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Pathophysiology and Clinical Outcomes of Vaginal and Cesarean Delivery

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Annotation: The study analyzes ultrasound examinations performed before delivery. An attempt at vaginal delivery was made with a uterine scar following a transverse incision, confirmed by ultrasound. The delivery took place in a fully equipped operating room with continuous monitoring of fetal function and uterine contractions.

Keywords: analyzes, ultrasound, vaginal, uterine, incision, section, women rupture, functional integrity, nature, labor, guarantee success, anamnestic, antepartum, intrapartum.

The rate of cesarean section (CS) is increasing dramatically, reaching ≥45% in some countries [1–3]. A global measure to reduce the recurrence of CS and its overall frequency is the subsequent vaginal delivery, defined as a trial of labor after CS of labor after cesarean, TOLAC), if successful – vaginal delivery after CS (English vaginal birth after cesarean, VBAC).

Data on the frequency of attempts, their effectiveness, and safety are unsystematic and controversial, as are outcome prediction models. This uncertainty in the global approach to TOLAC hinders the development of prognostic criteria based on proven randomized trials, perpetuating uncertainty in physicians and women regarding their choice of delivery method [1-2].

The aim of this study is to create a model for predicting the outcome of an attempted vaginal birth after a CS, based on anamnestic, general clinical, and ante-operative data. intranatal predictors.

Inclusion criteria: history of CS, transverse uterine incision, absence of clinical and ultrasound (US) signs of uterine scar failure or anatomical discrepancy between the fetal size and the maternal pelvis, placenta located outside the uterine scar, full-term pregnancy, singleton pregnancy, persistent desire for vaginal delivery, categorical refusal of cesarean section.

Exclusion criteria: the presence of absolute contraindications to delivery through the birth canal, multiple pregnancy, pregnancy period less than 35 weeks.

We analyzed the data from the ultrasound protocols performed before delivery, assessed the size of the fetus, the amniotic fluid index (AFI), the thickness of the scar on the uterus and its consistency, the resistance index (RI) of the uterine arteries, right (D) and left (S).

An attempt at vaginal delivery was performed if there was a uterine scar after a transverse incision confirmed by ultrasound and/or the surgical protocol, the patient had given informed consent, and a collegial decision had been made on whether the woman could attempt a vaginal delivery. The delivery was performed in a full-scale operating room with continuous monitoring the functional state of the fetus and contractile activity of the uterus.

Statistical data processing was performed using the computer programs Statistica v12.0, Microsoft Data Analysis Package Excel 2013. The mean value (M), standard deviation (SD), and significance of difference (p) were determined. Intergroup differences were determined based on discriminant analysis with calculation of Wilks' lambda, partial, F-criterion, its statistical significance (p), tolerance, and its multiple correlation coefficient R2.

Based on the discriminant function equation, its classification points were calculated, determining the prognosis of the probable outcome.

A logistic regression model (Logit model) was used to predict the binary outcome based on the selected predictor. A model with a p-value <0.05 was considered significant.

Based on global experience, potential clinical and anamnestic, antenatal Intrapartum predictors of the outcome of attempted vaginal birth after CS. Age, BMI, and the interval between the previous CS and the current pregnancy were comparable in both groups. A higher number of phenotypic markers of UCTD ($p = 0.02$) in women with intrapartum CS confirmed their involvement in obstetric complications.

