Vaginal Birth After a Previous Cesarean Section According to the Modified VBAC Score: A Single-Center Study

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SUMMARY

The aim of this study was to present the successfulness of vaginal delivery after a previous Cesarean section (C-section) according to the modified VBAC score at University Hospital Center Osijek, and to determine the possible use of such a score in a wider clinical setting.

Patients and methods: We performed a retrospective analysis of 403 medical histories from University Hospital Center Osijek for the period of 2012–2017. A simple score was used to calculate the VBAC score that included body mass index (BMI), age, type of delivery, history of previous C-sections, cervical dilation and effacement, induction of vaginal delivery, infection, duration of delivery, time between a previous C-section and the subsequent delivery, and the need for blood transfusion.

Results: The research was conducted on 403 patients, with a median age of 31 years. Repeated C-section was present in 62 (15.4%) patients, while 341 (84.6%) patients gave birth vaginally after a previous C-section. Five (0.01%) patients received a transfusion; 4 had a repeated C-section and 1 gave birth vaginally. A total of 68 (16.9%) patients had an infection; 60 who had a repeated C-section and 8 who delivered vaginally. The median VBAC score was 7, ranging from a minimum of 3 to a maximum of 12. Compared to patients with vaginal birth, patients who had a repeated C-section had a significantly higher BMI, a longer duration of labor and a significantly lower VBAC score. It was observed that patients with a VBAC score of less than 6 compared to those with a score of ≥7 had a 9.08 times greater chance of their delivery being completed by C-section.

KEYWORDS

VBAC; Cesarean section; Vaginal delivery

Introduction

In recent years, there has been an increasing number of women giving birth by C- section. By analyzing the indications for a C-section except those that are absolute — where vaginal birth is impossible — the most frequent ones are those that are justified in the interests of the mother and infant. Attitudes in obstetrics have for some time been "once C-section — always C-section"[1]. Through time, changes have been introduced in the clinical procedure and, according to data from the literature, one C-section does not significantly increase the complications of the mother and child in the next birth[2]. However, a repeated C-section increases the risk for maternal complications without significant benefits for the newborn[3,4].

Vaginal Birth After Previous Cesarean Section (VBAC) should be considered in all cases where, considering gestational and obstetrical findings, there is a possibility for vaginal birth. VBAC can be offered to women with a singleton pregnancy and fetal cephalic presentation, with a gestation of 37 weeks and a previous incision in the lower uterine segment with or without a history of previous vaginal delivery[5].

Aim

The aim of this study was to present and analyze the successfulness of vaginal delivery after a previous C-section according to the modified VBAC score at the Clinic for Gynecology and Obstetrics, University Hospital Centre Osijek.

Participants and methods

Data were sourced from the medical histories of patients and delivery room protocols of the Clinic for Gynecology and Obstetrics, University Hospital Centre Osijek for the period of 2012–2017. Patients who had a previous C-section yet started their vaginal birth in the period of 2012–2017 were followed retrospectively. The study involved 403 patients. To calculate the VBAC score, we used a modified VBAC scoring system that included the mothers' weight (BMI), the participants' age, whether vaginal birth occurred before and/or after a previous C-section, indications for the previous C-section, and cervical dilation and effacement. The evaluation was done according to the VBAC score: BMI > 30 (0); age < 40 (+2); vaginal birth before and after C-section (+4); vaginal birth after C-section (+2); vaginal birth before C-section (+1); without prior vaginal delivery (0); indication for a previous C-section that is not obstructed labor (+1); cervical effacement (> 75% +2; 25–75% +1; < 25% 0); cervical dilation > 4 cm (+1). Other common obstetrical diagnoses, gestation, newborn outcome, induction of vaginal delivery, infection, duration of delivery, time between a previous C-section and the subsequent delivery, and the need for post-delivery blood transfusion were analyzed.

Categorical data were represented by absolute and relative frequencies. Numerical data were described by their median and the limits of the interquartile range. The normality of the distribution of numerical variables was tested with the Shapiro–Wilk test. Differences between two independent groups were tested using the Mann–Whitney U test. Logistic regression analysis was used to analyze VBAC outcome as an independent factor associated with C-section. A receiver operating curve (ROC) was used to determine the optimal threshold, area under the curve (AUC), specificity and sensitivity of the VBAC score. The significance level was set at $\alpha = 0.05$. MedCalc®

Statistical Software version 20.218 (*MedCalc Software Ltd, Ostend, Belgium; https://www.medcalc.org; 2023*) was used for statistical analysis.

