

ULTRASOUND EVALUATION OF UTERINE SCAR IN THE DECISION ON THE MODE OF DELIVERY IN WOMEN WHO HAD PREVIOUSLY GIVEN BIRTH BY CESAREAN SECTION

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Abstract:

Background: Delivery planning for women with a previous caesarean delivery can begin with preconception counselling but should be addressed early in prenatal care.^{1,2} One of the most important and difficult challenges facing the field of obstetrics is VBAC.^{3,4} It has been shown to reduce overall rates of CS and eliminate the need for major surgery.⁵

Aim of the study: This study aimed to establish the effect measurement of the scar parameters on the uterus after a previous caesarean delivery that was evaluated by 3D ultrasound on the mode of the subsequent delivery mode.

Patients and method: An observational, prospective study conducted on 140 women aged between (23 – 40) years who attended the obstetrics-gynaecology clinic in Bent Al-Huda Teaching Hospital during the period from March 2023 to March 2024 in Al Nasiriyah City, Thi-Qar Province, Iraq. All had a previous caesarean section (CS) before at least a year, and their gestation age ranged between (35-39) weeks. For all women who completed the study, ultrasonography (US) was done for them, followed up until delivery according to the practice guidelines.

Results: About (97.1%) of the women with vaginal birth had triangular scars. All the women with (>3.5mm) of scar thickness ended with VB. All the variables of scar are significantly associated with the outcome of labour. Most of the women in this study were pregnant at 37 weeks (26.43%), had thirty months (25.71%) as the interpregnancy interval prior to their current pregnancy while most of the women who had a caesarean section had a balloon scar (81.4%), less than 3.5 mm of scar thickness (95.7%), an outer scar border (95.7%),

a homogenous structure of the LUS (64%), hypervascularization (64%), up to 10 mm of scar volume (100%), and discontinuity (87.1%).

Conclusion: Vaginal birth for women who have undergone a previous caesarean section may be safe under specific conditions, based on the results of the scar parameters, and the decision of the obstetrician-gynaecologist

Recommendations: There is an urgent need for more studies from various Iraqi governorates, with a larger sample size, to confirm the results of this study, and may reduce the number of women who undergo caesarean section.

Key Words: *Ultrasound Examination, uterine scar, mode of Delivery, Caesarean Section.*

Introduction

Introduction: One of the most important and difficult challenges facing the field of obstetrics is VBAC^{1,4}. It has been shown to reduce overall rates of CS and eliminate the need for major surgery.³ Therefore, reducing the risk of morbidity and mortality in both mothers and their newborns as well as the financial and psychological costs.⁶ Delivery planning for women with a previous cesarean delivery can begin with preconception counseling but should be addressed early in prenatal care.⁵

For pregnant women who have had a previous CS, selections for mode of birth in their subsequent pregnancy are either a trial of vaginal birth after cesarean (VBAC) or an elective repeat cesarean (ERC).^{2,7}

The frequency of vaginal birth after CS was significantly reduced from 28.3% in 1996 to only 10.6% in 2003, and the rate of repeated cesarean section (RCS) increased.^{1,5}

The predictors of a successful trial of labor after cesarean delivery are Previously successful vaginal birth after cesarean section (>90% success rate)⁸ Prior VB, spontaneous labor, favorable cervix, non-recurrent indication of cesarean section (breech, previa, herpes), preterm delivery (82% vs. 74%).⁹

Previous studies indicates that the likelihood of VBAC following a TOLAC varies between 60 and 80% in different settings and is influenced by various factors, including demographic characteristics such as maternal age, maternal body mass index (BMI), weight gain during pregnancy, maternal medical illness, and obstetric history, such as indication for a prior cesarean section^{10,11} furthermore, cervical dilation in initial childbirth.^{12,13}

Approximately 16% of Canadian obstetricians utilize sonography to assess the thickness of the LUS to identify suitable candidates for VBAC near or at term.¹⁴

The value of applying lower uterine segment thickness measurement to vaginal birth after cesarean section remains unclear.¹⁵

