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ORIGINAL ARTICLE

Ultrasound Assessment of Cesarean Section Scar and its Correlation to Intraoperative Scar Status

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ABSTRACT

Background and Aim: In the past decades the rate of cesarean sections has increased enormously, there are many indications for cesarean section like placenta previa, labor dystocia, presumed fetal distress, fetal malpresentation, multiple gestation, and suspected fetal macrosomia, but the commonest reason for performing a cesarean is a previous cesarean birth .The present study aimed to compare the sonographically measured lower uterine scar with actual status of scar at the time of operation.

Methodology: The descriptive cross-sectional study was conducted on 150 female patients who presented to Obstetrics department of Creek general hospital, affiliated with UMDC from August 2021 to January 2022. The Inclusion Criteria was: females with singleton pregnancy with history of previous single caesarian section, vertex presentation and gestational age 36-40 weeks. While women with multiple gestations, placenta previa, polyhydramnios or any uterine abnormality were excluded.

Results: The overall mean of age, gestational age, parity and fetal weight were 28.22±4.59 years, 37.60±0.78 weeks, 1.73±0.94 and 2.75± 0.47 kg respectively. Significant association was observed between lower uterine segment measurements by Sonographic scar thickness during pregnancy and intra-operative scar findings at the time of delivery (p-value< 0.05).

Conclusion: The present study found that sonographically measured lower uterine scar thickness is a solid predictor for scar defect in women with previous cesarean section. As a result, we can conclude that sonographic measurement of lower uterine segment thickness is a reliable tool for assessing scar status and deciding which women should be given a vaginal delivery trial.

Keywords: Previous Caesarean Section, Lower uterine scar, Sonography

INTRODUCTION

In the past decades the rate of cesarean sections has increased enormously, there are many indications for cesarean section like Placenta Previa, labor dystocia, abnormal or indeterminate fetal heart rate tracing, fetal malpresentation, multiple gestations, and suspected fetal macrosomia, but the commonest reason for performing a cesarean is a previous cesarean birth. [1] In the current era, repeated cesarean section are a burning issue, on which medical professionals are paying extreme attention. To avoid repeated cesarean, Trial of Labor- Vaginal birth after cesarean section (TOL –VBAC) is now a days highly supported by the obstetricians.[2] The highly skilled obstetricians have now changed the old dictum "once a cesarean, always a cesarean" as they are now performing more TOL-VBAC rather than the old repeat cesarean with an increased risk of morbidity and mortality.[3,4]

There is no standard criteria on which patient TOL –VBAC can be done, it can be decided on the basis of clinical assessment of individual patient and thickness of scar measured by different techniques like ultrasonography, MRI or by hysterosalpingography. Ultrasound in the late trimester is the best modality which is now frequently used to assess the integrity of the scar, it has many benefits the first it is a noninvasive technique with no risk of radiation, it can be performed easily and repeatedly.[5]

Başbuğ et al determined the lower uterine segment by categorizing it into 4 grades , grade I: indicating a well-developed lower uterine segment, grade II: indicates thin but without visible uterine contents (conception products), Ш: indicates partial scar defect– dehiscence, IV: indicating a uterus with a dehisced or a ruptured scar.[5,6] The integrity of a healthy scar is crucial factor on which TOL –VBAC is decided, as there is a direct relationship between scar thinning and uterine rupture during TOL –VBAC. [7]TOL –VBAC has many benefits, it reduces the time of stay in the hospital, it reduces the risk of postpartum hemorrhages, puerperal infections, it decreases the need of blood transfusions, and most importantly it prevents from surgical cut to the uterus that can further lead to morbidly adherent placenta in the subsequent pregnancies.[8] The downside of TOL –VBAC is scar dehiscence and uterine rupture during labor and delivery, which is a devastating complication and can be fatal.

The aim of our study was to observe the correlation between ultrasonographicaly measured scar thickness and actual scar status at the time of delivery during an open surgery.