Results

The research was conducted on 403 patients with a median age of 31 years (IQR 27–34 years). There were 226 (56.1%) patients without previous vaginal births. A total of 62 (15.4%) patients had a repeated C-section, while 341 (84.6%) patients gave birth vaginally after a previous C-section. Five (0.01%) patients received a transfusion; 4 of them had a repeated C-section and 1 gave birth vaginally. A total of 68 (16.9%) patients had an infection; 60 of them had a repeated C-section and 8 gave birth vaginally. The median VBAC score was 7, ranging from a minimum of 3 to a maximum of 12 (Table 1).

Compared to patients who gave birth vaginally, patients who had a repeated C-section had a significantly higher BMI (Mann–Whitney U test,

TABLE 1. Basic characteristics of the patients

Age [Median (min–max)]	31 (18–45)
BMI (kg/m^2) [Median (IQR)]	28.0 (25.60–31.43)
Vaginal birth [n (%)]	
Before and after C-section	20 (5.0)
After C-section	101 (25.1)
Before C-section	56 (13.9)
Without prior vaginal births	226 (56.1)
Type of delivery [n (%)]	
Vaginal	341 (84.6)
C-section	62 (15.4)
Blood transfusion [n (%)]	5 (0.01)
Blood transfusion C-section	4 (80)
Blood transfusion vaginal delivery	1 (20)
Infection [n (%)]	68 (16.9)
Infection C-section	60 (45.2)
Infection vaginal delivery	8 (11.7)
VBAC score [Median (IQR)]	7 (6–8)

IQR = interquartile range

TABLE 2. Differences in the observed values in relation to the type of labor

	Median (IQR)		†Difference (95% CI)	*P**
	Vaginal delivery (n = 341)	C-section (n = 62)		
Age (years)	31 (27–35)	31 (28–34)	0 (-1–1)	0.99
BMI (kg/m^2)	27.6 (25.4–30.9)	30.1 (26.5–33.6)	1.9 (0.6–3.3)	**0.004**
Time between C-section and vaginal delivery (years)	4 (3–7)	4 (3–6)	0 (-1–0)	0.31
Gestation (weeks)	39.28 (38.57–40)	39.5 (39–40)	0.14 (-0143–0.429)	0.39
Duration of labor (h)	2.5 (1–4)	3 (2–5)	0.5 (0–1)	**0.02**
VBAC score	7 (6–8)	5 (4–6)	-2 (-2 to -1)	**< 0.001**

IQR = interquartile range; 95% CI = 95% Confidence interval; *Mann–Whitney U test; †Hodges–Lehmann median difference. Bold font indicates statistical significance

TABLE 3. Parameters of the ROC curve of the observed parameters with regard to delivery via C-section

	AUC	95% CI	Sensitivity	Specificity	Cut–off point	Youden index	*P*-value
VBAC score	0.820	0.779–0.856	79	71	≤6	0.497	**<0.001**

AUC = Area under the ROC curve. Bold font indicates statistical significance

TABLE 4. Predicting the probability of delivery via C-section

	ß	Wald	*P*-value	OR	95% CI
VBAC score (≤6)	2.21	43.7	**<0.001**	9.08	4.72–17.48
Constant	-2.9	105.2	**<0.001**		

ß = regression coefficients; OR = Odds ratio

P = 0.004), a longer duration of labor (Mann–Whitney U test, *P* = 0.02), and a significantly lower VBAC score (Mann–Whitney U test, *P* < 0.001) (Table 2).

In order to assess the diagnostic value of the VBAC score, the ROC curve calculation method (a simple way of estimating the difference of an individual indicator between groups of subjects) was used. It is determined based on the specificity and sensitivity that gradually change the values that distinguish patients with vaginal delivery and patients with C-section. The cut-off point for a particular group of patients was changed, so that by creating a ROC curve it could be objectively determined which value best distinguishes the compared groups.

We can see that the VBAC score is a significant indicator of the probability of a C-section (sensitivity = 79, specificity = 71, *P* < 0.001) with a threshold value of ≤6 (Table 3 and Figure 1).

