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Original Research Article

Prospective study on success rate and outcomes of trial of labour after caesarean at a tertiary hospital

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ABSTRACT

Background: The increasing prevalence of pregnancies with a scarred uterus has led to a rise in repeat caesarean sections (CS), which are associated with significant maternal morbidity. Trial of labour after caesarean (TOLAC) offers an alternative to reduce CS rates and associated complications. This study aimed to determine the success rate of TOLAC and evaluate maternal and fetal outcomes in a tertiary care hospital.

Methods: This prospective observational study was conducted over one year (April 2023 to February 2024) at Fernandez Hospital a tertiary maternity centre. A total of 206 women with singleton term pregnancies and one previous lower segment caesarean section (LSCS), eligible and consenting for TOLAC, were included. Women with contraindications to vaginal birth or significant comorbidities were excluded. Maternal and neonatal outcomes were recorded and analyzed using appropriate statistical tests, with $p < 0.05$ considered significant.

Results: The success rate of TOLAC was 21.8% (45/206). Factors significantly associated with successful vaginal birth after caesarean (VBAC) included younger maternal age ($p = 0.019$), shorter inter-delivery interval ($p = 0.048$), previous VBAC ($p < 0.001$) and spontaneous onset of labour ($p = 0.001$). Induced labour was associated with higher CS rates. Postpartum haemorrhage (PPH) was significantly higher in the VBAC group (20% vs 6.2%, $p = 0.009$). There were no cases of maternal mortality or major surgical injuries. Neonatal outcomes, including NICU admission and morbidity, were comparable between groups, with no neonatal deaths reported. Cord arterial pH was slightly lower in the VBAC group ($p = 0.023$), though clinically acceptable.

Conclusions: The success rate of TOLAC in this study was relatively low, likely due to high induction rates. However, with careful selection and monitoring, TOLAC remains a safe option without significant adverse maternal or neonatal outcomes. Reducing unnecessary inductions and primary caesarean sections may improve VBAC success rates.

Keywords: Trial of labour after caesarean, Vaginal birth after caesarean, Uterine scar, Maternal outcome, Neonatal outcome, Labor induction, Postpartum haemorrhage

INTRODUCTION

In recent years, number of pregnancies with scarred uterus have increased in antenatal clinics. Such women are in a dilemma regarding their mode of birth in terms of risks and complications for themselves and their babies. Repeat caesarean sections are associated with complications such as morbidly adherent placenta, scar rupture, surgical morbidity with bowel-bladder injury, postpartum haemorrhage.¹ WHO recommends reduction of caesarean section rate to 15%.¹ Most common indication of repeat

CS is a primary CS. TOLAC is a way to reduce CS rates and improves outcomes for women.

Different guidelines such as RCOG green top guideline 45 allow clinicians to make better judgement to decide among women requiring elective repeat caesarean section (ERCS) versus women who can be allowed vaginal birth after previous caesarean birth (VBAC). Previous uterine rupture, Classical caesarean scar, obstetric complications like placenta praevia, malpresentations in present pregnancy are contraindications of VBAC.²

Even in a low resource setting, evidence-based information can help boost obstetricians to counsel for TOLAC and create awareness among pregnant woman about their birth options.³ Planned VBAC may be offered in singleton, term, cephalic pregnancies who have had a previous LSCS. Successful VBAC has lowest risk in terms of avoiding secondary surgical trauma, shorter recovery period and risk of maternal morbidities associated with multiple caesarean births (hysterectomy, organ injury, adherent placenta). Success rate of planned VBAC is 72-75%.⁴ Risk of scar rupture is 0.2-1.5% with transverse uterine incision, with it being more in induced labour than in spontaneous labour.⁵

We conducted this study with the aim to determine the success rate of TOLAC at our tertiary care maternity centre and to analyse maternal and foetal outcomes to educate mothers opting for TOLAC and aid them to take an informed decision.

METHODS

Study design

The study was a Prospective observational study conducted at a tertiary care maternity centre conducting up to 10,000 births per year. The study was carried out over a period of one year from April 2023 to February 2024. We included all women eligible for TOLAC during the duration of the study and who consented for the same. These were term singleton pregnancies with one previous CS where the previous surgery was performed for non-recurrent indication. We excluded women with chronic medical co-morbidities or those with obstetric indication for an ERCS. The eligible women are counselled during their antenatal period regarding the risks and benefits of TOLAC versus ERCS. The ones who consented are prepared for vaginal birth with childbirth classes and follow-up in specialty VBAC clinics run by midwives. The recruitment for the study was done at the time of admission for delivery after taking informed consent for the same. Details were collected regarding the labour and outcomes with follow up till 6 weeks postpartum. Maternal outcomes such as mode of delivery, indication of CS, complications like postpartum haemorrhage, scar rupture, bowel-bladder injury, need for blood transfusion, surgical site infection, mortality were assessed. Foetal outcomes such as low APGAR scores, need for NICU admission, neonatal death was analysed.

