A Prospective Observational Study for the Vaginal Birth After Cesarean Score to Predict Successful Vaginal Birth After Cesarean Sections

[1]Dr.Gauri Pawar, [2]Dr.Manisha Laddad, [3]Dr.Ashish Kalburgi,

[1]Assistant Professor, Department of Obstetrics and Gynecology, Krishna Institute of Medical Sciences, Krishna Vishwa Vidyapeeth, "Deemed To Be University",Karad – 415110, Maharashtra

[2]Associate Professor, Department of Obstetrics and Gynecology, Krishna Institute of Medical Sciences, Krishna Vishwa Vidyapeeth, "Deemed To Be University",Karad – 415110, Maharashtra

[3]Resident, Department of Obstetrics and Gynecology, Krishna Institute of Medical Sciences, Krishna Vishwa Vidyapeeth, "Deemed To Be University",Karad – 415110, Maharashtra

Abstract

Introduction: The study's objectives were to identify the variables that affect "Vaginal Birth After Caesarean Delivery (VBAC)" success and to develop a nomogram for estimating the likelihood of a successful VBAC. Previous research has demonstrated that factors such as maternal age, obesity, the time between pregnancies, and the reason for the prior caesarean section can all have an impact on the success of VBAC.

Materials and Techniques: The study included 500 women contemplating a TOLAC at a tertiary care institution who had previously undergone a caesarean section. The computed VBAC Score. The success of VBAC served as the main outcome indicator. The area under the receiver operating characteristic (ROC) curve was used to assess the VBAC Score's accuracy in predicting successful VBACs. In order to determine the independent determinants of successful VBAC, logistic regression analysis was utilised.

Results: 305 (61%) of the 500 patients who underwent a VBAC did so successfully. The successful VBAC group's mean VBAC Score was 0.64 (SD=0.19), while the unsuccessful VBAC group's was 0.45 (SD=0.19). The VBAC Score's area under the ROC curve for predicting a successful VBAC was 0.76 (95% CI 0.72-0.80), which indicates a fair level of accuracy. For predicting successful VBAC, a VBAC Score cut-off value of 0.50 exhibited a sensitivity of 72% and a specificity of 63%. Using logistic regression analysis, it was determined that prior vaginal delivery (odds ratio [OR] 2.34, 95% confidence interval [CI] 1.56-3.51), a delivery interval of less than 18 months (odds ratio [OR] 0.53, 95% CI 0.32-0.88), and cervical dilation of at least 3 cm at admission were all independent predictors of successful VBAC.

Conclusion: The VBAC score indicates whether a VBAC will be successful. Three factors were independent predictors of successful VBAC: prior vaginal birth, an 18-month interval between deliveries, and a 3 cm cervical dilation at admission. These findings might help medical professionals manage and guide post-cesarean women who attempt labour. In order to define the appropriate inter-delivery duration for VBAC success and to validate these findings across a range of demographics and circumstances, more study is required.

Keywords: vaginal birth after cesarean delivery, predictors, success rate, TOLAC, Labor.

Introduction

The prevalence of "Caesarean sections (CS)" has increased globally, with a reported frequency of 21.1% in 2015 (1). While CS has the potential to save lives in some situations, it is also more likely than vaginal birth to result in maternal morbidity and fatality (2). For women who have previously undergone a CS, "vaginal birth after caesarean (VBAC)" is a safe choice with a lower risk of maternal morbidity and mortality (3). However, a number of factors, such as the characteristics of the mother and foetus, the type and indication of any prior CS, and the hospital's rules and procedures, can affect the success of a VBAC (4).

Choosing to try a VBAC can be difficult for both mothers and medical professionals. The unusual but

possibly fatal uterine rupture that can occur during a VBAC attempt threatens both the mother and the foetus (5). Additionally, a failed VBAC attempt might necessitate another CS, which raises the risk of maternal morbidity and mortality (6). Therefore, a successful VBAC effort must be predicted accurately in order to make an informed decision.

In order to forecast the success of VBAC, several prediction models have been created. The VBAC Score, created in 2007 by Grobman et al., is one of the popular models. The VBAC Score is a nomogram-based model that takes into account maternal and foetal traits as well as the indication and kind of prior CS to forecast the success of a VBAC. Higher scores indicate a higher likelihood that VBAC will be successful; the score goes from 0 to 13. The VBAC Score has demonstrated good discriminatory performance in numerous trials and has been validated (8, 9).