Logistic regression was used to check whether the VBAC score (≤6) was a significant predictor of C-section. It was observed that patients with a VBAC score of <6 compared to those with a score of ≥7 had a 9.08 times greater chance of their delivery being completed by C-section (OR = 9.08) (Table 4).

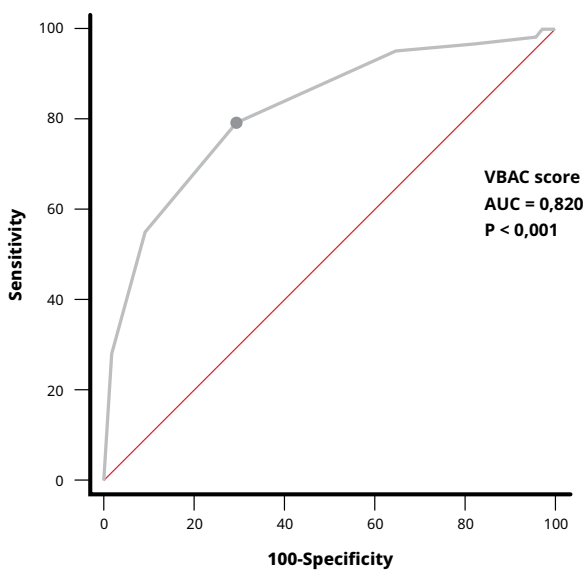

FIGURE 1. ROC analysis of the VBAC score as a diagnostic indicator of C-section

Discussion

For the best chance of evaluating the effectiveness of vaginal delivery, all pregnant women who previously had a C-section should undergo an evaluation of the possible mode of delivery, preferably by some sort of scoring system. The VBAC score system — the calculation of VBAC pre-birth — proved to be a key predictor of delivery type (a repeated C-section or vaginal delivery)[6]. Higher VBAC scores in patients with a previous C-section indicate successful vaginal delivery, while lower VBAC scores point to a repeated C-section[7]. In our research, patients with a VBAC score of less than 6, compared to those with a score of ≥ 7, had a 9.08 times greater chance for a repeated C-section. This can be compared to Meyer and Osterhaus, whose research on 262 patients with a history of previous C-section showed that patients with a VBAC score ≥ 7 had a 90% chance of vaginal delivery[8]. We have shown that, compared to patients who gave birth vaginally, patients who had a repeated C-section had a significantly higher BMI, a longer duration of labor and a significantly lower VBAC score. A search of the available literature showed that multiple authors have shown that the mother's BMI is a predictive indicator for a repeated C-section. Ehrenberg et al. saw that VBAC success was decreased in obese women compared to women with a normal BMI[9]. Trojano et al. have shown that labor stays lasting more than four hours after admission were associated with a high failure rate of VBAC, which coincides with our results[10]. As many authors have stated, our research has shown that the VBAC score is a significant predictor of C-section probability.

In our study, patients who had a repeated C-section had a higher infection rate. The risk of postpartum infections after C-section was reported to be five times greater than after a vaginal delivery. The prevalence of infection was 5.0% after a C-section compared to 0.08% after vaginal delivery. There was also a 50% higher risk of infection following an emergency C-section compared to elective C-sections and more than 75% of postpartum infections occurred after hospital discharge[11,12].

In our study, 5 patients received a blood transfusion. Four of these patients had a repeated C-section and one gave birth vaginally. Contrary to our results, Pont et al. cite that the attempt of vaginal delivery after the first C-section is associated with a greater need for blood transfusion compared to elective C-sections[13].

The success of a vaginal birth after a previous C-section is greater in the case of a spontaneous start of labor. Decreased success of vaginal delivery after a former C-section is associated with induced labor, no prior vaginal births in the medical history, dystocia as the main factor for the previous C-section and a BMI greater than 30[5,14]. In special circumstances, such as overdue pregnancy, twin pregnancy, fetal macrosomia, intrauterine death of the fetus, diabetes and pregnancy over the age of 40, an individual approach and experienced obstetrician are needed[15-18]. In the case of premature birth, success rates are the same as for vaginal delivery in due date after a former C-section with a lower risk of uterine rupture[17].