Sample size

Sample size was calculated assuming the proportion of successful VBAC as 47.9% as per the study by Jagannathan et al.³ Other parameters considered for sample size calculation were 7% absolute precision and 95% confidence level. The formula was used for sample size was as per the study by Daniel et al.⁶ The required sample size was calculated as 196. To account for a non-participation rate of about 5%, another 10 subjects were

added to the sample size. Hence the final required sample size was 206.

Statistical analysis

Successful VBAC was considered as primary outcome of interest. The association between categorical explanatory variables and quantitative outcome was assessed by comparing the mean values. The mean differences along with their 95% CI is presented. Categorical variables are presented as frequency and percentage whereas continuous variables are presented as median (IQR) due to non-normal data. Fisher exact test was used to test the statistical significance of cross-tabulation between categorical variables. Mann-Whitney U test was used to compare the median (IQR) of continuous variables between two groups. P value < 0.05 was considered statistically significant. RStudio Desktop Version latest version was used for statistical analysis. (Reference: RStudio Team (2024). RStudio: Integrated Development for R. RStudio, PBC, Boston, MA URL <http://www.rstudio.com/>).

RESULTS

Mode of delivery

Out of the 206 women in our study, 45 had vaginal birth after caesarean section (VBAC) and 161 had caesarean section. The successful VBAC rate in our study is 21.8%. Majority of women delivered between 39-40 weeks of gestation (68, 33%), followed by 40-41 weeks (54, 26.2%). The indications for Cesarean section are detailed in Figure 1.

Sub-analysis was done to assess the factors that were associated with successful VBAC. Table 1 depicts the comparison of baseline profile of the women with mode of delivery. There was a statistically significant difference in median age and median Inter delivery Period (IDP) between CS and VBAC. Women within ages 27 to 33 years have higher probability of having a successful VBAC. Shorter IDP (3.6 years) was associated with successful VBAC. There was no statistically significant difference when the BMI was compared.

Further comparison was done to see whether a previous history of VBAC influenced the mode of delivery. This was found to be statistically significant. Table 2 details the analysis. When the labor type was compared with mode of birth, induced labor was found to be associated with higher CS rate and this finding was statistically significant. Table 3 depicts the same analysis. The most common indication of induction of labor was diabetes in pregnancy followed by postdates.

Maternal complications

Intraoperative findings in failed TOLAC cases undergoing emergency LSCS included adhesions in 16% of cases, thinned lower uterine segment (LUS) in 14% of cases, scar

dehiscence in 4 cases and 4 cases showing scar rupture. Uterine angle extension was seen in 2 cases. Among the 9 cases with atonic uterus (6%) requiring surgical management 1 case underwent left uterine artery ligation while 1 case required Hayman's sutures and balloon tamponade. There were no cases of inadvertent organ injury and no cases of PPH requiring hysterectomy. Table 4 shows the comparison between maternal outcomes with mode of birth. There was a statistically significant difference in the proportion of PPH between CS and VBAC ($p<0.05$). Blood transfusion was required in 3 cases with failed TOLAC who had PPH but was not statistically significant. Among successful TOLAC cases there was no incidence of third or fourth-degree perineal tears.

Neonatal outcomes

Among 206 babies born to women under study, 45 babies required NICU admission following birth during the duration of hospital stay. The most common indication for admission was Neonatal jaundice followed by respiratory distress. No significance was found among proportion of NICU admission rates between successful and failed TOLAC cases. Table 5 compares the NICU admission with the mode of birth.

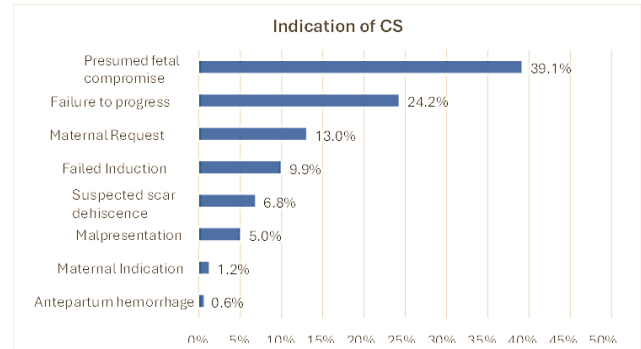


Figure 1: CS indication in women with caesarean section (n=161).