METHODOLOGY

Study Design and Study Population: The descriptive cross-sectional study was conducted on 150 female patients who presented to the Gynecology and Obstetrics Department of Creek General Hospital, affiliated to United medical and dental college Karachi, Pakistan from August 2021 to January 2022. Ethical approval for the study was taken from the Ethical Review Committee of United Medical and dental college. The Inclusion Criteria was: females with singleton pregnancy with history of previous single, The Inclusion Criteria was: females with singleton pregnancy with history of previous single caesarian section, vertex presentation and gestational age 36-40 weeks. while women with multiple gestations, placenta previa, polyhydramnios or any other uterine abnormality were excluded from the study. A written informed consent was received from all patients before including them in the study.

Clinical Diagnosis and Study tool: Prior to ultra-sonographic evaluation, a Performa was filled with questions about maternal age, parity, number of previous scars, gestational age, indications of previous scar, number of previous vaginal deliveries, inter delivery interval. Trans abdominal ultrasonographical examination of the lower uterine segment was performed from 36 to 40 weeks of pregnancy using Toshiba Color Doppler Ultrasound Machine, (Model SSA-340a, Toshiba, Japan). A convex array transducer with frequency of 3.75 MHz was used in ultra-sonography. During the examination if the contraction was seen then the process was stopped and resumed as the contraction subsided. A detailed sonographic examination of lower uterine segment was done with partially distended urinary bladder for the measurement of scar thickness. The thickness of scar was graded in mm from <2mm, 2-2.5mm, 2.5-3.5mm and >3.5mm. To avoid and minimize the inter-observer variations, a single senior sonologist using the standard protocols was involved in the study. The participants were followed till their caesarian section. The second assessment of scar

thickness were done at the time of open surgery. At that time the state scar was assessed as normal, thin, dehiscent or rupture.

Statistical Analysis: The data was analyzed using SPSS version 20. The descriptive statistics of the variables were taken with mean and standard deviation for the numerical variable and frequencies and percentage for the categorical variables. The correlation analysis of the scar thickness was done , in all cases p value of <0.05 was kept significant with 95% confidence interval.

RESULTS

The overall mean of age, gestational age, parity and Fetal weight were 28.22±4.59 years, 37.60±0.78 weeks, 1.73±0.94 and 2.75± 0.47 kg respectively. Table-I represents the quantitative descriptive statistics of all the participants, While Table-II demonstrates Descriptive statistics of qualitative data. Table III illustrate the association of sonographically measured scar thickness and actual observed scar status at time of surgery. Participants who had sonographic scar thickness less than 2mm, following intraoperative scar findings were noted, 0.7% were normal, 16.7% were thin, 4.7% dehiscent and 1.3% were rupture at time of surgery. While those who had scar thickness more than 3.5 mm, following intraoperative scar findings were noted 6.7% were normal and none were thin, dehiscent or rupture. significant association was observed between Lower uterine segment measurements by Sonographic scar thickness during pregnancy and intra-operative scar findings at the time of operation (p-value< 0.05).

Table-1: Descriptive Statistics of Quantitative Data

Variables	Mean	± SD	Min	Max	95% C.I
Age [in Years]	28.22	4.589	20	42	27.48 – 28.96
Gestational Age [In Weeks]	37.60	0.777	36	40	37.47 – 37.72
Parity	1.73	0.938	0	5	1.58 – 1.88
Fetal Weight [In Kg]	2.75	0.469	1.80	6.00	2.67 – 2.82

Table-2: Descriptive Statistics of Qualitative Data

	Frequency	Percent
Previous Vaginal Deliveries		
No	137	91.3
Yes	13	8.7
Indication of C-section		
Elective	77	51.3
Emergency	73	48.7
Inter Delivery Interval Months		
LESS THAN 18	44	29.3
MORE THAN 18	106	70.7
Sonographic Scar Thickness (mm)		
> 3.5	10	6.7
2.5-3.5	48	32.0
2-2.5	57	38.0
<2	35	23.3

Table-3:

Sonographic Scar Thickness	Intra-operative Scar Findings				P-Value
	Normal	Thin	Dehiscent	Rupture	
< 2	1 (0.7%)	25 (16.7%)	7 (4.7%)	2 (1.3%)	0.001
2 - 2.5	11 (7.3%)	38 (25.3%)	7 (4.7%)	1 (0.7%)	
2.5 - 3.5	42 (28.0%)	5 (3.3%)	1 (0.7%)	0 (0%)	
> 3.5	10 (6.7%)	0 (0%)	0 (0%)	0 (0%)	

There is a significant association between Lower uterine segment measurements by Sonographic scar thickness during pregnancy and intra-operative scar findings at the time of delivery (p-value< 0.05).

