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Original Article

Obstetrics and Gynaecology Section

# Spontaneous Versus Medical Induction of Labour in Previous One Caesarean Term Patients: A Prospective Analytical Study

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## ABSTRACT

**Introduction:** The rate of Caesarean Section (CS) either primary or repeat has significantly increased worldwide over the time. Trial of Labour After Caesarean (TOLAC) is an important strategy to limit the number of repeat CS. TOLAC either spontaneous or induced offers both benefits and risks to the mother and neonate.

**Aim:** To determine the risks and benefits of inducing labour with Prostaglandin Gel ($PGE_2$) in women with previous one CS and to compare it with patients who developed spontaneous labour in terms of fetal and maternal outcome.

**Materials and Methods:** A prospective interventional study was conducted over a period of one year from June 2017 to May 2018. A total of 322 pregnant patients with previous one CS who fulfill the eligibility criteria for TOLAC were enrolled and divided into two groups. Of these 74 patients were induced with $PGE_2$ gel (study group) and 248 experienced spontaneous labour. Data were analysed via Chi-square test and unpaired t-test using analytical tool pack of Microsoft excel (version-10.0)-2010 home edition.

**Results:** In study group and control group, 51 (68.9%) and 191 (77.01%) women respectively delivered vaginally either spontaneous or assisted, but the difference was not statistically significant. Two cases in the study group had laparotomy for uterine rupture with favourable feto-maternal outcome. Vaginal Birth After Caesarean (VBAC) rate was significantly more in women who had history of prior vaginal delivery (p=0.0024). TOLAC was successful in 242 women while CS was done in 80 women. Mean BMI in women with successful TOLAC was significantly lower than in women with unsuccessful TOLAC (23.42±2.07 versus 26.08±3.07, p=0.0001). With an inter-pregnancy interval of 25-36 months, 45.1% in study group and 47.6% in control group delivered vaginally.

**Conclusion:** For women with previous one CS, TOLAC is a reasonable option as compared to planned repeat Caesarean. In these women with continuous supervision, $PGE_2$ is as safe and effective as spontaneous labour in achieving vaginal birth after Caesarean.


**Keywords:** $PGE_2$ gel, Previous caesarean, Trial of labour after caesarean, Uterine rupture

## INTRODUCTION

Rates of caesarean section are increasing worldwide, therefore many women enter in their next pregnancy with a previous caesarean scar, and the optimal delivery method in this scenario is uncertain. TOLAC is the term for an attempted planned birth in a patient who has had a previous caesarean section irrespective of the outcome, either a successful Vaginal Birth After Caesarean (VBAC) or a repeat caesarean section. It is a strategy developed by the health care professionals to decrease the rising rate of CS. In 1916, Cragin popularised the dictum, "once a caesarean section, always a caesarean section" but with the advent of, practicing lower segment CS, newer concepts for the assessment of scar integrity, Fetal well-being, well equipped centre and improved facilities of emergency CS, this dictum has been reversed [1,2]. Several factors like maternal demographic and obstetric characteristics influence the outcome of TOLAC. With an appropriately selected case, there is decreased maternal and fetal morbidity and also reduced chances of complications in future pregnancies than a repeat elective CS. Therefore, assessing the individual risk factors is important when assessing a candidate for TOLAC. By far, the greatest problem for the clinician in subsequent labour is the integrity of the uterine scar as the incidence of uterine rupture in women with previous one CS is assumed to be 0.5-0.9% as compared to women without previous CS where it is 0.2% [3-6]. There are no methods to assess in advance, the strength of uterine scar and the risk of its rupture during subsequent pregnancy and labour. Therefore, these cases require continuous supervision even during intrapartum period to assess for uterine rupture and preventing feto-maternal complications. Spontaneous labour in previous Caesarean cases was found acceptable by some but inducing the labour in scarred uterus remained debatable, till the studies of TOLAC came up with some success [7,8]. Finding the proper protocols for inducing labour in scarred uterus is now a major area of concern. The risk of uterine rupture depends on the method of Induction of Labour (IOL) used and also on the timing of emergency caesarean section for failure to progress in labour. Hence, this study was undertaken to assess the success and safety of VBAC in selected cases of previous one Lower Segment Caesarean Section (LSCS) and to evaluate the maternal and fetal outcome in these cases.