Out of 36 babies admitted to the NICU, one baby had APGAR score <7 which was an outcome of failed TOLAC where Emergency CS was done for cord prolapse and there were no cases of neonatal death. Table 6 compares the neonatal outcomes with mode of delivery. Table 7 shows the comparison with cord ABG pH with mode of delivery. The median (IQR) cord ABG pH was statistically significantly higher in CS group as compared to VBAC group ($p<0.05$).

Table 1: Comparison of baseline characteristics between CS and VBAC (n=206).

Variables	CS (n=161)	VBAC (n=45)	P value
Age (in years), Median (IQR)	31 (29, 33)	30 (27, 33)	0.019
Body mass index (kg/m ²), Median (IQR)	30 (26.9, 32.7)	27.3 (29.7, 32.5)	0.682
Inter delivery period (in years), Median (IQR)	4 (3.3, 6)	3.6 (2.6, 5.8)	0.048

Table 2: Sub-analysis of incidence of previous history of VBAC in study population (n=206).

Previous VBAC, N (%)	CS (n=161)	VBAC (n=45)	P value
Yes	8 (5.0%)	14 (31.1%)	<0.001
No	153 (95.0%)	31 (68.9%)	

Table 3: Comparison of labour type between CS and VBAC (n=206).

Labour type, N (%)	CS (n=161)	VBAC (n=45)	P value
Induced	73 (45.3%)	7 (15.6%)	0.001
Spontaneous	88 (54.7%)	38 (84.4%)	

Table 4: Comparison of maternal outcomes between CS and VBAC (n=206).

Outcomes	CS (n=161)	VBAC (n=45)	P value
PPH, N (%)			
Yes	10 (6.2%)	9 (20.0%)	0.009
No	151 (93.8%)	36 (80.0%)	
Need for blood transfusion, N (%)			
Yes	3 (1.9%)	0 (0%)	1.000
No	158 (98.1%)	45 (100%)	
Wound infection/SSI, N (%)			
Yes	3 (1.9%)	0 (0%)	1.000
No	158 (98.1%)	45 (100%)	

Continued.

Outcomes	CS (n=161)	VBAC (n=45)	P value
Pyrexia, N (%)			
Yes	14 (8.7%)	4 (8.9%)	1.000
No	147 (91.3%)	41 (91.1%)	

Table 5: Need for NICU admission among babies under study (n=206).

NICU admission, N (%)	CS (n=161)	VBAC (n=45)	P value
Yes	30 (18.6%)	6 (13.3%)	0.509
No	131 (81.4%)	39 (86.7%)	

Table 6: Comparison of neonatal outcomes between CS and Successful VBAC cases (n=206).

Outcomes	CS (n=161)	VBAC (n=45)	P value
Sepsis			
Yes	9 (5.6%)	1 (2.2%)	0.694
No	152 (94.4%)	44 (97.8%)	
RD			
Yes	11 (6.8%)	3 (6.7%)	1.000
No	150 (93.2%)	42 (93.3%)	
Neonatal seizure			
Yes	1 (0.6%)	0 (0.0%)	1.000
No	160 (99.4%)	45 (100.0%)	
Hypoglycaemia			
Yes	1 (0.6%)	2 (4.4%)	0.121
No	160 (99.4%)	43 (95.6%)	

Table 7: Comparison of cord ABG pH and cord VBG pH between CS and VBAC (n=168).

Variables	CS (n=131)	VBAC (n=37)	P value
Cord ABG pH, Median (IQR)	7.25 (7.21, 7.3)	7.21 (7.19, 7.26)	0.023
Cord VBG pH, Median (IQR)	7.3 (7.26, 7.33)	7.32 (7.27, 7.34)	0.137

DISCUSSION

Successful VBAC has lowest risk in terms of avoiding secondary surgical trauma, shorted recovery period and risk of maternal outcomes associated with multiple caesarean births (hysterectomy, organ injury, adherent placenta). Success rate of planned VBAC is 72-75%.⁴ TOLAC in selected cases has great importance in the present era because of the rising rate of primary CS. The current study helps in providing the required information while counselling women with one previous LSCS for TOLAC and enables them to make a decision.

In the study, out of 206 mothers undergoing TOLAC, the success rate of TOLAC was 21.8% (45) including both spontaneous and assisted vaginal births. In comparison, a reference study by Jagannathan et al showed the proportion of successful VBAC to be 47.9%. Most of the study population, 94(46%) belonged to the age group 31-35 years with median age being 31 yrs. This was in comparison to Singh et al who observed most women 36 (60%) in the age group of 26-40 years.⁷ Majority of mothers belonged to gestational age group of 39-40 weeks

i.e., 68 cases (33%). The median inter delivery period (IDP) in our study was 4 years for failed TOLAC cases and at 3.6 years for successful cases. Short intervals are associated with an increased risk of uterine rupture in women for TOLAC according to a systematic review of 22 observational studies done by Conde-Agudelo et al.⁸ In a study by Rahman et al of the 100 mothers, 6 had a previous spontaneous vaginal birth and all 6 women had successful VBAC.⁹ In comparison, in our study out of 22 women who had a previous history of successful VBAC, 8 had failed TOLAC while 14 birthed vaginally which was statistically significant.

