Original Research Paper

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ULTRASOUND PREDICTABILITY OF LOWER UTERINE SEGMENT CAESAREAN SECTION SCAR THICKNESS

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ABSTRACT **Background And Aims:** The global increase in Caesarean section (CS) rates has raised concerns about the associated risks for both mothers and babies, especially with repeated procedures. This has led many working mothers to opt for vaginal delivery when possible. To better predict the risk of scar dehiscence or rupture, evaluating the thickness of the CS scar near term using ultrasound has been suggested. This study aims to determine the relationship between sonographic scar thickness and the intraoperative status of the scar. **Methods:** A total of 265 antenatal women with previous one CS between 35 completed weeks to 38+6 weeks period of gestation were included in the study. The study was conducted at Swaroop Rani Nehru Hospital, Motilal Nehru Medical College and Kamla Nehru Memorial Hospital, Prayagraj, Uttar Pradesh, India. The study utilized transabdominal ultrasonography for lower segment caesarean section scar thickness measurement. Sonographic findings were then correlated with intraoperative findings. **Result:** Gestational age at the time of caesarean section was between 35 completed weeks to 38+6 weeks period of gestation with a mean of 37.78±0.86 weeks. The mean scar thickness was 3.29±0.64 mm. The association between scar thickness and intraoperative scar status showed a p-value <0.001. **Conclusion:** Ultrasonographic scar thickness was significantly associated with intraoperative scar status.

KEYWORDS : Caesarean section, Scar thickness, vaginal birth after caesarean, ultrasonography, Trial of labor after caesarean

INTRODUCTION

Caesarean section (CS) is a prevalent surgery worldwide, with a global average rate of 21%.[1] Despite WHO's recommendation that CS should only be performed when medically necessary, rates remain high due to various indications, including failed labor induction and fetal malpresentation. In India, the CS rate is 8.5%, with one-third being repeat procedures often due to difficulties in assessing scar integrity during the antenatal period. Reducing repeat CS rates is crucial, and vaginal birth after caesarean (VBAC) is an important option, especially given the increased awareness of the risks associated with CS and advancements in antenatal scar evaluation.[2,3]

The rise in CS rates has been linked to increased complications in subsequent pregnancies, such as Placenta Accreta Spectrum (PAS) and Caesarean Scar Pregnancy (CSP), which pose significant morbidity and mortality risks. Assessing scar integrity near term, particularly through ultrasonography, is crucial for safely attempting a trial of labor after caesarean (TOLAC).[4] Ultrasonography, which is non-invasive and quick, can effectively evaluate scar thickness, typically in the 2 to 3.5 mm range. Validating ultrasonography as a reliable tool for predicting scar integrity can help reduce CS rates and improve safety for women planning TOLAC.[5]

AIM AND OBJECTIVES

We aim to find out the association between scar thickness assessed sonographically and intraoperative scar status.

OBJECTIVES:

1. To measure lower segment caesarean section scar thickness in late third trimester.
2. To assess the pregnancy outcome whether successful VBAC or repeat C-section.
3. To find out association between scar thickness assessed sonographically and intra-operative findings.

MATERIAL AND METHODS

The study took place over 12 months at the Department of Obstetrics and Gynaecology of Swaroop Rani Nehru Hospital, Motilal Nehru Medical College and Kamla Nehru Memorial Hospital, Prayagraj, Uttar Pradesh, India, and involved 265 antenatal patients between 35 and 38+6 weeks of gestation. Ethical approval was secured, and all participants provided informed consent. Inclusion criteria were pregnant women with one previous CS, singleton pregnancies, cephalic presentation, and those not in active labor. Exclusion criteria included pregnant women who did not give consent, active labor, placenta previa or accreta, more than one previous CS, multiple pregnancies, and malpresentations.

Detailed history covered various aspects such as age, address, education, occupation, socioeconomic status, menstrual and obstetric history, and personal habits. Comprehensive general examinations included measurements of height, weight, body mass index, and assessments for pallor, icterus, oedema, and other physical signs. Systemic and obstetrical examinations assessed the central nervous, cardiovascular, and respiratory systems, along with fundal height, lie, presentation, and fetal heart rate. Routine investigations included blood grouping, haemoglobin levels, HIV, HbsAg, Anti HCV, VDRL tests, blood sugar levels, S.TSH, and urine analysis.

