Original Research Article

EVALUATING THE SUCCESS RATE OF VAGINAL DELIVERY AFTER CAESAREAN SECTION

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Abstract: *The retrospective study was conducted in the Department of Gynecology Dr. Ruth K. M. Pfau Civil Hospital Karachi, from February 2021 to February 2022, for the evaluation of factors associated with the success of TOLAC (trial of labor after cesarean delivery) and to identify variables for predicting the success of TOLAC in subjects with prior Caesarean section (CS). A total of 315 women were included in the study. They were divided into the validation cohort (n=20, 63%) and the training cohort(n=295, 93.6%). The primary endpoint was the success rate of vaginal delivery. The results showed that of 315 participants, 264 (83.8%) women had successful TOLAC and vaginal delivery, and 51 (16.1%) had ERCS. According to multivariate analysis, BMI-estimated birth weight, gestational age <41 weeks, rupture of membranes, and cervix Bishop score ≥5 was significantly associated with the success of TOLAC. Results suggest that TOLAC has a high success rate in women with a history of c-sections.*

Keywords: Vaginal birth after cesarean section, elective repeat cesarean section, prediction model, the trial of labor after caesarean delivery

Introduction

The caesarean section (CS) is a widely performed procedure. It is associated with health risks such as haemorrhage, surgical risks, and anesthesia complications. After a prior CS, a decision regarding the subsequent mode of delivery has to be taken. Both vaginal birth after caesarean section (VBAC) and elective repeat caesarean section (ERCS) have potential benefits and risks (Betran et al., 2021). The decision about the mode of delivery is based on patient priorities and perinatal and maternal morbidity associated with the procedure (Roberge et al., 2019). A prior cesarean section is the most common indication of ERCS (Kietpeerakool et al., 2019). The success rate of VBAC ranges from 60% to 80 %(De Leo et al., 2020). In unsuccessful cases, serious complications such as uterine rupture are associated with morbidity (Levin et al., 2020). However, CS is associated with increased blood loss, thromboembolic events, maternal visceral injury, and longer recovery time than vaginal delivery. ERCS is also associated with an increased risk of neonatal respiratory distress syndrome compared to vaginal delivery. With each CS future risk of placental adhesive disorders and

placenta praevia increases (Donovan and Shainker, 2021). Thus, an alternative procedure for repeated CS is trial of labour after caesarean delivery (TOLAC). While every VBAC is associated with risk, if suitable candidates for VBAC can be identified over morbidity may be reduced by avoiding repeated CS. Moreover, women who are at higher risk of VBAC associated morbidity can also be counseled accordingly.

TOLAC is accepted as a reasonable option worldwide. However, in Pakistan rate of ERCS is in women with prior CS remains high (Kanji et al., 2019). Thus, TOLAC will effectively decrease morbidity associated with repeated CS. The current study aims to evaluate factors associated with the success of TOLAC and to identify variables for predicting the success of TOLAC in subjects with prior CS.

Methodology

This retrospective study was conducted in the Department of Gynecology, Dr.Ruth K.M. Pfau, Civil Hospital Karachi, from February 2021 to February

2022. The study included pregnant females above 18 years with a history of prior CS and were candidates for TOLAC. Those with preterm labour, history of ≥ 2 prior CS and uterine incisions like myomectomy, and congenital fetal anomalies were excluded. The informed consent of participants was recorded. The ethical board of the hospital approved the study.

Demographic and medical data on delivery outcomes and complications were abstracted from the patient's medical records. The baseline data included education level, maternal age, gestational age, pre-pregnancy BMI, history of vaginal delivery or abortion, recurrence of indications of previous labour, the onset of labour, and estimated birth weight was recorded. Moreover, information related to the previous childbirth, including analgesic administration, oxytocin administration, cervix Bishop Score, and rupture of membranes, was recorded. Common ultrasound measurements were used for estimating birth weight. Women who requested labour induction with prolonged or delayed pregnancy, premature rupture of membrane, and gestational diabetes or hypertension were candidates for oxytocin augmentation. The primary endpoint was the success of TOLAC. The secondary endpoint was neonatal and maternal adverse events like maternal infection, uterine rupture, blood transfusion, Apgar score <7, neonatal intensive care unit (NICU), neonatal death, and maternal death.