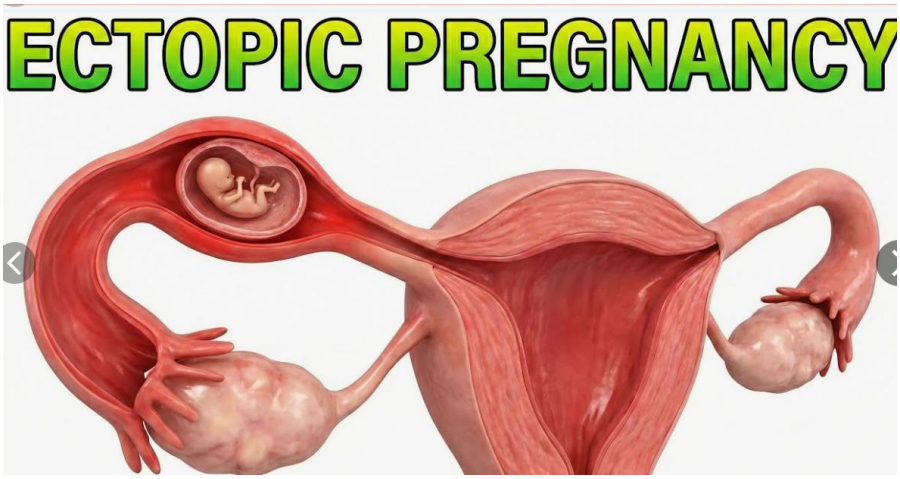
Between-group differences were determined by reproductive factors—number of abortions and the serial number of the current delivery, regardless of the previous method (which was higher in the vaginal delivery group, $p=0.01$). 25.26% of women in the entire cohort had undergone two previous CSs, which were not associated with an intrapartum CS.

Thus, it has been shown that reproductive experience (number of abortions, total number of deliveries regardless of the method) influences the outcome of an attempt at vaginal delivery after CS, but the scenario of the previous delivery is not lifelong; the experience of childbirth before CS, the success of an attempt at childbirth after CS do not mean the success of a natural delivery in the future.

When assessing objective parameters, no intergroup differences were observed in maternal

weight gain (p = 0.75) or estimated fetal weight (EFW) (p = 0.75). Ultrasound assessment of uterine scar thickness, comparable between groups, confirmed its low informative value in predicting the outcome of labor [1].

Significant differentiation in the outcome of an attempt at vaginal birth after a CS was determined by antenatal markers of the body's readiness for childbirth: amniotic fluid index (AFI) ($p<0.01$), resistance index (RI) of the uterine arteries (right and left; $p =0.03$ and $p=0.01$) and maturity of the cervix (CM) before the onset of labor ($p<0.01$).



The intranatal differentiating criteria were not the anhydrous interval (AI) (p = 0.22) or the duration of the first (p = 0.21), second (p = 0.08) period of labor, but the opening of the cervical os during the discharge of amniotic fluid (AF) ($p < 0.01$) and intranatal Fetal cardiotocography (CTG) ($p<0.01$). The binary logistic regression method substantiated the significance of these parameters in predicting the outcome of attempted vaginal delivery after a CS.

The number of artificial abortions, the serial number of delivery, the RI of the uterine arteries, the maturity of the cervix before the onset of labor, the dilation of the cervical os during the discharge of the OPV, and intrapartum CTG determined not only the high significance of the model, but were also associated with an increased chance of intrapartum CS.

The combination of all these predictors proved to be prognostically uninformative. Stepwise discriminant analysis identified the ideal combination for antenatal and intrapartum prediction of the outcome of attempted vaginal birth after CS. The discriminant function equations predicted (in the training set) failure of attempted vaginal birth after CS with 86.84% accuracy antenatal and 88.57% accuracy intrapartum.

The predictors underlying the models corresponded to the indications for intrapartum CS. An attempt at vaginal delivery was terminated in the absolute majority of women due to abnormal labor (primary and secondary weakness, labor discoordination), complicated by threatened uterine rupture (12.31%) and intrapartum fetal distress (10.77%).

It should be noted that abnormalities of labor developed in women of both groups, but became an indication for intrapartum CS either in the absence of treatment effect, or when symptoms of a threatening uterine rupture or intrapartum fetal distress.

Pain relief during labor complicated by incoordination or weak labor posed a risk of underdiagnosis of impending uterine rupture, and not without reason. However, the association between symptoms of impending uterine rupture and fetal distress with true uterine scar failure turned out to be insignificant, demonstrating the extreme complexity of intrapartum care. Non-invasive diagnostics. In cases of labor anomalies, the absence of symptoms of impending uterine rupture and CTG signs of fetal distress does not rule out uterine scar failure after a C-section!