Many investigators have reported a correlation between the history of CS and AUB.^{16–26} Thus, CSDs must be considered when other causes (e.g., anovulation, myomas, polyps, hyperplasia, and chronic endometritis) cannot be identified in women with AUB and a previous cesarean section delivery. The World Health Organization (WHO) estimates the rate of cesarean sections between 10-15% of all births in developed countries.²⁷

Numerous writers have endeavored to harness the power of transabdominal and transvaginal 2-D ultrasound to gauge the depth of scars and uncover any flaws in the healing process. A handful of these writers assessed the full depth of the lower uterine segment.²⁸

Delivery by C-sections accounted for 28% of deliveries in Iraq. A brief and rapid survey of C-sections in Baghdad Teaching Hospital, a tertiary referral hospital, indicated that emergency C-sections account only for 62.2% of the total number of C-sections performed outside working hours during April.²⁹ In Al-Elwyia Maternity Teaching Hospital, the cesarean delivery rate was 37.5% from January 2011 to January 2012.³⁰

Ultrasound waves or magnetic resonance are used to demonstrate the matrix tissue in the uterus.³¹ In an ultrasound scan, the LUS scar can vary from normal-appearing and practically homogenous from an unscarred one to paper-slim with poor visualization of the uterine muscle layer contents.³²

Numerous researchers have endeavored to employ transabdominal and transvaginal two-dimensional ultrasound for the assessment of scar thickness and the identification of healing anomalies. Several researchers quantified the full thickness of the lower uterine segment..²⁸

This study aimed to establish the measurement of the scar parameters on the uterus after a previous cesarean delivery that was evaluated by 3D ultrasound.

Methodology: An observational, prospective study conducted on **140** women, aged between **(23-40)** years, who attended the obstetrics-gynecology clinic in Bent Al-Huda Teaching Hospital during the period from March **2023** to March **2024** in Al Nasiriyah City, Thi-Qar Province, Iraq. For all women who completed the study, ultrasonography (US) was done for them, followed up until delivery according to the practice guidelines.

Inclusion Criteria: All pregnant women who willing to give a written informed consent form to participate in the clinical study. Pregnant women who had hysterotomy by low transverse section. Every woman who had a previous cesarean section (CS) before at least a year with an unlimited number of vaginal deliveries (VD). **Preg. Exclusion Criteria:** Any women who had inconstant with inclusion criteria There is an absolute indication for a cesarean section (CS). The habitual fetal death and Twins' pregnancy.

This observational, prospective, randomized study was conducted in a unit of sonography clinic to establish the measurement of the scar parameters on the uterus after a previous cesarean delivery that was evaluated by ultrasonography (US).

Selecting the included participants through by systematic random sampling³³ to maintain an appropriate degree of precision and sample size by the number of sonography days within the sample frame to obtain the number of the cases per day. The included cases were selected according to the approximate sample interval depending on the mean number of visitors in previous week.

Ultrasound examination of the uterine scar had done via Voluson E6 (GE Healthcare, Japan) to elevate form of scarring, thickness (thickening), continuity, outer scar border, the echo structure of the lower uterine segment, vascularization, and scar volume.

The Chi-square test, and ANOVA test were used to compare distributed groups. Probability levels less than 0.05 were deemed physiologically significant, and p-values less than 0.01 were deemed extremely significant.

Results; Most of the women in this study had at least a single parity (66.43%), did not have a previous Vaginal Birth (VB) (66.43%), did not have a previous VBAC, and most of them did not have a history of fetal loss (59.29%). Most of the women in this study had a breath presentation (20.71%) as an indication of previous cesarean section (CS), and all of the women in this study had a previous cesarean section (CS).

Pregnant at 37 weeks (26.43%) had thirty months (25.71%) as the interpregnancy interval prior to their current pregnancy and ERCD (50%), so the attempted Vaginal Birth (VB) failed in most women (71.43%), and fortunately, it was without any indication of ERCS (67.14%).