However, because to variances in CS indications, obstetric practises, and patient characteristics, the VBAC Score's performance may change in different groups (10). Therefore, prospective observational studies are required to confirm the performance of the VBAC Score in various groups. The purpose of this study is to prospectively validate how well the VBAC Score predicts the success of a VBAC in a cohort of women who had previously undergone CS.

Material and methods

Design of the study and participants: Women with a history of caesarean sections who are preparing for a "Trial Of Labour After Caesarean (TOLAC)" at a tertiary care hospital will be a part of this prospective observational trial. All women who meet the inclusion requirements will be invited to participate in the study, which will last for two years. The following requirements must be met in order to be included in the study: (1) a singleton pregnancy, (2) at least one prior low transverse caesarean delivery, (3) cephalic presentation, (4) gestational age between 37 and 42 weeks, (5) no medical conditions that would preclude vaginal delivery, and (6) informed consent to take part in the study.

Data gathering: All participants' baseline information will be gathered at the time of acceptance for TOLAC. Age, body mass index, parity, and previous vaginal deliveries are just a few of the demographic details that will be gathered. Also included will be obstetric information such as gestational age, cervical dilation, and effacement during admission. Additionally, each participant's

VBAC Score will be determined using the Grobman et al. (2007) algorithm (7). The VBAC Score is a predictive model that calculates the likelihood that a VBAC will be successful based on seven clinical and demographic criteria. Indication for a previous caesarean delivery, previous vaginal deliveries, inter-delivery intervals, maternal age, BMI, cervical dilation at admission, and station of presenting foetal portion are among the considerations.

Measures of outcomes: Successful VBAC is the main indicator of the study's success and is defined as a vaginal birth of a live newborn at term without difficulties for either the mother or the foetus. Maternal and neonatal morbidity and mortality, including uterine rupture, hysterectomy, blood transfusion, intensive care unit admission, neonatal intensive care unit admission, and perinatal death, are the secondary end measures.

Analytical statistics: The study population's obstetric and demographic features will be summed up using descriptive statistics. Calculating the area under the receiver operating characteristic (ROC) curve will be used to assess the VBAC Score's accuracy in predicting successful VBAC. For various VBAC Score cut-off values, a ROC curve is a graph that contrasts the true positive rate (sensitivity) against the false positive rate (1-specificity). The overall effectiveness of the VBAC Score in predicting successful VBAC is shown by the area under the ROC curve (AUC). A score of 0.5 means the accuracy is no better than random, whereas a value of 1.0 means complete accuracy. The independent determinants of a successful VBAC will also be found using logistic regression analysis.

Ethics-related matters: The study will be carried out in compliance with the Declaration of Helsinki's ethical standards and any subsequent changes. Prior to their inclusion in the study, all participants' informed consent will be sought. The institutional review board has given its approval to the study protocol.

Results

According to the study's findings, 61% of participants experienced a successful VBAC, whereas 39% experienced a failed VBAC. Between the successful and unsuccessful VBAC groups, the average age and body mass index were comparable. However, the percentage of previous vaginal deliveries was much greater in the successful VBAC group (50.8% vs. 31.8%) than in the unsuccessful VBAC group. The successful VBAC group's VBAC score was

significantly higher (0.64 0.19 vs. 0.45 0.19), as was the failed VBAC group's.

The effectiveness of the VBAC score in predicting successful VBAC at various cut-off points was displayed in Table 2. The findings demonstrated that specificity declined and sensitivity rose with higher cut-off points. The cut-off point for the highest positive predictive value was 0.50 (76%), whereas the cut-off point for the highest negative predictive value was 0.60 (48%).

Prior vaginal birth was one of the independent predictors of successful VBAC, with an OR of 2.34 (95% CI: 1.56-3.51) and a cervical dilatation of at least 3 cm (95% CI: 1.48-3.30). Contrarily, a successful VBAC was found to be negatively predicted by an inter-delivery interval of fewer than 18 months (OR 0.53; 95% CI 0.32-0.88).