According to some authors, VBAC should not be offered to pregnant women who have had previous uterine rupture, those with a T or J incision and a vertical cut of the lower segment, and to pregnant women who had laparoscopic or laparotomic miomectomy, due to a high risk of uterine rupture[19,20]. However, other authors state that the type of delivery should be decided on while taking into consideration whether there was any opening of the uterine cavity during myomectomy or not[21]. VBAC should be offered to pregnant women who want future pregnancies and such labor should be monitored at medical centers. An increased risk for uterine rupture occurs in pregnant women who had a delivery in a period shorter than 12 months after a previous

Cesarean delivery, in overdue pregnancies, obese pregnant women, fetal macrosomia, and if ultrasound uterine scarring is less than 2 mm[22]. The benefits of vaginal delivery after a previous C-section, as opposed to a repeated elective C-section, are shorter stays in maternity clinics, fewer complications such as early infection, increased bleeding and thromboembolic incidents, as well as fewer breathing problems in newborns in the first days after delivery[5,22]. Xing et al. have tested their model of a modified score system for VBAC and Trial of labor after Cesarean (TOLAC) adding pelvic measurements and estimated prenatal fetal birthweight as novel parameters, proving the usefulness of similar tests in TOLAC and VBAC[23]. Planned VBAC is a clinically safe choice for most pregnant women with one previous C-section. In addition to economic cost-effectiveness, the risk for maternal and neonatal complications caused by operative birth is decreased[24].

Conclusion

Although this study is limited by its retrospective nature, the data analyzed in our cohort led us to conclude that introducing the calculation of the VBAC score for women with a previous C-section in the future will be of great help in evaluating the way their pregnancy should end.

The chosen VBAC score modification was selected primarily because it is cost-free and requires only the effort and knowledge of medical staff (midwives, doctors) included in childbirth. However, it would be unwise to generalize this model for the overall population, especially in cases where an additional maternal pathology exists (e.g. hypertension, diabetes). Still, it can be very useful in the triage of women in order to ascertain whether they should undergo TOLAC or VBAC.

Successful VBAC is itself a reward for the mother, child and the staff in terms of reduced mortality, morbidity, hospital stay and therapeutic requirements.

Future extended prospective studies are needed to validate this model in wider, hospital settings.

Ethical approval

All patients have signed an Informed consent, which is kept in the archive of University Hospital Centre Osijek, Croatia. Ethical approval itself was not required, as the study was retrospective and revealed no potential information that might identify any of the participants.

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SAŽETAK

Vaginalni porod nakon prethodnog carskog reza prema modificiranom VBAC izračunu: monocentrična studija

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Cilj: prikazati ishode i uspješnost vaginalnih poroda nakon prethodnog carskog reza, prema modificiranom VBAC sustavu bodovanja u KBC-u Osijek te utvrditi mogućnosti uporabe takve ljestvice u širem kliničkom okruženju.

Ispitanici i metode: Retrospektivna analiza 403 povijesti bolesti u KBC-u Osijek u razdoblju 2012.-2017. godine. Za izračun VBAC sustava bodovanja korišten je jednostavan izračun koji je obuhvaćao indeks tjelesne mase (BMI), dob, način poroda, povijest prethodnog carskog reza, dilataciju i održivost vrata maternice, indukciju poroda, moguće infekcije, trajanje poroda, vrijeme između prethodnog carskog reza i porođaja te potrebe za transfuzijom krvi.

Rezultati: Istraživanje je provedeno na 403 ispitanice, prosječne dobi od 31 godine. Ponovljeni carski rez imale su 62 (15,4 %) ispitanice, dok je 341 (84,6 %) ispitanica rodila vaginalno nakon prethodnog carskog reza. Transfuziju krvi primilo je 5 (0,01 %) ispitanica od kojih su 4 imale ponovljeni carski rez, a 1 je rodila vaginalnim putem. Ukupno 68 (16,9 %) ispitanica imalo je infekciju, od čega ih je 60 imalo ponovljeni carski rez, a 8 vaginalni porod. Medijan VBAC rezultata bio je 7, u rasponu od minimalno 3 do maksimalno 12. U usporedbi s pacijenticama s vaginalnim porodom pacijentice koje su imale ponovljeni carski rez imale su značajno viši BMI, dulje trajanje poroda i značajno niži VBAC rezultat. Uočeno je da su pacijentice s VBAC rezultatom manjim od 6 u usporedbi s onima s rezultatom ≥ 7 imale 9,08 puta veću šansu da će njihov porod biti dovršen carskim rezom.

KLJUČNE RIJEČI

VBAC; Carski rez; Vaginalni porod