All the variables of scar are significantly associated with the outcome of labor. Most of the women who had Vaginal Birth (VB) had triangular scars (97.1%), more than 3.5 mm of scar thickness (100%), an inside outer scar border (95.7%), a homogenous structure of the lower uterine segment (LUS) (95.7%), hypervascularization (98.6%), more than 3.5mm scar volume (100%), and clear continuity (91.4%). While most of the women who had a cesarean section had a balloon scar (81.4%), less than 3.5 mm of scar thickness (95.7%), an outer scar border (95.7%), a homogenous structure of the LUS (64%), hypervascularization (64%), up to 10 mm of scar volume (100%), and discontinuity (87.1%).

All of scar variables in this study were significantly differences between women based on the outcome of labor, with p-values less than **0.005**.

Discussion: Cesarean section (CS) is the most common operation the gynecologist performs worldwide. Even as almost it allows safe birth, it remains associated with a chance of adverse consequences.³⁴

Numerous scholarly investigations have established a relationship between maternal age, the interval between pregnancies, the technique of single-layer closure, the incidence of infection following a prior cesarean section, and the occurrence of scar rupture or dehiscence.^{35,36} Conversely, another study indicated the absence of a statistically significant difference between normal and abnormal cesarean section scars concerning maternal age, maternal body mass, gestational age, and the duration of the preceding cesarean section..³⁷

Most of the women in this study were pregnant at 37 weeks (26.43%). The investigation conducted in French focused on analyzing the scar of the LUS in 642 patients, was determined that the risk of scar rupture is influenced by the thinning of the LUS, which is evaluated at 37 weeks of gestation.³⁸ The possibility of intensive supervision of labor and related applications outside of tocography enhances our confidence and provides a deeper understanding of the uterine activity, hence reducing the risk of uterine rupture. Currently, there is a higher likelihood of women who birth vaginally.³⁹

Most of the women who had VB had triangular scars (97.1%), more than 3.5 mm of scar thickness (100%), an inside outer scar border (95.7%), a homogenous structure of the lower uterine segment (LUS) (95.7%), hypervascularization (98.6%), more than 3.5mm scar volume (100%), and clear continuity (91.4%). While most of the women who had a cesarean section had a balloon scar (81.4%), less than 3.5 mm of scar thickness (95.7%), an outer scar border (95.7%), a homogenous structure of the LUS (64%), hypervascularization (64%), up to 10 mm of scar volume (100%), and discontinuity (87.1%).

In this study, the mean scar thickness in women with VB was 3.65 ± 0.23 mm, lower than those with CS, which was 2.69 ± 0.35 mm, as presented in the **Error! Reference source not found.** The study conducted by Asakura et al. focused on measuring the thickness of the LUS as a predictor of uterine scar dehiscence, who determine 1.6 mm as the threshold value. The transvaginal ultrasonography demonstrated a sensitivity of 77.8% and a specificity of 88.6%. Simultaneously, the USG demonstrated a positive predictive value of 25.9% and a negative predictive value of 98.7%.⁴⁰ Using sonography, the uterine myometrium as good for VB based on the following criteria: the lower uterine segment should have a V shape, be at least 3–4 mm thick, have a continuous shape, and have structures with small areas of increased echogenicity or a homogeneous echo structure.^{39,41}

About 74% of those were successfully delivered vaginally without significant maternal or fetal mortality. The literature published ultrasound studies, examining the relationship between the thickness of the LUS and the risk of scar separation and uterine rupture during labor in women who VBAC.

The prevalence of scar separation during birth was 7%. The analysis revealed that 17.4% of women had a thickness of LUS 2mm or less, and among them, scar separation occurred in 22%. Scar separation occurred in 3.4% of patients with a scar thickness above 2 mm. Out of all the instances, 36% had scar thickness between 3.0 and 3.5 mm, and 18% showed scar separation.³⁹ Another study also revealed that the LUS, measuring between 3.0 and 3.5 mm in thickness, has an exceedingly low risk of uterine scar departure from a previous CS. In such cases, vaginal birthing is possible.