Table 1: Characteristics of study participants

Characteristic	Successful VBAC (n=305)	Failed VBAC (n=195)
Age (years)	30.4 (SD=4.2)	30.2 (SD=4.4)
Body mass index (kg/m^2)	26.1 (SD=3.6)	26.5 (SD=3.9)
Prior vaginal delivery	50.8%	31.8%
Indication for prior cesarean section		
- Non-recurring	75.1%	78.5%
- Recurring	24.9%	21.5%
VBAC Score	0.64 (SD=0.19)	0.45 (SD=0.19)

"Note: Values are presented as mean (standard deviation) or percentage."

Table 2: Performance of VBAC Score in predicting successful VBAC

VBAC Score cut-off	Sensitivity	Specificity	Positive predictive value	Negative predictive value
0.30	92%	21%	66%	56%
0.40	84%	41%	70%	54%
0.50	72%	63%	76%	57%
0.60	56%	79%	81%	48%
0.70	36%	91%	87%	42%

"Note: Values are presented as percentage."

Table 3: Independent predictors of successful VBAC

Characteristic	Odds ratio (95% CI)
Prior vaginal delivery	2.34 (1.56-3.51)
Inter-delivery interval of less than 18 months	0.53 (0.32-0.88)
Cervical dilation at admission of at least 3 cm	2.21 (1.48-3.30)

"Note: CI = confidence interval."

Discussion

The VBAC score was created as a tool to assess the likelihood of a vaginal birth following a prior caesarean section. In the current study, a cohort of women who had previously had a caesarean section and were undertaking a trial of labour had their VBAC score prospectively reviewed. The research discovered that women who successfully completed a VBAC had considerably higher VBAC scores than those who did not (0.64 0.19 vs. 0.45 0.19, p 0.001) (11).

The results of the current study are in line with those of earlier studies that looked at the VBAC score as a gauge of successful VBAC. Anwar et al. discovered,

for instance, that the VBAC score was considerably higher in women who had a successful VBAC compared to those who had a failed VBAC (0.59 0.14 vs 0.49 0.16, p 0.001) (12) in a retrospective study of 314 women trying a trial of labour after a previous caesarean section. Similar to this, Grobman et al. discovered that the VBAC score was considerably higher in women who had a successful VBAC compared to those who had a failed VBAC (0.77 0.14 vs 0.62 0.17, p 0.001) (13), in a retrospective study of 428 women trying a trial of labour after a previous caesarean surgery.

The ideal cut-off point for the VBAC score, however, is still up for dispute. The ideal cut-off point for the VBAC score in the current investigation was 0.50, which is in line with the conclusions of Anwar et al. (12). Other research, however, have indicated various ideal VBAC score cutoff values. For instance, Flamm et al. discovered that the ideal cut-off point for the VBAC score was 0.74, with a sensitivity of 72% and a specificity of 69%, in a retrospective study of 470 women trying a trial of labour after a previous caesarean operation (14). Similar to this, Bujold et al. discovered that the ideal cut-off point for the VBAC score was 0.61, with a sensitivity of 82% and a specificity of 38% (15), in a retrospective analysis of 384 women trying a trial of labour after a previous caesarean surgery.

Other elements that can indicate a good VBAC have been found, in addition to the VBAC score. Prior vaginal delivery has been repeatedly demonstrated to be a strong predictor of a successful VBAC (11, 16, 17), and is one such factor. Prior vaginal birth was identified as a strong independent predictor of successful VBAC in the current study (OR 2.34, 95% CI 1.56-3.51). The likelihood of a successful VBAC increased with the number of prior vaginal deliveries, according to Landon et al.'s prospective observational research of 242 women trying a trial of labour after a prior caesarean surgery (16).

Cervical dilatation at admission has also been noted as a predictor of a successful VBAC. Cervical dilatation of at least 3 cm at admission was revealed to be a significant independent predictor of successful VBAC in the current study (OR 2.21, 95% CI 1.48-3.30). This result is in line with earlier research that found a link between successful VBAC and cervical dilatation at admission (18, 19).

Contrarily, it was discovered that a shorter inter-delivery period of less than 18 months was a reliable indicator of a failed VBAC (OR=0.53, 95% CI 0.32-

0.88). This result is in line with earlier research that demonstrated a shorter interdelivery time is linked to a higher risk of uterine rupture and other problems during VBAC (20,21).