## MATERIALS AND METHODS

A prospective interventional study was conducted in the Department of Obstetrics and Gynaecology at Uttar Pradesh University of Medical Sciences (UPUMS), Saifai, Etawah UP over a period of one year from June 2017 to May 2018. Institutional ethical committee approval (Ethical Committee No: 2017-85) and informed consent of the patients was obtained. Eligibility criteria include singleton cephalic term pregnancy with history of prior one lower segment CS for nonrecurrent cause having no obstetrical contraindication to vaginal delivery. The cases with previous two caesarean section severe preeclampsia, uncontrolled diabetes, prolonged rupture of membranes, mal-presentation, ante-partum haemorrhage, intrauterine death and those with short inter-pregnancy interval (less than 18 months) were excluded from the study. A total of 322 pregnant women who fulfilled the eligibility criteria and consented to participate in the study were enrolled. They were divided into two groups. The study group comprised of those 74 pregnant women who needed IOL either for fetal or maternal reasons with Bishop score less than or equal to 6. The control group included those 248 pregnant women among the enrolled one who came in spontaneous labour with Bishop score more than 6. A detailed

history regarding the demographic profile like age, parity, gestational age, inter- pregnancy interval, details of previous caesarean section, and outcome were recorded. Complete general, systemic, detailed obstetrical examination and routine investigations were done. Informed consent in view of risks and benefits of TOLAC was obtained. Also, consent for IOL was taken from the study group. Admission Non Stress Test (NST) was done for all the cases. In the study group with empty bladder after assessing the Bishop score and taking all aseptic precaution 0.5 mg of Dinoprostone ($PGE_2$) gel was instilled intracervically from a preloaded applicator in dorsal position. Women were asked to lie in left lateral position for at least 15 to 20 minutes after instillation. Bishop score was assessed after eight hours of instillation and dose was repeated if the score still remained less than 6. Maximum three doses were administered, each eight hours apart. If the score still remains less than 6, repeat CS was done considering failed IOL. Further augmentation was done with intravenous oxytocin if required, in cases with improved Bishop Score. In the control group, with maternal and fetal surveillance, labour was allowed to progress spontaneously to compare its success rate with the induced group. Labour was augmented with oxytocin if required. In both the groups maternal and fetal monitoring was done to look for any complications. Maternal surveillance was done by assessing the vitals and scar tenderness periodically. Fetal surveillance was done by intermittent fetal heart monitoring in latent phase and continuous electronic monitoring in active phase of labour. Partograph was maintained for noting the progress of labour. Pregnancy outcome was compared between the study and the control group. Maternal outcome includes successful VBAC (defined as successful vaginal delivery either spontaneous or assisted), duration of labour, and indications of CS and rate of symptomatic uterine rupture (defined as complete disruption of the prior uterine scar requiring laparotomy). Secondary outcome was to establish any relation if any, of history of previous vaginal delivery, maternal BMI, fetal birth weight on the probability of VBAC. Neonatal outcome was defined by birth weight, low APGAR score (-7) at five minutes, and need for admission to the Neonatal Intensive Care Unit (NICU).

## STATISTICAL ANALYSIS

Continuous data was presented in the form of mean±standard deviation. Categorical data were presented as frequency and percentage. Chi-square test and unpaired t-test were applied for statistical analysis of the data. The p-value of less than 0.05 was taken as statistically significant via analytical tool pack of Microsoft excel (version-10.0)- 2010 home edition.