The results compared to another study by Estrade, et al.,⁴² which conducted over a span of 8 years revealed no instances of excessive uterine rupture in women who had undergone previous caesarean births before 32nd gestational week. The two incidences of uterine rupture did not result in any maternal or fetal problems. The study revealed that women who had a previous caesarean delivery before 32nd gestational week did not have an increased risk of uterine rupture. However, it is important to note that there were two instances of total rupture in these women, whereas no such cases were observed in women who had undergone previous caesarean births beyond 32nd gestational week.

Therefore, based on this limited sample size, it is not possible to definitively infer that there is no minor increase in the probability of total rupture. In a separate meta-analysis of 71 studies, Guise et al.⁴³ discovered that there were no instances of maternal deaths caused by uterine rupture in TOL after caesarean births. They also informed a perinatal mortality risk of 1.4 per 10,000.

The older study Halperin, et al.,⁴⁴ which came out in 1988, looked at how the risk of uterine rupture changed depending on the type of incision—classic or transverse in the LUS—in a group of women who had a CS before they were 37 weeks pregnant. They discovered out of 141 pregnant women, all of whom had undergone traditional incisions, only nine cases of uterine ruptures, and only three of those had attempted a TOL, and all of them had their initial CS before to 32 weeks.

Recently, Rochelson et al.⁴⁵ discovered a hazard of 11.8% for complete uterine rupture, 3.5% due to TOL, in pregnant women with a previous CS before 37th gestational week. This frequency is like others, which reported it ranged from 0.3 to 2.3% for complete ruptures; the chief study discovered a proportion of <1%.^{43,46} The variations in the criteria for determining the method of delivery and monitoring of labor may have contributed to the observed differences.

Table 1: Ultrasound findings of scar variables in this study

Variables	Parameters		Outcome of labor		Total	Stat
			VB	CS		
Scar Shape	Ballon	n	2	57	59	R=88.617 P=0.000
		%	2.9%	81.4%	42.1%	
	Triangular	n	68	13	81	
		%	97.1%	18.6%	57.9%	
Scar Thickness	<3.5mm	n	0	67	67	R=128.493 P=0.000
		%	0.0%	95.7%	47.9%	
	>3.5mm	n	70	3	73	
		%	100.0%	4.3%	52.1%	
Outer scar Border	Outside	n	3	67	70	R=117.029 P=0.000
		%	4.3%	95.7%	50.0%	
	Inside	n	67	3	70	
		%	95.7%	4.3%	50.0%	
Echo structure of the LUS	Non-homogenous	n	3	55	58	R=79.596 P=0.000
		%	4.3%	78.6%	41.4%	
	Homogenous	n	67	15	82	
		%	95.7%	21.4%	58.6%	
Scar Vascularization	Hypo	n	1	57	58	R=92.313 P=0.000
		%	1.4%	81.4%	41.4%	
	Hyper	n	69	13	82	
		%	98.6%	18.6%	58.6%	
Scar volume	> 3.5mm	n	70	0	70	R=140 P=0.000
		%	100.0%	0.0%	50.0%	
	> 10 mm	n	0	70	70	
		%	0.0%	100.0%	50.0%	
Scar Continuity	Discontinuity	n	6	61	67	r=86.588 p=0.000
		%	8.6%	87.1%	47.9%	
	Clear Continuity	n	64	9	73	
		%	91.4%	12.9%	52.1%	
Total		n	70	70	140	
		%	100.0%	100.0%	100.0%	