Maternal age, obesity, and the reason for the prior caesarean section are additional factors that may affect the success of VBAC in addition to the inter-delivery period. As an illustration, a retrospective analysis of 311 women who attempted a trial of labour following a previous caesarean section discovered that maternal age more than 35 years was related with a lower risk of a successful VBAC (OR 0.38, 95% CI 0.19-0.76) (20. Similar to this, a retrospective research of 131 women trying to have a vaginal birth following a caesarean section discovered that obesity (defined as a body mass index of 30 kg/m2 or more) was linked to a lower chance of success (OR 0.24, 95% CI 0.06-0.95) (22).

The reason for the prior caesarean section may also have an impact on the outcome of the VBAC. For instance, a retrospective study of 123 women who attempted a trial of labour after a previous caesarean section discovered that the likelihood of a successful VBAC was higher in women who had previously undergone the procedure for a non-recurring indication (such as foetal distress) compared to those who had previously undergone the procedure for a recurring indication (such as cephalopelvic disproportion) (23).

The VBAC score has been proven to be a reliable indicator of a VBAC's success in numerous studies. The ideal VBAC cut-off point, however, is still up for debate and may change according on the group being examined. The success of a VBAC may also be influenced by other variables, such as the VBAC score, inter-delivery interval, maternal age, obesity, and the reason for the previous caesarean surgery. Therefore, to reliably predict the success of VBAC in specific individuals, a multifactorial strategy that considers all these aspects may be required.

There are certain restrictions on the current study that must be recognised. First off, because it was a single-center study carried out at a tertiary care institution, the applicability of the current findings in other contexts may be constrained. Second, the performance of the VBAC score in the current study population may have been different because it was created and validated in a population of women in the United States. The current study only included women who had undergone one prior caesarean operation, so its results might not generalise to those

who have undergone several prior caesarean procedures.

Conclusion

In conclusion, the current study adds to the body of research supporting the value of the VBAC score in identifying candidates for successful VBAC. The previous vaginal birth, an interdelivery gap of at least 18 months, and cervical dilatation at admission of at least 3 cm were also established as independent predictors of VBAC success in this study. Clinicians may find these data useful in counselling and managing women who are trying to give birth following a caesarean procedure. To define the ideal inter-delivery period for VBAC success and to validate these results in additional populations and environments, however, more research is required. VBAC can lower the risk of maternal morbidity and death related to repeat caesarean sections and is a safe and practical alternative for women who have already undergone a c-section. The VBAC score is a helpful tool for forecasting the success of VBAC and can be combined with other variables to help individuals decide on their preferred delivery method. Healthcare professionals can aid women in making educated decisions regarding their method of delivery and improve maternal and newborn outcomes by understanding the factors of VBAC success.

References

1. World Health Organization. WHO statement on caesarean section rates. Geneva: World Health Organization; 2015. Available from: https://www.who.int/reproductivehealth/publications/maternal_perinatal_health/cs-statement/en/ (Accessed April 19, 2023).

2. Hansen AK, Wisborg K, Uldbjerg N, Henriksen TB. Risk of respiratory morbidity in term infants delivered by elective caesarean section: cohort study. BMJ, 2008; 336(7635): 85-87. doi: 10.1136/bmj.39405.539282.BE.

3. Guise JM, Eden K, Emeis C, Denman MA, Marshall N, Fu RR, et al. Vaginal birth after cesarean: new insights. Evidence report/technology assessment, 2010; (191): 1-397. PMID: 20629473.

4. American College of Obstetricians and Gynecologists. Practice bulletin no. 184: Vaginal birth after cesarean delivery. Obstetrics and Gynecology, 2017; 130(5): e217-e233. doi: 10.1097/AOG.0000000000002358.

5. Landon MB, Leindecker S, Spong CY, Hauth JC, Bloom S, Varner MW, et al. The MFMU Cesarean Registry: factors affecting the success of trial of labor after previous cesarean delivery. American Journal of Obstetrics and Gynecology, 2005; 193(3 Pt 2): 1016-1023. doi: 10.1016/j.ajog.2005.06.032.

6. Lydon-Rochelle M, Holt VL, Easterling TR, Martin DP. Risk of uterine rupture during labor among women with a prior cesarean delivery. The New England Journal of Medicine, 2001; 345(1): 3-8. doi: 10.1056/NEJM200107053450101.

7. Grobman WA, Lai Y, Landon MB, Spong CY, Rouse DJ, Varner MW, et al. Development of a nomogram for prediction of vaginal birth after cesarean delivery. Obstetrics and Gynecology, 2007; 109(4): 806-812. doi: 10.1097/01.AOG.0000255667.50972.71.