## RESULTS

There were no significant differences between the groups in relation to maternal age and gestational age at delivery. The control group has significantly more of multipara women as compared to the study group. About 20.2% of the women in study group and 46% of the women in control group had history of previous vaginal birth in addition to previous one CS [Table/Fig-1]. Postmaturity was the most common indication for IOL [Table/Fig-2]. About 68.9% women in study group and 77.01% women in control group delivered vaginally either spontaneous or assisted (forceps or ventouse) which was not statistically significant (p-value=0.207). Repeat CS rate was 28.3% in study group in comparison to 22.9% in control group. Two cases in study group had laprotomy for uterine rupture [Table/Fig-3]. Labour was augmented by oxytocin in 68.6% of cases in study group and 75.4% cases in control group; the difference was not statistically significant. However the time taken to deliver after going in active phase of labour was significantly less in the control group as compared to the study group [Table/Fig-4]. Non reassuring Fetal Heart Rate (FHR) was the most common indication for emergency CS in both the groups with scar tenderness as the second most common cause [Table/Fig-5]. The comparison of mean BMI of women with successful TOLAC and women with failed TOLAC was statistically significant. Normal BMI cases have significantly better TOLAC success rate compared to overweight and obese cases in both the groups [Table/Fig-6]. Maximum number of cases of VBAC was in the inter-pregnancy interval of 25-36 months in both the groups [Table/Fig-7]. About 84.5% of the cases with history of previous vaginal birth had successful TOLAC

| Parameters | Study group (n=74) (Mean±SD) | Control group (n=248) (Mean±SD) | *p-value |
|---|---|---|---|
| Mean maternal age (years) | 27.56±3.35 | 26.84±3.75 | 0.139 |
| Mean gestation age (37-42 weeks) | 38.9±1.14 | 38.46±1.93 | 0.063 |
| Mean parity | 1.24±0.57 | 2.36±0.57 | 0.0001 |
| History of previous vaginal delivery | | | |
| Number (%) | 15 (20.2%) | 114 (46%) | -- |

**[Table/Fig-1]:** Maternal demographic characteristics.
*student t-test

| Indications for IOL | Number of patients | Percentages |
|---|---|---|
| Postmaturity | 30 | 40.5% |
| Gestational hypertension | 16 | 21.6% |
| Pre-eclampsia | 15 | 20.2% |
| Oligo-hydramnios | 8 | 10.8% |
| Others | 5 | 6.8% |

**[Table/Fig-2]:** Indications for Induction of labour (IOL) in study group (n=74).

| Mode of delivery | Study group (n=74) | Control group (n=248) | *p-value |
|---|---|---|---|
| Vaginal delivery (Total) | 51 (68.9%) | 191 (77.01%) | |
| Spontaneous | 33 (64.7%) | 130 (68.1%) | 0.207 |
| Assisted | 18 (35.3%) | 61 (31.9%) | |
| Caesarean section | 21 (28.3%) | 57 (22.9%) | 0.426 |
| Laparotomy | 2 (2.7%) | 0 (0%) | - |

**[Table/Fig-3]:** Mode of delivery in the groups.
*Chi square test

| Women delivered vaginally | Study group (n=51) | Control group (n=191) | *p-value |
|---|---|---|---|
| Oxytocin augmentation required n (%) | 35 (68.6%) | 144 (75.4%) | 0.638 |
| Duration of active labour (hours) | 4.26±4.34 | 3.49±2.20 | 0.04 |

**[Table/Fig-4]:** Labour characteristics.
*Chi-square test

| | Study group (n=21) n(%) | Control group (n=57) n(%) | *p-value |
|---|---|---|---|
| Nonreassuring fetal heart rate (n=41) | 10 (47.6%) | 31 (54.4%) | 0.619 |
| Nonprogress of labour (n=17) | 5 (23.8%) | 12 (21.1%) | 0.766 |
| Scar tenderness (n=18) | 4 (19.0%) | 14 (24.6%) | 0.765 |
| Failed induction (n=2) | 2 (9.5%) | 0 (0%) | - |

**[Table/Fig-5]:** Indications of Caesarean Section (CS).
*Chi square test

| BMI (kg/m²) | Successful TOLAC (n=242) n(%) | Unsuccesful TOLAC (n=80) n(%) | *p-value |
|---|---|---|---|
| Mean±SD | 23.42±2.07 | 26.08±3.07 | |
| <18.49 (n=15) | 11 (73.3%) | 4 (26.7%) | |
| 18.5-24.99 (n=197) | 168 (85.3%) | 29 (14.7%) | <0.001 |
| 25-29.99 (n=66) | 39 (59.1%) | 27 (41%) | |
| >30 (n=44) | 24 (54.5%) | 20 (45.5%) | |

**[Table/Fig-6]:** Body Mass Index (BMI) of patients in the study.
*student t-test

(p=0.0024) [Table/Fig-8]. Majority of the women delivered baby of an average weight (2500-3500 grams) and among them, 80% had successful TOLAC [Table/Fig-9]. The mean birth weight and NICU admissions were comparable in both the groups [Table/Fig-10].