Table 2: Past obstetric characteristics of women

Variables	Parameters	Freq.	Percent
Parity	1	93	66.43%
	2	29	20.71%
	3	9	6.43%
	4	9	6.43%
Previous VD	No	93	66.43%
	Yes	47	33.57%
No. of Previous VD	Never	93	66.43%
	Once	29	20.71%
	Twice	9	6.43%
	3 times	9	6.43%
Previous VBAC	None		100%
History of fetal loss	Never	83	59.29%
	Once	47	33.57%
	Twice	10	7.14%
Indications of previous CS	Breech presentation	29	20.71%
	Fetal Macrosomia	27	19.29%
	Prolonged labor	19	13.57%
	Fetal distress	18	12.86%
	Preeclampsia	18	12.86%
	Precious baby	10	7.14%
	dystocia	9	6.43%
	oligohydramnios	10	7.14%
No. of previous CS	Once	140	100 %
Total		140	100 %

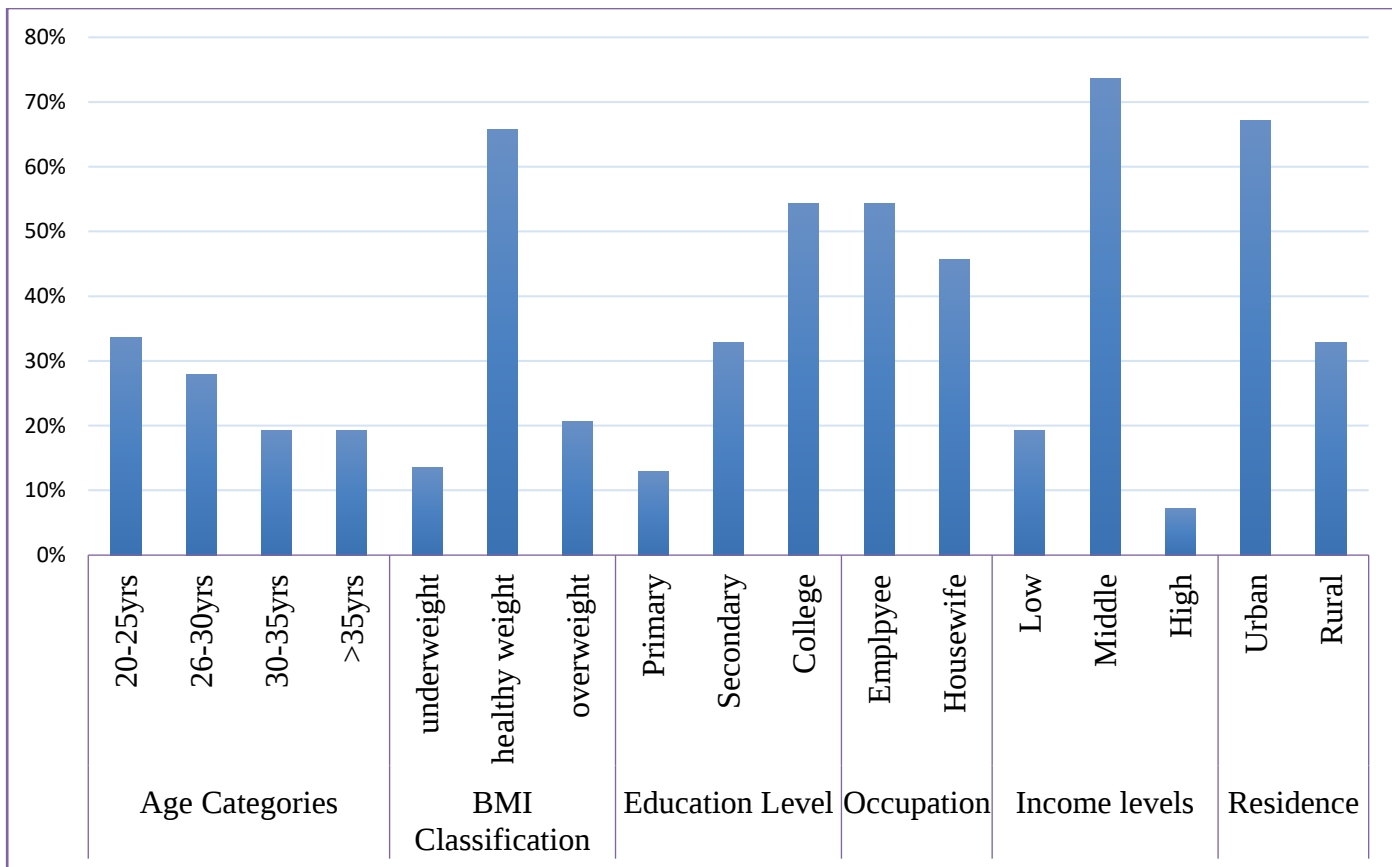


Figure1: Sociodemographic characteristics of women

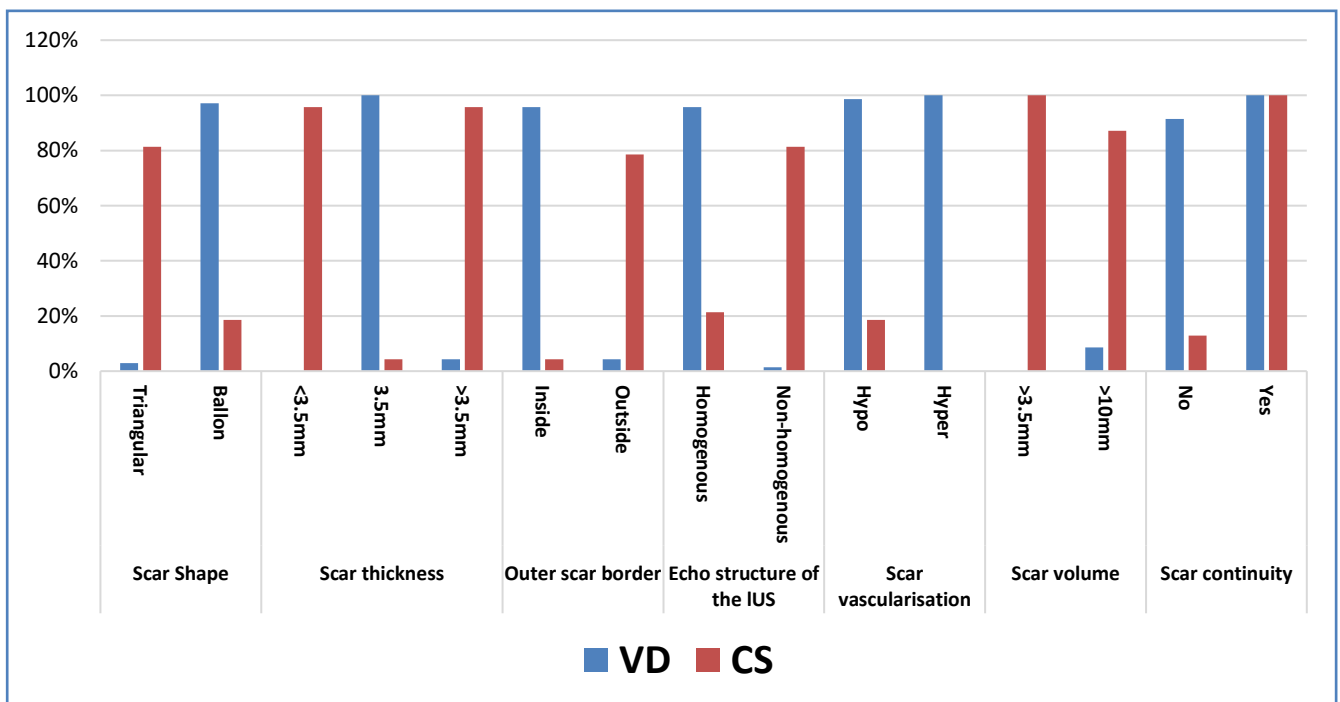


Figure 2: Ultrasound findings of scar variables in this study.



Images show Ultrasonography examination of the uterine scar.

The **Voluson E6** has a newer architecture and is an excellent women's health ultrasound machine providing great **2D/3D/4D** imaging, as well as excellent diagnostic, ergonomic, and efficient workflow tools.

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