Data was analyzed using SPSS version 23.0. Categorical data were represented as frequency or percentage. $\chi2$ test or Fisher's exact test was used for inter-group comparison. Predictors of successful TOLAC were determined using univariate and multivariate analysis. Multivariate analysis findings were used to construct a nomogram, which included selected variables for predicting the success of TOLAC. Nomogram was used on the validation cohort for validating findings. Its specificity, sensitivity, accuracy rate, positive predictive value (PPV), and negative predictive value (NPV) for estimating the success of TOLAC were also calculated. $P < 0.05$ was considered statistically significant

Results

A total of 315 women were included in the study. They were divided into the validation cohort (n=20, 63%) and the training cohort (n=295, 93.6%). The majority of women (88%) were aged above 35 years. 40 (12.6%) women had a previous vaginal delivery. 26 (8.2%) women had pre-gestational diabetes. Regarding baseline data, there was no significant difference between the groups, except for a history of vaginal delivery (P=0.02) and parity (P=0.03).

Of 315 participants, 264 (83.8%) women had successful TOLAC and vaginal delivery, and 51 (16.1%) had ERCS. Of 51 cases, 22 (43.1%) requested CS themselves, 9 (17.6%) had fetal distress, and 5 (9.8%) had failed labour induction. 2 (0.6%) women had a blood transfusion, 2 (0.6%) had a uterine rupture, 1 (0.3%) had a hysterectomy and 3 (0.9%) had the maternal infection. There were no maternal deaths. In 312 (99%) newborns, 5-minute Apgar score was 10, and in 3 (1%), it was <7. There were 3 (1%) cases of neonatal asphyxia, 1 (0.3%) neonatal death, and 20 (6.4%) NICU admissions. Participants who requested repeated CS were excluded from the prediction model.

Univar ate analysis of the predictors of successful TOLAC in the training cohort are summarized in Table I. Women with gestational age < 41 weeks, previous vaginal delivery, more than two previous deliveries, spontaneous onset of labour, lower BMI, and lower estimated birth weight were likely to achieve successful TOLAC.

According to multivariate analysis, BMI-estimated birth weight, gestational age <41 weeks, rupture of membranes, and cervix Bishop Score ≥5 was significantly associated with the success of TOLAC (Table II). The significant independent variables from the multivariate analysis were used to develop the nomogram prediction model.
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Table I Univariate analysis of predictors of successful TOLAC

Characteristic	Failed TOLAC (n=51)	Successful TOLAC (n=264)	OR (95% CI)
Age (years)			
< 35	5 (9.8%)	237 (89.7%)	1.0
≥35	4 (7.8%)	238 (90.1%)	1.02 (0.58- 71)
Gestational age (weeks)			
≥41	7 (13.7%)	228(86.3%)	1.0
<41	4(7.8%)	240 (91%)	1.76 (1.15 - 2.71)
Parity			
1 previous delivery	5 (9.8%)	235(89%)	1.0
≥ 2 previous deliveries	3(5.8%)	250 (95%)	2.06 (1.13 - 3.77)

No. of abortions			
< 3	5 (9.8%)	238 (90.1%)	1.0
≥3	6 (11.7%)	235(89%)	0.91 (0.45- 1.82)
Previous vaginal delivery			
No	6(11.7%)	235 (89%)	1.0
Yes	5(5.8%)		2.04 (1.12 - 3.75)
BMI (kg/m^2)			
≥30	8 (15.6%)	219 (82.9%)	1.0
<30	4 (7.8%)	240 (90.9%)	2.08 (1.32- 3.34)
Estimated birth weight (Kg)			
≥4	19 (37.2%)	166 (62.8%)	1.0
<4	4 (7.8%)	240 (90.9%)	6.18 (3.32- 11.57)
Onset of labour			
Induced	11 (21.5%)	203 (76.8%)	1.0
Spontaneous	3 (5.8%)	245 (92.8%)	4.21 (2.92 - 6.02)
Oxytocin augmentation			
Yes	12 (23.5%)	203 (76.8%)	1.0
No	3 (5.8%)	245 (92.8%)	4.56 (3.18- 6.55)
Cervix Bishop score			
<5	8 (15.6%)	221 (83.7%)	1.0
≥5	2 (3.9%)	250 (94.6%)	4.07 (2.76- 6.01)
Rupture of membrane			
Yes	7 (50%)	224 (84.8%)	1.0
No	4 (7.8%)	240 (90.9%)	1.95 (1.33 to 2.85)