Transabdominal ultrasonography was used to assess the integrity of caesarean scar by evaluating the lower uterine segment (LUS) thickness. Intraoperatively, scar status was assessed.

INTRAOPERATIVE CLASSIFICATION USING THE QURESHI'S GRADING SYSTEM[6]

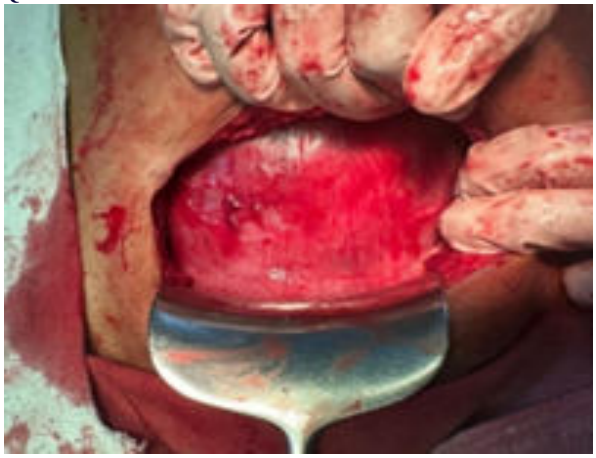

Figure 1: Grade I scar: well-formed lower uterine segment with intact scar

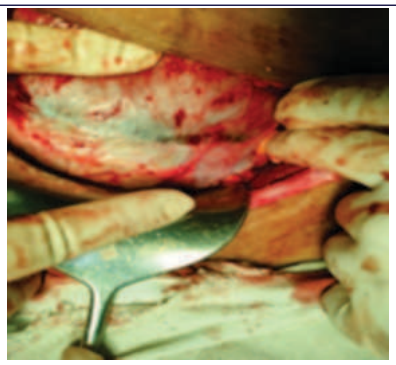

Figure 2: Grade II scar: thinned out scar but uterine contents not visible

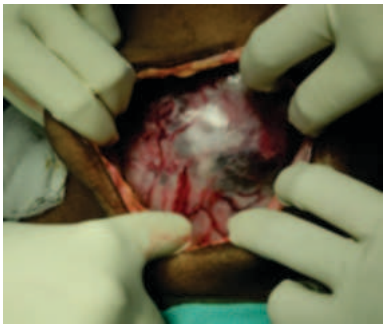

Figure 3: Grade III scar: scar dehiscence/uterine contents visible

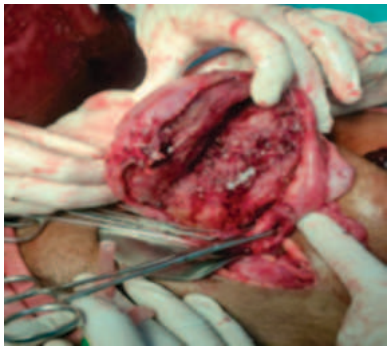

Figure 4: Grade IV scar: ruptured uterine scar

Intraoperative pictures were captured and used after taking informed and voluntary consent of the patient before procedure.

RESULT

Table 1: Distribution Of Study Population Based On The Period Of Gestation (N=265)

Period of Gestation	Frequency	Percentage
35 – 35+6 weeks	12	4.53
36 – 36+6 weeks	37	13.96
37 – 37+6 weeks	129	48.68
38 – 38+6 weeks	87	32.83
Mean±SD	37.78±0.86	
TOTAL	265	100%

Inference : It was observed that most of the patients belonged to 37-37+6 weeks period of gestation (48.68%), followed by 38 – 38+6 weeks (32.83%), 36 – 36+6 weeks (13.96%) and 35 – 35+6 weeks (4.53%). The mean gestational age was 37.78±0.86 weeks.

