveries in women that only received prostaglandins the first day was 84.6%, whereas in women who received other types of treatment the rate was 64.9% (RR=1,3), that is a significant difference (Chi-Square Test 0,001).

When the rate of vaginal deliveries using prostaglandins two days and oxytocin the third day was calculated, the rate of vaginal deliveries was 61.1%, so it was lower than the rate obtained with other treatments, which was 77.7% (RR=1.27); This reduction shows a significant difference (Chi-Square Test <0,03).

We have determined the rate of vaginal delivery taking into account the reason for induction (Table 3).

We can observe that induction due to pre-labour rupture of membranes show a difference of 57 points between the rate of vaginal

deliveries and the rate of caesarean section, followed by induction due to intrauterine growth restriction (a 54.6 point difference) and oligohydramnios (50.8 points). Whereas, if we divide the total of induction according to the final result, we can see that the largest percentage of vaginal deliveries is obtained when induction is indicated due to prolonged pregnancy. This is because there are more cases of induction due to prolonged pregnancy (41.7%) compared to other causes, but it shows a difference of 40.2 points between the rate of vaginal deliveries and caesarean section.

The most frequent cause of induction is prolonged pregnancy, with 221 women. We need to turn our attention to this group in order to improve the rate of vaginal delivery. In Table 4 we show the rate of vaginal delivery in prolonged pregnancy (41 weeks and 3 days in our study), with 70.1% of vaginal delivery. We observe that most success is obtained in women that only received prostaglandins the first day, and the failure of the oxytocin as the only treatment.

**Table 3** The rate of vaginal delivery taking into account the reason for induction

Cause of induction	Total	Vaginal delivery	Caesarean section
Prolonged pregnancy	221 (41.07%)	155 (70.1%)	66 (29.9%)
PRM	158 (29.8%)	124 (78.5%)	34 (21.5%)
Higher blood pressure	24 (4.5%)	15 (62.5%)	9 (37.5%)
Oligohydramnios	65 (12.3%)	49 (75.4%)	16 (24.6%)
Hepatic cholestasis	7 (1.3%)	7 (100%)	-
Intrauterine Growth Restriction	44 (8.3%)	34 (77.3%)	10 (22.7%)
Foetal interest	5 (0.9%)	3 (60%)	2 (40%)
Chorioamnionitis	1 (0.2%)	-	1 (100%)
Others	5 (0.9%)	3 (60%)	2 (40%)

**Table 4** The rate of vaginal deliveries and caesarean section in prolonged pregnancies

	Total	Vaginal delivery	Caesarean Section
A: Prostaglandins 1 <sup>st</sup> day	87 (85.2%)	15 (14.7%)	
B: Prostaglandins 1 <sup>st</sup> + 2 <sup>nd</sup> day	20 (80%)	5 (20%)	
C: Prostaglandins 1 <sup>st</sup> day + Oxytocin 1 <sup>st</sup> day	3 (75%)	1 (25%)	
D: Prostaglandins 1 <sup>st</sup> and 2 <sup>nd</sup> day + Oxytocin 2 <sup>nd</sup> day	2 (40%)	3 (60%)	
E: Prostaglandins 1 <sup>st</sup> day + Oxytocin 2 <sup>nd</sup> day	16 (59.2%)	11 (40.7%)	
F: Prostaglandins 1 <sup>st</sup> and 2 <sup>nd</sup> day + Oxytocin 3 <sup>rd</sup> day	26 (40.6%)	28 (59.3%)	
G: Oxytocin 1 <sup>st</sup> day	1 (25%)	3 (75%)	
Total	221	155 (70.1%)	66 (29.8%)

We compared the vaginal delivery rate in nulliparous and multiparous women submitted to labour induction. We obtained in multiparous women; a 93.1% rate of vaginal deliveries while in nulliparous women, the rate of vaginal deliveries was 66.2%. The rate of vaginal deliveries in women with previous caesarean section is low, with 50% of vaginal deliveries.

If we show the finalization of delivery in nulliparous women we can see that the rate of instrumental births is 76.1% in comparison to 23.9% observed in multiparous women (RR=3.18). The same happened with the caesarean section, that was observed in 74.6% of

nulliparous and in a 25.7% of multiparous women (RR=2.9).

Perinatal results depend on the reason of previous caesarean section (Table 5).

We also determine the different types of induction in women with previous caesarean section. The method most frequently used was to administer prostaglandins the first day (Group A), 68.4% of vaginal deliveries were obtained. Group of treatment A and B achieved the highest rate of vaginal deliveries in women with previous caesarean section (68.4% and 75% respectively).