Table II Multivariate logistic analysis of predictors of successful TOLAC

Characteristic	OR (95% CI)	P value
Gestational age	1.68 (1.04 - 2.61)	.0299
Previous vaginal delivery	1.71 (1.18 - 2.78)	.0179
Estimated birth weight	5.32 (2.64 - 10.94)	<.0001
BMI	1.81 (1.09 - 3.02)	.0209
Onset of labour	2.52(1.68 - 3.79)	<.0001
Cervix Bishop score	3.37 (2.12 - 5.17)	<.0001
Rupture of membranes	2.52 (1.75 - 3.89)	<.0001

Under the nomogram prediction model, two groups were observed, the group with a high probability of TOLAC success (TOLAC success rate 92.9%, 78.7% validation cohort and TOLAC success probability ≥.85) and a group with a low probability of TOLAC success (TOLAC success rate 81.4%,21.5% validation cohort and TOLAC success probability <.85). Specificity, Sensitivity, accuracy rate, PPV and NPV of nomogram model were 41.8%, 80.8%, 76.8%, 92.9%, and 18.9% respectively.

Discussion

The current study shows that TOLAC had a relatively higher (83.8%) success rate and a low incidence of adverse effects. Though our study indicates a high success rate of TOLAC, a previous study by Li et al. reported that ERSC is preferred in females with prior CS (Li et al., 2019). This study established a prediction model based on independent predictors of successful TOLAC. This model can be used clinically

for identifying women with a higher chance of successful vaginal delivery. Such women can be counseled for pursuing a vaginal mode of delivery as it is associated with fewer complications and shorter recovery times.

This study showed that gestational age < 41 weeks was associated with successful TOLAC. This was in line with the finding of a previous study by Thapsamuthdechakorn et al., which reported that late gestational age was the predictor of TOLAC failure (Thapsamuthdechakorn et al., 2018). Like the results of the previous study (Familiari et al., 2020), BMI is also a predictor included in the prediction model of our study. Our study indicated that women with ≥ 3 previous vaginal have more chances of successful TOLAC. Similar findings were reported in a study conducted by Trojano et al. (Trojano et al., 2019). A study conducted by Wu et al. showed that Bishop's score was significantly associated with successful VBAC(Wu et al., 2019), which was in line with the current study's findings. Jamshed et al. reported that a

Bishop Score ≥6 was an independent indicator of successful TOLAC (Jamshed et al., 2022). Different studies have evaluated the effect of neonatal birth weight on TOLSC and found that lower estimated birth weight increases the chances of successful TOLAC (Place et al., 2019). Our study's results align with previous studies, which showed that spontaneous onset of labour was associated with successful VBAC. The rate of ERCS was higher with the induction of labour (Agarwal et al., 2022).

This study has a few limitations. First, repeated CS was requested by many participants themselves. Though these subjects were excluded from the prediction model, we can't neglect their potential impact on the significance of the model. This issue can be considered in future research, and new measures for encouraging persistent TOLAC may be established. Second, the study was conducted on a small sample from a single center, which does not represent a heterogeneous population. This sample size is limited for estimating neonatal and maternal adverse events. A more extensive study is recommended for further analysis topic.

Conclusion

TOLAC has a high success rate in women with a history of c section. It implies that ERCS rates can be potentially decreased through TOLAC. The prediction model developed in the study can be used clinically to counsel potential candidates of TOLAC.

Conflict of interest

The authors declared an absence of conflict of interest.

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