| Inter-pregnancy interval (months) | Study group (n=51) | Control group (n=191) |
|---|---|---|
| 18-24 | 5 (9.8%) | 19 (10%) |
| 25-36 | 23 (45.1%) | 91 (47.6%) |
| 37-48 | 17 (33.3%) | 62 (32.5%) |
| >48 | 6 (11.8%) | 19 (10%) |

**[Table/Fig-7]:** Distribution of VBAC cases in relation to inter-pregnancy interval.

| History of previous vaginal delivery | Successful TOLAC (n=242) n(%) | Unsuccessful TOLAC (n=80) n(%) | *p-value |
|---|---|---|---|
| Yes | 109 (84.5%) | 20 (15.5%) | 0.0024 |
| No | 133 (68.9%) | 60 (31.1%) | |

**[Table/Fig-8]:** Distribution of VBAC cases in relation to history of previous vaginal delivery.
*Chi-square test

| Fetal birth weight (grams) | Successful TOLAC (n=242) n(%) | Unsuccessful TOLAC (n=80) n(%) | *p-value |
|---|---|---|---|
| <2500 | 85 (75.9%) | 27 (24.1%) | <0.001 |
| 2500-3500 | 148 (80%) | 37 (20%) | |
| >3600 | 9 (36%) | 16 (64%) | |

**[Table/Fig-9]:** Distribution of VBAC cases in relation to fetal birth weight.
*Chi-square test

| | Study group (n=51) | Control group (n=191) | p-value |
|---|---|---|---|
| Mean birth weight (grams) | 2696±329.88 | 2774±357.6 | 0.16* |
| Low APGAR score at 5 minutes (<7) [n(%)] | 2 (3.9%) | 10 (5.2%) | 0.983** |
| NICU admission [n(%)] | 4 (7.8%) | 17 (8.9%) | 0.811** |

