ORIGINAL ARTICLE

Factors Predicting Uterine Rupture Following a Cesarean Section

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ABSTRACT

Objective: This study was conducted to evaluate factors that predict uterine rupture following a previous cesarean section.

Study Design: A cross-sectional study.

Place and Duration of Study: The Study was conducted at the Department of Gynecology, Bakhtawar Amin Hospital Multan, Pakistan from June 2022 to June 2023.

Methods: The study included 100 women who had previously given birth. Women who had a successful vaginal birth after cesarean section (VBAC) were controls and who had rupture/scar dehiscence were considered cases. Socio-demographic data and information related to delivery, labor, and pregnancy were collected.

Results: A total of 100 women (40 cases and 60 controls) were included in the study. All women had spontaneous onset of labor. 12.5% (8) cases and 85% (51) controls had a successful vaginal birth after the cesarean section (VBAC). 34.1% of all rupture cases happened during the second stage of labor and 41.4% during the latent phase of labor. Upon arrival 30% (12) of cases had shock. Maternal complications in cases included anemia (21 patients), death (2 patients), uterine artery involvement (3 patients), and bladder rupture (4 patients). According to multivariate analysis factors including previous vagina delivery, duration of labor, fetal weight, and number of ANC visits were significantly related to rupture of uterus after previous cesarean (*P*<.05).

Conclusion: Factors including prolonged labor, lesser antenatal care follows ups, and fetal weight > 3.8 kg increase the likelihood of uterine rupture following a C-section. It is crucial to develop strict criteria, considering intrapartum obstetric care, infrastructure, and referral system, for the selection of favorable candidates for trial of labor.

Keywords: *Cesarean Section, Gynecology, Trial of Labor, Uterine Rupture.*

Introduction

Uterine ruptures occur when whole layers of the uterus separate during labor or pregnancy.[1] It occurs rarely in the unscarred uterus (.034%), while in the scarred uterus its incidence is relatively higher (.14-2.4%).[2,3] There has been an increased effort to avoid repeat cesarean section (C-section), and suitable candidates were allowed to undergo the trial of labor (TOL) after previous C-section.[4] Vaginal birth after cesarean section (VBAC) has relatively less risk of complications and more than 50% successful births. However, it is not completely risk free and is associated with a higher risk of uterus rupture.[5] Rupture of the uterus can be life threatening and can cause serious feto-maternal complications, requiring urgent laparotomy followed by hysterectomy or uterine repair. Moreover, with VBAC there is the risk of visceral injuries, major vessel involvement, severe bleeding, and hysterectomy.[6] Studies show that an increasing number of emergency C-sections are being conducted due to maternal anxiety and fear of uterine rupture. However, the American College of Obstetricians and Gynecologists recommends that VBAC should be preferred in favorable conditions.

Different studies have been conducted to assess predictors of uterine rupture after VBAC; however,

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there is debate over definite factors that cause uterine rupture.[7] Women with one previous C-section and without any contraindication for VBAC are candidates for trial of labor (TOL) However, these recommendations were made by studies conducted in developed countries with better obstetric care. There is limited research on predictors of uterine rupture in developing countries like ours. Developing countries have limited health resources and a major portion of the population resides in rural regions and has to travel to obstetric care centers in urban areas. Thus, there is a high risk of feto-maternal complications after TOL, and strict criterion is required to choose candidates suitable for TOL. Studies suggested that strict criteria and intrapartum follow-up reduce the risk of complications.[8] In this study we aim to evaluate factors that predict uterine rupture following a previous cesarean section. There is limited data on predictors of uterine rupture so results will provide insight for developing criteria for TOL after VBAC.

Methods

This cross-sectional study was conducted in the Department of Gynecology, Bakhtawar Amin Hospital Multan, Pakistan from June 2022 to June 2023 after obtaining approval from the Ethical Review Board of the hospital vide letter no: 22/120 held on dated: 08th February 2022. The study included 100 adult women with singleton pregnancies who had given birth previously by cesarean section selected through convenience sampling. The sample size was calculated by Fisher's formula keeping a 95% confidence interval, 50% population proportion, and 70% precision. Primipara women, women with multiple gestations, a history of hypertension, and those whose medical records were missing were excluded. All women provided their informed consent to become a part of the study. Women who had successful VBAC were controls and those who had rupture/scar dehiscence during birth were considered cases. Socio-demographic data and information related to delivery, labor, and pregnancy were collected.