**Table 5** Finalization of delivery in women with previous caesarean section

Prior caesarean section due to:	Vaginal delivery	Caesarean section
No Progression/Failed induction 15 (31, 25%)	5	10
Cephalopelvic Disproportion 7 (14, 6%)	4	3
Losing Fetal Wellbeing 9 (18, 7%)	4	5
Other causes 17 (35, 4%)	11	6

We can observe that among cases receiving oxytocin the second day or the first day directly, as the cervix was favourable (Bishop Score  $\geq 6$ ), the rate of caesarean section was greater; with 83.3% when we administered the treatment Group E, and 61.5% when we administered the treatment Group F, and 66.6% when we administered oxytocin directly without prior prostaglandin (Group G).

We determined the influence of the Bishop Test Score in the rate of vaginal deliveries. The results obtained are that if the Bishop Test Score on the first day of induction was greater than 4, the rate of vaginal delivery was 73.8%, in comparison to the 70.7% (RR=1.04) observed when the Bishop Test Score was 4 or less; although this difference was not statistically significant.

On the second day of induction, if the Bishop Test Score was greater than 4, the rate of vaginal deliveries was 69.8%, in comparison to the 63.7% (RR=1.09) observed if the Bishop Test Score was 4 or less, but no significant difference was found. However, when the Bishop Test Score was calculated on the third day of induction, it was found that if the score was greater than 4, the rate of vaginal deliveries was 81.3%, but when it was 4 or less, the rate of vaginal deliveries was 45.5% (RR=1.78); and that this difference was statistically significant (Chi-Square Test  $<0,04$ ).

Out of 530 births, it was possible to calculate postpartum pH in 498 cases. The average was 7.28 with a standard deviation of 0.085; which is within the normal range.

## Discussion

Although the rate of vaginal delivery is higher than 70%, in post-term labour in week 41, the rate declines by up to 66%. The rate of caesarean section in the inductions of our study was 26.4%; this is acceptable taking into account other studies. In this study the rate of instrumental deliveries was 12.6% of total inductions (17.2% of all vaginal deliveries). According to a study in the UK,<sup>3</sup> labour induction is associated with 15% of instrumental births and 22% of caesarean deliveries.

According to similar studies, oxytocin without prior administration of prostaglandins is the method with the highest rate of caesarean section when women have unfavourable cervix.<sup>10</sup> Vaginal or oral misoprostol could improve Bishop score in this patients.<sup>11</sup> In this sense, oral misoprostol seems to have a lower rate of caesarean section.<sup>12</sup> Moreover time to delivery is lower with oral misoprostol.<sup>13</sup>

We obtain similar results when we analyse only prolonged pregnancies, which is the main cause of labour induction. Three trials.<sup>11</sup> including 260 women reported that oxytocin was associated with more failures in achieving vaginal delivery within 24 hours than vaginal prostaglandin E2.

In this study, we decided to treat with oxytocin directly when there was no contraindication to prostaglandins, if the cervix was considered favourable or if the Bishop Test score was 6 or more.

However, NICE guidelines do not support the use of intravenous oxytocin alone for labour induction. In clinical practice, in the case of ruptured membranes, intravenous oxytocin is often recommended as an alternative initiating agent to prostaglandins.<sup>3</sup> Moreover, WHO recommends that when prostaglandins are not available, intravenous oxytocin alone should be used for labour induction.<sup>14</sup> Both guidelines acknowledge that there is a higher chance of vaginal birth within 24 hours with the use of prostaglandins as opposed to oxytocin alone.

A different group is women with premature rupture of membranes. In a systematic review<sup>15</sup> was included 240 women that compared oxytocin to vaginal prostaglandin E2 for premature rupture of membranes at term; in this study, oxytocin was associated with a significantly shorter time from induction to delivery (3.4 +/- 1.5 versus 9.6 +/- 4.7 hours; p = 0.02). In our study there was no difference in the risk of caesarean section.

In our study, the induction in nulliparous women was more frequent than in multiparous, with a rate of 58.1% and 32.8% respectively (RR=1.77). In the case of previous caesarean delivery, the rate was only 9.1% of total labour inductions. There are other studies that conclude that labour induction in nulliparous with unfavourable cervix results in high caesarean delivery rates.<sup>16,17</sup>

It is necessary to emphasize that the efficacy of prostaglandins (dinoprostone) is also demonstrated in cases of previous caesarean section, obtaining high rates of vaginal deliveries, such as 68.4% in cases of prostaglandins for the first day, 75% in cases of prostaglandins for the first and second days, and 100% when prostaglandins and oxytocin were received the first day. However, it should be recognized that the sample is very unrepresentative.

In women with Bishop score <7 mechanical methods could also be helpful. Double balloon catheter or Foley catheter are safe and decrease the rate of unfavourable cervix.<sup>18,19</sup>

It could be interesting to know which the cost associated to labour induction are. According to some studies misoprostol decrease time to delivery and for this reason the cost compared with double balloon catheter or dinoprostone is lower.

We acknowledge the limitations of the study, such as the wide range of gestation weeks and the induction in different types of pregnancies, such as prolonged pregnancies, preterm rupture of membranes and preeclampsia, among others, that are all complicated pregnancies.

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## Conflicts of interest

The authors report no declarations of interest.

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