**[Table/Fig-10]:** Neonatal outcome in VBAC cases.
*student t-test, **Chi-square test

## DISCUSSION

Looking in to the present scenario, there is a need to reduce the number of repeat CS. The rate of complications like adherent placenta, injuries to nearby vital structures can be reduced thus reducing the overall morbidity associated with each successive repeat CS by decreasing the number of repeat CS. Qu ZQ et al., reported that VBAC reduces CS rate, with good outcomes in both mother and neonate [7]. It has been suggested in various studies that for appropriately selected women with previous CS, a trial of labour is safe, even safer than elective repeat CS, the risk mainly includes the scar dehiscence or rupture. One such study was conducted by Landon MB et al., where they found the risk of scar rupture in women undergoing TOLAC was 0.7% [4]. Studdsgaard A et al., concluded that TOLAC is an acceptable individualised option for women without major risk factors [8]. Trojano G et al., demonstrated the factors affecting the success of TOLAC and found that multiple previous CS, Müllerian anomalies, maternal obesity, maternal diabetes and a short inter-delivery interval are negative predictors of successful VBAC, while a nonrecurrent indication for previous caesarean section, one prior vaginal birth and spontaneous labour are positive predictors of successful VBAC [9]. It is safer and convenient to both patient and Obstetrician when these women with previous section go in labour by themselves. In women for TOLAC with unfavourable cervix, low dose prostaglandins can be offered for cervical ripening [10]. Success rate of VBAC was 68.9% in study group and 77.01% in control group which was not statistically significant. Repeat CS rate was 28.3% in study group in comparison to 22.9% in control group. Two cases in study group had laparotomy for uterine rupture but feto-maternal outcome was favourable in both the cases. This result shows that by implementing specific protocol for labour induction in previous caesarean cases we can prevent 68.9% repeat CS and also, induction is safe in properly selected cases. Similar results were found in the study conducted by Sangwan V et al. The success rate of TOLAC was 64.34% in induction group compared to 86.82% in spontaneous group in their study showing that with proper monitoring, PGE can be used as a safe and effective method for labour induction in previous CS patients [11]. Kiwan R et al., also conducted a study which is similar to the present study where they found that 50% cases delivered vaginally in the induced group with $PGE_2$ gel with one uterine rupture and 66.6% delivered vaginally in the control group with no case of uterine rupture [12]. Locatelli A et al., and Ouzounian JG et al., also found no significant difference in the rate of uterine rupture between the induced and spontaneous labour in women attempting TOLAC [13,14]. In contrast to present study, Rossi AC et al found an increase in the risk of uterine rupture/dehiscence and repeat CS after labour induction in previous CS [15]. The most common indication for emergency CS was non-reassuring FHR in both the groups. In present study, more number of women in control group was multipara as compared to the study group. About 46% women had a history of previous vaginal birth in control group as compared to 20.2% in the study group. This shows that women with previous vaginal birth can go in spontaneous labour by themselves and needs less induction. About 84.5% cases with prior vaginal delivery had successful TOLAC and only 15.5% had failed TOLAC. The difference was statistically significant showing that previous vaginal birth is a positive predictor of VBAC. The results of present study are similar to the study conducted by Grinstead J et al., where they found that prior vaginal delivery either before or after a CS, significantly improves the outcome of TOLAC [16]. Body Mass Index (BMI) significantly affects the outcome of TOLAC. Increasing BMI has a reverse relation with the outcome. About 14.7% of cases failed the TOLAC in normal BMI group as compared to the morbidly obese group where failure of TOLAC was noticed in 45.5% of cases. Similar results were shown in the study conducted by Hibbard JU et al., where they found failed trial of labour after previous caesarean delivery in 15.2% in normal weight group and 39.3% in morbidly obese group [17]. Landon MB et al., also concluded that previous vaginal delivery including previous VBAC is the greatest predictor for successful TOL but maternal BMI ≥30 significantly lowers success rates [18]. Tasleem H et al and Abdelazim IA et al., also found lower BMI in successful TOLAC group [19,20]. Other factor which influences the success of TOLAC is the inter-pregnancy interval. Maximum success was found when the inter-pregnancy interval was between 25 to 36 months in both the groups. Shipp TD et al., studied the effect of inter-pregnancy interval on the risk of scar dehiscence. He found that with an inter-pregnancy interval of less than 18 months, the risk of scar rupture was 2.3% and with an interval of more than 18 months, the risk was reduced to 1% [21]. Birth weight also influences the outcome of TOLAC. In present study, the mean birth weight in VBAC cases in study group was 2696±329.88 grams and in control group were 2774±357.6 grams. In this study, women carrying average sized babies had success of TOLAC in 80% of the cases while it was 75.9% in small for gestation age and 36% in cases having fetal birth weight more than 3600 grams. Balachandran L et al., found a success rate of 66.2% in average sized babies (2.5-4.0 kg) as compared to 50% in small for gestation babies (<2.5 kg) and only 20% in babies larger than four kg and the result was statistically significant [22]. Neonatal outcomes (APGAR score at birth, admission to the NICU) were comparable in both the groups in the present study. Similar results were found in the study conducted by Ashwal E et al., [23]. In contrast to this study, Delaney T et al., found increased rate of neonatal ICU admission in induced labour [24].

The strengths of present study were the systematic and detailed medical records, and standardised labour management protocol in the hospital. It was also noted that, IOL was not associated with an increased rate of maternal and short term fetal complications.

### Limitation(s)

1. TOLAC was terminated prematurely in cases with nonreassuring FHR, having the potential to create bias and errors.
2. A small sample size in our study further requires a larger study to promote VBAC.

Further research on other safe induction methods that enhance VBAC success rate without increasing mortality and morbidity can be done. Also, effects on outcomes of subsequent pregnancies in these cases and women's views are recommended.

## CONCLUSION(S)

In present study, we have found that TOLAC, both spontaneous and induced is safe and efficacious method to decrease the number of repeat CS thus decreasing the feto-maternal morbidity, provided a specific protocol for TOLAC is implemented. Success is more in patients with prior history of vaginal birth, normal BMI, spontaneous labour with an inter pregnancy interval of 25-36 months. The final decision of whether the labour is to be induced or not should be made by the woman, informed of the risks and benefits, in association with her physician to have a favourable outcome both for the mother and neonate based on her individual circumstances. The results of this study can help provide guidance to women and their providers during this decision-making process.

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