Table-4:

Variables		Sonographic Scar Thickness	Intra-operative Scar Findings				P-Value
			Normal	Thin	Dehiscent	Rupture	
Age [In Years]	20-30 (n=47)	< 2	1 (1.0%)	16 (15.5%)	4 (3.9%)	2 (1.9%)	0.001
		2 – 2.5	6 (5.8%)	26 (25.2%)	5 (4.9%)	1 (1.0%)	
		2.5 – 3.5	29 (28.2%)	4 (3.9%)	0 (0%)	0 (0%)	
		> 3.5	9 (8.7%)	0 (0%)	0 (0%)	0 (0%)	
	> 30 (n=103)	< 2	0 (0%)	9 (19.1%)	3 (6.4%)	0 (0%)	0.001
		2 – 2.5	5 (10.6%)	12 (25.5%)	2 (4.3%)	0 (0%)	
		2.5 - 3.5	13 (27.7%)	1 (2.1%)	1 (2.1%)	0 (0%)	
		> 3.5	1 (2.1%)	0 (0%)	0 (0%)	(%)	
Gestational Age [In Weeks]	36–38 (n=131)	< 2	0 (0%)	23 (17.6%)	5 (3.8%)	2 (1.5%)	0.001
		2 – 2.5	10 (7.6%)	32 (24.4%)	7 (5.3%)	1 (0.8%)	
		2.5 – 3.5	37 (28.2%)	4 (3.1%)	1 (0.8%)	0 (0%)	
		> 3.5	9 (6.9%)	0 (0%)	0 (0%)	0 (0%)	
	38-40 (n=19)	< 2	1 (5.3%)	2 (10.5%)	2 (10.5%)	0 (0%)	0.024
		2 – 2.5	1 (5.3%)	6 (31.6%)	0 (0%)	0 (0%)	
		2.5 - 3.5	5 (26.3%)	1 (5.3%)	0 (0%)	0 (0%)	
		> 3.5	1 (5.3%)	0 (0%)	0 (0%)	0 (0%)	
Parity	0 – 2 (n=117)	< 2	1 (0.9%)	20 (17.1%)	4 (3.4%)	2 (1.7%)	0.001
		2 – 2.5	6 (5.1%)	32 (27.4%)	7 (6.0%)	1 (0.9%)	
		2.5 – 3.5	31 (26.5%)	4 (3.4%)	1 (0.9%)	0 (0%)	
		> 3.5	8 (6.8%)	0 (0%)	0 (0%)	0 (0%)	
	> 2 (n=33)	< 2	0 (0%)	5 (15.2%)	3 (9.1%)	0 (0%)	0.001
		2 – 2.5	5 (15.2%)	6 (18.2%)	0 (0%)	0 (0%)	
		2.5 - 3.5	11 (3.3%)	1 (3.0%)	0 (0%)	0 (0%)	
		> 3.5	2 (6.1%)	0 (0%)	0 (0%)	0 (0%)	
Fetal Weight [In Kg]	1.8–2.5 (n=47)	< 2	1 (2.1%)	9 (19.1%)	3 (6.4%)	1 (2.1%)	0.022
		2 – 2.5	3 (6.4%)	10 (21.3%)	3 (6.4%)	1 (2.1%)	
		2.5 – 3.5	10 (21.3%)	3 (6.4%)	1 (2.1%)	0 (0%)	
		> 3.5	2 (4.3%)	0 (0%)	0 (0%)	0 (0%)	
	> 2.5 (n=103)	< 2	0 (0%)	16 (15.5%)	3 (3.9%)	1 (1.0%)	0.001
		2 – 2.5	8 (7.8%)	28 (27.2%)	4 (3.9%)	0 (0%)	
		2.5 - 3.5	32 (31.1%)	2 (1.9%)	0 (0%)	0 (0%)	
		> 3.5	8 (7.8%)	0 (0%)	0 (0%)	0 (0%)	
Indication of C-section	Elective (n=77)	< 2	0 (0%)	15 (19.5%)	2 (2.6%)	0 (0%)	0.001
		2 – 2.5	7 (9.1%)	18 (23.4%)	0 (0%)	0 (0%)	
		2.5 – 3.5	28 (36.4%)	0 (0%)	0 (0%)	0 (0%)	
		> 3.5	7 (9.1%)	0 (0%)	0 (0%)	0 (0%)	
	Emergency	< 2	1 (1.4%)	10 (13.7%)	5 (6.8%)	2 (2.7%)	0.001