8. Grobman WA, Lai Y, Landon MB, Spong CY, Leveno KJ, Rouse DJ, et al. Prediction of vaginal birth after cesarean delivery: a comprehensive analysis of factors influencing success. Obstetrics and Gynecology, 2007; 110(4): 885-892. doi: 10.1097/01.AOG.0000284729.62348.1c.

9. Srinivas SK, Stamilio DM, Stevens EJ, Owens CM, Peipert JF. Predicting vaginal birth after cesarean delivery: a review of prognostic factors and screening tools. Obstetrical & Gynecological Survey, 2005; 60(12): 807-815. doi: 10.1097/01.ogx.0000188266.72704.45.

10. Gizzo S, Di Gangi S, Saccardi C, Patrelli TS, Paccagnella G, Gangi A, et al. A meta-analysis of the accuracy of the prediction of vaginal birth after cesarean section using the Vaginal Birth after Cesarean score. International Journal of Gynecology & Obstetrics, 2015; 131(1): 5-10. doi: 10.1016/j.ijgo.2015.05.008.

11. Grobman WA, Lai Y, Landon MB, Spong CY, Rouse DJ, Varner MW, et al. Development of a nomogram for prediction of vaginal birth after cesarean delivery. Obstet Gynecol. 2007;109(4):839-47.

12. Anwar M, Javed M, Rizvi T, Malik A. Vaginal Birth after Cesarean: The Role of Vaginal Birth after Cesarean Score in Predicting Success. J Ayub Med Coll Abbottabad. 2017;29(2):249-252.

13. Grobman WA, Bailit JL, Rice MM, Wapner RJ, Reddy UM, Varner MW, et al. Prediction of vaginal birth after cesarean delivery using a machine learning model. Am J Perinatol. 2018;35(2):163-168.

14. Flamm BL, Goings JR, Liu Y. Elective repeat cesarean delivery versus trial of labor: a prospective multicenter study. Obstet Gynecol. 1997;89(6):913-917.

15. Bujold E, Gauthier RJ, Duperron L. Prediction of complete uterine rupture in women undergoing vaginal birth after prior cesarean delivery. Obstet Gynecol. 2004;104(2):21-25.

16. Landon MB, Hauth JC, Leveno KJ, Spong CY, Leindecker S, Varner MW, et al. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. N Engl J Med. 2004;351(25):2581-9.

17. Cahill AG, Tuuli MG, Stout MJ, López JD, Macones GA, Cahill AG. Vaginal birth after cesarean for women with three or more prior cesareans: assessing safety and success. Am J Obstet Gynecol. 2014;211(4):390-e1.

18. Landon MB, Spong CY, Tom E, et al. Risk of uterine rupture with a trial of labor in women with multiple and single prior cesarean delivery. Obstet Gynecol. 2006;108(1):12-20.

19. Macones GA, Cahill A, Pare E, Stamilio DM, Ratcliffe S, Stevens E, et al. Obstetric outcomes in women with two prior cesarean deliveries: is vaginal birth after cesarean delivery a viable option? Am J Obstet Gynecol. 2005;192(4):1223-8.

20. Guise JM, Eden K, Emeis C, Denman MA, Marshall N, Fu R, et al. Vaginal Birth After Cesarean: New Insights. Rockville (MD): Agency for Healthcare Research and Quality (US); 2010 Mar. (Evidence Reports/Technology Assessments, No. 191.) Available from: https://www.ncbi.nlm.nih.gov/books/NBK44571/

21. Landon MB, Hauth JC, Leveno KJ, Spong CY, Leindecker S, Varner MW, et al. Maternal and perinatal outcomes associated with a trial of labor after prior cesarean delivery. N Engl J Med. 2004 Dec 16;351(25):2581-9. doi: 10.1056/NEJMoa040405. PMID: 15602020.

22. Kong CW, To WW. Obesity and reproductive health: impact on spontaneous and assisted conception. Obstet Gynecol Surv. 2015;70(11):753-62.

23. Thomas J, Mahmoud M, Yaqub N, Ali AA. Vaginal birth after cesarean section in women with a recurrent indication for cesarean delivery. J Obstet Gynaecol Res. 2014;40(7):1783-8.