SPSS version 23 was used for data analysis. Data was presented as mean, standard deviation, and frequencies. The association between study variables and uterine rupture was by binary logistic regression analysis. Statistically significant variables were subjected to multivariate analysis. P value < 0.05 was considered statistically significant.

Results

A total of 100 women (40 cases and 60 controls) were included in the study. The mean age of the cases was 28.53 ±4.34 years and of controls was 28.11 ± 4.82 years. 50% of cases and 20% of controls were rural residents. About 2/3rd controls had > 4 antenatal care (ANC) visits, while cases had < 4 ANC visits. 17.5% and 1.6% controls had more than 5 previous pregnancies.

All women had spontaneous onset of labor. 12.5% (8) cases and 85% (51) controls had successful VBAC. 8.3% (5) controls and 40% (16) cases reported macrosomia. 34.1% of all rupture cases happened during the second stage of labor and 41.4% during the latent phase of labor. (Table-1).

Upon arrival 12 (30%) cases had shock. Maternal complications cases included anemia (21 cases), uterine artery involvement (3 cases), maternal death (2 cases), and bladder rupture (4 cases). 65% of cases require total abdominal hysterectomy and uterine repair. (Table-2).

According to multivariate analysis factors including previous vagina delivery, duration of labor, fetal weight, and number of ANC visits were significantly associated with uterine rupture after previous C-section (P<.05) (Table-3).

Discussion

The results of our study showed that factors like previous vaginal delivery, number of ANC visits, duration of labor, and fetal weight > 3.8 kg are associated with uterine rupture following a previous C-section.

The trial of labor in our cases was 7.5% which is significantly higher than the previously reported range of 0.3-4.6% making it a significant risk factor for uterine rupture.[9,10] Trial of labor has also been reported as an independent predictor of uterine rupture in other studies.[3,11] This calls for standardized examination of women with a history C-section before initiating TOL. Evaluating uterine scars had been reported as a useful method for predicting patients at a higher risk of rupture.[12,13]

A history of vaginal birth is also a predictor of successful trial of labor in cesarean delivery as

Table-1: Intrapartum Characteristics*

Variable		Cases (n=40)	Controls (n=60)	*P*-value	*Chi-square*
Labor onset	Spontaneous	40 (100%)	60 (100%)	-	
Partograph use	Yes	4 (10%)	18 (30%)	0.50	39.34
	No	36 (90%)	42 (70%)		
Obstructed Labor	Yes	5 (12.5%)	-	0.369	36.45
	No	35 (87.5%)	60 (100%)		
Trial of Instrumental Delivery	Yes	2 (5%)	-	0.390	36.91
	No	38 (95%)	60 (100%)		
Trial of labor after cesarean (TOLAC)	No	37 (92.5%)	50 (83.3%)	0.80	47.27
	Yes	3 (7.5%)	10 (16.6%)		
Previous Vaginal Delivery	Yes	10 (25%)	42 (70%)	0.02	23.84
	No	30 (75%)	18 (30%)	-	
Diagnosis of Rupture	Latent phase of labor	17 (42.5%)	-	-	
	The active phase of labor	9 (21.9%)	-	-	
	The second stage of labor	13 (32.5%)	-	-	
	Postpartum	1 (2.5%)		-	
Fetal Weight	≤3800	17 (42.5%)	42 (70%)	0.002	19.03
	≥3801	23 (57.5%)	18 (30%)		
Median days of Hospital Admittance	Median (days)	4	3.20±2.5	-	
Admittance to Hospitals before Arrival at Current Institution	None	0	22 (36.6%)	0.003	19.74
	1	9 (22.5%)	31(51.6%)		
	2	31 (77.5%)	7 (11.6%)		

*Fisher's exact test

Table-2: Comparison of perioperative conditions between both groups

Variables		Cases	Controls	*Chi-Square value*	*P*-value
Maternal condition on admission	Stable	28 (70%)	60 (100%)	18.35	0.002
	Shock	12 (30%)	0		
Weight of baby (grams)		3530.6 ±549	3249.4± 670.9	3.06	0.002
Condition of baby after birth	Good APGAR score	0	60 (100%)	0.04	0.002
	Low APGAR score	4 (10%)	0		
Status of mother	Dead	36 (90%)	0	18.35	0.002
	Alive	38 (95%)	60 (100%)		
	Dead	2 (5%)	0		
Rupture of uterus	LUST	34 (85%)	-		-
	LUS vertical	4 (10%)	-		-
	Died before surgery	2 (5%)	-		-
Intraoperative complication	Bladder rupture	4 (10%)	-		-
	Uterine artery involvement	5 (12.5%)	-		-