Low prognostic value of symptoms of incipient uterine rupture (especially with regional methods of pain relief during labor), intrapartum Fetal distress with persistent weakness or abnormal

labor, underestimation of uterine scar failure symptoms, continued conservative labor management, labor augmentation, tocolysis, and analgesia are fraught with the development of life-threatening conditions for the mother (uterine rupture, massive bleeding, etc.) and fetus (intrapartum asphyxia). Treatment-resistant abnormal labor with a competent scar reflects the persistent dysfunction of the operated uterus in ensuring labor. Established predictors have confirmed that the success of a labor attempt after a CS depends on the quality of myometrial regeneration, ensuring tolerance to stress and preventing rupture, biological readiness for full-term labor, adequate uteroplacental- fetal circulation, and effective uterine contractility, including expulsion of the fetus. The thickness of the scar in the absence of ultrasound signs of its failure is not a measure of the functional capacity of the uterus.

Insufficient biological maturity of the cervix (before the onset of labor and/or when the OPV is released), insufficient amount of OPV (IAF), impaired myometrial tone on the eve of labor (increased IR) in combination with a complicated reproductive history, the presence of ≥2 markers of UCTD are associated with an unsuccessful attempt at vaginal delivery after CS: with abnormalities of labor complicated by the onset of uterine rupture and/or intrapartum fetal distress.

In other words, the model for predicting the outcome of an attempted vaginal birth after a CS is nothing more than a model for predicting abnormalities in the contractile activity of the operated uterus.

Childbirth with and without a scar on the uterus is ensured by the same mechanisms, but an operated uterus increases the risk of abnormalities in labor [1], requiring timely intrapartum CS in the interests of not only the mother, but also the fetus.

The validity of intrapartum CS was confirmed by a lower score of the newborn on the Apgar scale at the 1st ($p<0.01$) and 5th ($p =0.00001$) minutes, timeliness – satisfactory condition of the newborns, transfer to the physiological department.

The range of neonatal birth weights between vaginal and CS deliveries was extremely wide but comparable ($p = 0.08$) and did not influence the outcome of attempted vaginal delivery after CS. Low-birth-weight infants were identified only in vaginal deliveries; they showed signs of prematurity and did not require additional monitoring or intensive care.

Although neonatal birth weight did not predict the outcome of attempted vaginal birth after a C-section, only in women with intrapartum C-sections did it correlate with minimal scar thickness (-0.37, $p < 0.05$), confirming its significance in the risk of uterine rupture. Thus, the success or failure of an attempted vaginal birth after a C-section is determined by the functional integrity of the operated uterus.

The main predictors of birth outcome after a C-section are the nature and specific complications of labor, which can only be assessed by offering the woman the opportunity to give birth naturally. To paraphrase a well-known idiom, the following position is irrational: "Once a natural birth is a lifetime birth," or "once a failure after a C-section is a lifetime failure." As always, Heraclitus is right: "You can't step into the same river twice." [3-15].

A typical birth scenario is likely, but not mandatory, given the role of the fetus in initiating labor, the cumulative impact of adverse endo- and exogenous, epigenetic, and other factors on the coordination of maternal systems, etc. An unsuccessful attempt at labor after a C-section or a refusal to provide one in previous births largely depends on the hospital's level, the obstetrician-gynecologist's experience, their risk tolerance, and obstetric patience. A history of two C-sections does not preclude subsequent vaginal births.

The resulting models for predicting the outcome of an attempted vaginal birth after a CS do not guarantee success, but they do identify anamnestic, general clinical, antepartum, and intrapartum markers that support the choice of delivery method. The presence of appropriate conditions and

the absence of contraindications allow a woman to attempt a vaginal birth after a CS. Otherwise, a compelling justification for refusal, reflected in the medical documentation (the woman's reluctance, etc.), is required.

Modern possibilities of routine use of pain relief, labor intensification, and tocolysis require timely diagnosis of uterine scar failure, which is entirely feasible with individualized labor management and the resources of modern obstetric hospitals.

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