	(n=73)	2 – 2.5	4 (5.5%)	20 (27.4%)	7 (9.6%)	1 (1.4%)	
		2.5 - 3.5	14 (19.2%)	5 (6.8%)	1 (1.4%)	0 (0%)	
		> 3.5	3 (4.1%)	0 (0%)	0 (0%)	0 (0%)	
Previous Vaginal Deliveries	Yes (n=13)	< 2	0 (0%)	1 (7.7%)	1 (7.7%)	0 (0%)	0.026
		2 – 2.5	1 (7.7%)	3 (23.1%)	0 (0%)	0 (0%)	
		2.5 – 3.5	6 (46.2%)	1 (7.7%)	0 (0%)	0 (0%)	
		> 3.5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
	No (n=137)	< 2	1 (0.7%)	24 (17.5%)	6 (4.4%)	2 (1.5%)	0.001
		2 – 2.5	10 (7.3%)	35 (25.5%)	7 (5.1%)	1 (0.7%)	
		2.5 - 3.5	36 (26.3%)	4 (2.9%)	1 (0.7%)	0 (0%)	
		> 3.5	10 (7.3%)	0 (0%)	0 (0%)	0 (0%)	
Inter Delivery Interval Months	< 18 (n=44)	< 2	0 (0%)	17 (38.6%)	6 (13.6%)	2 (4.5%)	0.001
		2 – 2.5	1 (2.3%)	15 (34.1%)	0 (0%)	0 (0%)	
		2.5 – 3.5	2 (4.5%)	1 (2.3%)	0 (0%)	0 (0%)	
		> 3.5	0 (0%)	0 (0%)	0 (0%)	0 (0%)	
	> 18 (n=106)	< 2	1 (0.9%)	8 (7.5%)	1 (0.9%)	0 (0%)	0.001
		2 – 2.5	10 (9.4%)	23 (21.7%)	7 (6.6%)	1 (0.9%)	
		2.5 – 3.5	40 (37.7%)	4 (3.8%)	1 (0.9%)	0 (0%)	
		> 3.5	10 (9.4%)	0 (0%)	0 (0%)	0 (0%)	

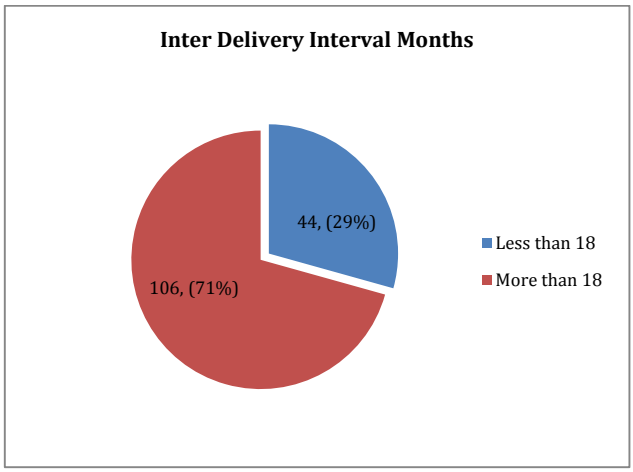

Figure-1:

DISCUSSION

A major challenge faced by obstetrician in modern obstetric practice is to offer trial of labor to women with previous Cesarean delivery. The main source of concern is uterine rupture or scar dehiscence, which occurs at a rate ranging from 0.3 to 3.8% .[9,10,11] There is a chance that a thin lower uterine segment with a scar will rupture during labor, causing severe morbidity and mortality for both mother and fetus. Its evaluation has become critical prior to delivery, allowing low-risk women to have a trial of labor and high-risk women to have a planned Caesarean section. Several studies have suggested that thinning of the lower uterine segment (LUS) as measured by ultrasound at various stages of pregnancy is a risk factor for miscarriage. The low threshold for repeat caesarean section is doubt about the integrity of the previous caesarean scar and the status of the lower uterine segment (LUS). In subsequent pregnancies, thin LUS is likely to rupture.[12,13] According to Jordans et al, there is an inverse relationship between LUS thickness and scar rupture, with a LUS thickness of 3.5mm being protective against uterine rupture.[14] A meta-analysis found a strong relationship between the degree of LUS thinning measured near term and the risk of uterine scar defect at birth. According to their findings, full uterine scar thickness ranged from 2.0 to 3.5mm.

In a recent study , Van der et al. dtermined that 2.5mm was the critical cut-off value for LUS thickness, whereas another study determined that less than 1.8mm was a valid cut-off value for identifying patients at risk of thin uterine scar.[15] In a study conducted by Pralhad Gulino et al., [16] LUS thickness of 3 mm had a high negative predictive value, indicating that obstetricians should consider vaginal birth in women who had previously delivered via caesarean section. Donnez et al. [17] defined a good healed scar as 2mm. In his meta-analysis, Laganà et al. [18] identified a full LUS cutoff value of 3.1-5.1mm as a strong negative predictive value for the occurrence of a defect scar during labor trial.

LUS thickness is measured in pregnant women using transabdominal and transvaginal approaches, as well as combinations. We used the Trans abdominal approach to measure uterine scar defect because it was not only convenient for our patients but was also used in a large number of studies due to better scar visualization and integrity .[19]

In our study, there was a significant association between prior vaginal delivery and urgency of c-section, elective/ emergency (p=0.001). A similar finding was reported by O. Naji et al.[20] in his study. A recent study found a significant relationship between thin lower uterine segment and short inter pregnancy interval, increased maternal age, and caesarean performed during labor.[21] Naji et al. looked for other factors such as smoking, infection after a previous cesarean section and the number of previous caesarean sections and found no significant association with thin scar.

Many studies found a higher incidence of abnormal LUS in women who had a primary caesarean during labor. observing the scar visually while performing caesarean section with inter delivery interval and current type of caesarean section, done electively or in emergency, revealed a significant association. Women who had an emergency caesarean section had a thinner scar.[22,23,24] The current study found that the ultrasonographically determined lower uterine segment scar thickness during pregnancy well correlated with operative findings. Women with scars thicker than 3 mm can be reassured that they can have a normal vaginal delivery because their scar was found to be normal at the time of delivery. There is a strong need for large studies to be conducted to examine the effects of various factors such as interval between deliveries, prior vaginal deliveries, number of previous Caesarean sections, and prior labor on the scar status in women who have had previous caesarean sections.

CONCLUSION

The present study found that sonographically measured lower uterine scar thickness is a solid predictor for scar defect in women with previous cesarean section. As a result, we can conclude that sonographic measurement of lower uterine segment thickness is a reliable tool for assessing scar status and deciding which women should be given a vaginal delivery trial. However, due to some limitations in our study, we were unable to predict the cut off values at which women who had previously had a Caesarean section could be given a labor trial.

Ethical Approval: Ethical approval for the study was taken from the Ethical Review Committee of United Medical and dental college**.**

Consent for Publication: Informed verbal and written consent were taken from participants

Availibility of Data: Data sets of study cannot be made public, due to confidentiality of patients, however corresponding author can be mailed for data files
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