In our study 80 women were induced as per the institutional protocols. The most common indication was diabetes mellitus including both pre gestational DM and gestational DM, second most common indication being postdates (gestational age beyond 40 weeks). There was statistical difference in outcomes between induced cases and those who set into spontaneous labour with 73 women among the 80 induced mothers having failed TOLAC. In contrast studies have shown successful outcomes even in

induced cases as concluded by Sangwan V et al where the success rate of TOLAC was 64.34% in induction group.¹⁰

A major indication for emergency CS in our study was presumed fetal compromise 63 (39.1%) followed by failure to progress in 39 (24.2%). 13% of cases underwent Caesarean section during the Trial of labour for maternal request which accounts for third most common indication for LSCS. Sangwan et al's study also quoted fetal distress as the most common indication in 99 cases of TOLAC (41.7%).¹⁰ Uterine rupture is a serious complication of TOLAC and intrapartum monitoring for features of scar dehiscence or impending rupture is of utmost importance in women undergoing TOLAC. Various studies reported that the rate of uterine rupture in attempted TOLAC cases were 1.0 to 4.2%.^{11,12} Uterine rupture or dehiscence associated with TOLAC results in the most significant increase in the likelihood of additional maternal and neonatal morbidity. In the study 11 women underwent emergency LSCS for suspected scar dehiscence with intrapartum findings of tachycardia and scar tenderness, 1 had scar dehiscence intraoperatively and 4 others showed thinned out lower uterine segment. Coincidentally scar rupture was seen intraoperatively in 4 cases where indication for section was presumed fetal compromise in 3 cases and failure to progress in 1 case.

Omental and rectus sheath adhesions were noted in most of our cases intraoperatively with bladder adhesions requiring Foley's catheterisation for 24-48 hours in 24 cases (12%). There were no cases of inadvertent bladder or bowel injuries in our study. In a study on bladder injury in obstetric emergency surgeries by Tarney CM, failed TOLAC was seen more in the bladder injury group than control group (64% versus 22%) with concurrent uterine rupture seen in 14% of bladder injury cases.¹³ The proportion of postpartum haemorrhage (PPH) was found to be statistically significant with 9 cases (20%) out of 45 VBAC. This is in concordance with a 7 years prospective observational study by Anne et al in a Danish hospital where the risk of maternal haemorrhage was found to be more than five times greater for women with previous LSCS attempting TOLAC compared with women who had an elective LSCS.¹⁴ Among other adverse maternal outcomes, wound infection/ Surgical site infection was seen in 3 cases of failed TOLAC requiring antibiotics as per culture sensitivity report of wound discharge and daily wound dressings.

36 babies required NICU admission with most common indication being jaundice. Sepsis and respiratory depression were the next common reasons occurring in 17 cases with added complication of neonatal seizures requiring antiepileptics in 1 of them. Other reasons for NICU admission were significant weight loss during hospital stay and hypoglycaemia. All babies were discharged in stable condition and were doing well at 6 weeks post birth with scheduled visits to the paediatrician for further follow up.

Cord arterial blood gas analysis showed pH of 7.21 median among VBAC group and 7.25 median among CS group which was statistically significant. pH of 7.1 or less were seen in 6 cases (5 of whom had CS for either PFC, Suspected scar dehiscence or cord prolapse) with all the neonates monitored in NICU post birth for respiratory depression and suspect sepsis. There was no incidence of perinatal mortality in our study which is in accordance to a four-year prospective observational study conducted by Landon et al which showed that there was no significant difference in the overall rate of intrapartum stillbirth at term and neonatal death among women offered TOLAC vs those who underwent elective CS.¹⁵

CONCLUSION

The success rate for TOLAC was 21.8% in our study. This can be attributed to the increased rates of induction of labour and the same as reflected by the significantly higher incidence of CS in the induced group. We recommend revising the need for induction overall and for TOLAC women to improve the chance of successful TOLAC. Though not significant statistically, overall lower rates of maternal and neonatal morbidity were seen in the successful TOLAC group. Thus, TOLAC can be offered to women with one previous CS without compromising on safety, especially in centres that are equipped to handle any complications that may arise. The focus to reduce overall CS rates must be on avoiding unindicated primary caesarean sections. But even in case of one previous CS, a trial is justified in appropriate cases and appropriate settings to improve birth outcomes.

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Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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