*Chi-square test

Table-3: Factors associated with risk of uterine rupture*

Variables		Crude odds ratio (95% CI)	*P*-value	*t test* statistics
Place of residence	Urban Rural	1 12.58 (7.9–16.4)	0.8	1.38
Age	<35 ≥35	1 2.30 (1.50–3.49)	0.40	0.32
Number of ANC	<4 ≥4	1 4.0 (1.40– 7.30)	0.02	15.89
Previous vaginal delivery	Yes No	1 1.8 (1.89–3.39)	0.03	10.58
Gravidity	1–4 ≥5	1 16.30 (1.69–12.50)	0.19	1.47
Trial of labor after cesarean	Yes No	1 4.80 (1.58–13.90)	0.29	0.78
Fetal weight	<3800 ≥3801	1 6.9 (2.30–21.40)	0.0002	1591.55
Uterine scar duration	19–59 months Short and long intervals	1 3.12 (1.20–7.10)	0.10	3.08
Duration of labor	<15 hrs. ≥ 15 hrs.	1 10.50 (2.09–52.6)	0.002	1591.55

Multi-variate regression analysis

reported by the literature.[14,15] In our study, vaginal delivery was reported as a risk factor of uterine rupture. Another study also contradicts the previously reported results and concluded that women with more vaginal births were more likely to get a complete uterine rupture, indicating that vaginal birth does not guarantee the elimination of the risk of rupture, and if rupture occurs there is a high chance of complete rupture.[16]

In the current study, fetal weight > 3800g increased the risk of uterine rupture. It was observed that fetal weight greater than 3800g doubled the risk of rupture, similar to findings of previous studies; however, the cut point in this study is lower because of socioeconomic disparities.[12] However, considering fetal weight as a risk factor for uterine rupture remains debatable.[7] Mothers who have < 4 ANC follow-ups are at increased risk of uterine rupture compared to those who have > 4 follow-ups. Different institutions have verified the importance of antenatal care in improving neonatal and maternal outcomes. Reports reveal that more than 4 ANC follow-ups have a major positive impact on fetomaternal outcomes.[17] ANC visits enable health providers to assess pelvic adequacy, fetal weight, and the possibility of malpresentation, and thus screen favorable candidates. Moreover, it is the ideal time for counseling regarding TOL.

The majority of the cases had visited other health institutions before coming to the managing hospital. This is common practice in this country and about 47.5% of cases visited primary health centers and were referred from there. Pakistan's healthcare comprises primary, secondary, and tertiary healthcare facilities.[18] These facilities serve a major portion of the population, primary healthcare facilities have very limited resources and personnel so which they refer patients to better-equipped facilities. This referral unnecessarily delays management and prolongs labor. Moreover, rural residents have limited access to transportation and route of transport which further complicates the situation. A previous study has shown that prolonged labor is a significant risk factor for uterine rupture, even in an unscarred uterus.[19] A current study revealed that labor > 15 hours increases the risk of uterine rupture. Moreover, the majority of cases had no pantograph follow-up due to there being no prior information on labor abnormalities.[20] Infrastructure-related and other socio-cultural causes delay in interventions due to which there is an increased risk of uterine rupture, particularly in the scarred uterus.

Delayed intervention leads to poor neonatal and maternal outcomes.

Unfortunately, Pakistan has a dilapidated health structure, its infrastructure is underdeveloped and there is a severe lack of operation setups and human and medical resources. There is a need for precise criteria for choosing women for TOL, thus a large-scale study is required for gather general data. The strength of the current study is, that it will be a good addition to the limited literature on this topic and shed light on new factors such as institution-related variables and duration of labor.

Our study has some limitations. We did not categorize women according to complete and partial uterine rupture. Additionally, the study was conducted at hospitals with excellent obstetrics care, the results could only be relevant to facilities with comparable services.

Conclusion

Factors including prolonged labor, lesser ANC follow ups and fetal weight > 3.8 kg increase the risk of uterine rupture following a C-section. It is crucial to develop strict criteria, considering intrapartum obstetric care, infrastructure, and referral system, for the selection of favorable candidates for TOL.

Conflict of Interest: The authors declare no conflict of interest.

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Authors Contribution

ST: Idea conception, data collection
BH: Study designing, data analysis, results and interpretation, manuscript writing and proofreading
HZQ: Data collection
HI: Idea conception, data analysis, results and interpretation

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