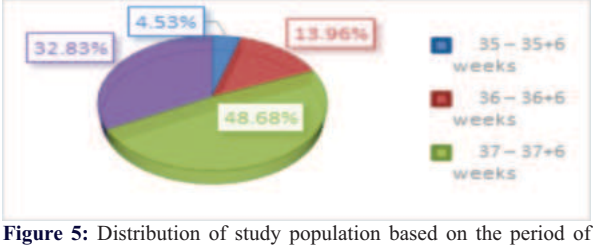

Figure 5: Distribution of study population based on the period of gestation (N=265)

Table 2: Distribution Of Study Population Based On Sonographic Scar Thickness (N=265)

Sonographic scar thickness	Frequency	Percentage
<2mm	8	3.02
2-2.5mm	20	7.55
2.6-3.0 mm	57	21.51
>3.0 mm	180	67.92
Mean±SD	3.29±0.64	
TOTAL	265	100%

Inference: It was observed that the majority of the study participants (67.92%) had sonographically derived scar thickness over 3.0 mm. 21.51% had scar thickness measuring between 2.6 to 3.0 mm, while 7.55% had scar thickness measuring between 2 to 2.5 mm. The smallest group, i.e., 3.02% had scar thickness less than 2 mm. The mean scar thickness was 3.29±0.64 mm.

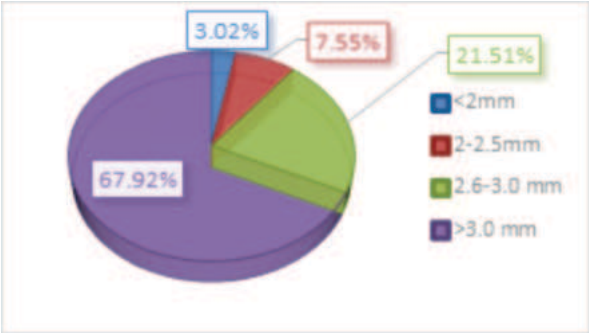

Figure 6: Distribution of study population based on sonographic scar thickness (N=265)

Table 3: Distribution Of Study Participants Based On Pregnancy Outcome In Relation To Ultrasonographic Scar Thickness (N=265)

Pregnancy outcome	Total (N=265)	<2 mm (no.=8)		2-2.5mm (no.=20)		2.5-3 mm (no.=57)		>3mm (no.=180)		p-Value
		no.	%	no.	%	no.	%	no.	%	
LSCS	230	8	100	20	100	53	92.98	149	82.78	0.034
VBAC	35	0	0	0	0	4	7.02	31	17.22	

Inference: It was observed that all patients with thinner scars (<2 mm and 2-2.5 mm) underwent repeat lower segment caesarean section (LSCS), with percentage of 100 in both categories. In contrast, 17.22 % patients whose scar thickness exceeds 3 mmand 7.02 % patients with scar thickness between 2.5-3 mm had successful vaginal birth after caesarean.

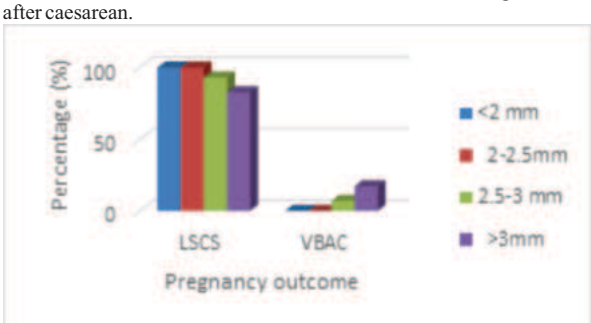

Figure 7: Distribution of study participants based on pregnancy outcome in relation to ultrasonographic scar thickness (N=265)

Table 4: Distribution Of Study Participants Based On Intraoperative Findings Of Caesarean Scar In Relation To Ultrasonographic Scar-thickness (N=265)

Intra-operative findings	Total (no.=230)	<2 mm (no.=8)		2-2.5mm (no.=20)		2.5-3 mm (no.=53)		>3mm (no.=149)		p-Value
		no.	%	no.	%	no.	%	no.	%	
Grade I (Well defined LUS)	116	0	0.00	0	0.00	20	37.74	96	64.43	<0.001
Grade II (thin LUS but invisible uterine contents)	64	0	0.00	5	25.00	21	39.62	38	25.50	
Grade III (scar dehiscence)	34	3	37.50	12	60.00	8	15.09	11	7.38	
Grade IV (scar rupture)	16	5	62.50	3	15.00	4	7.55	4	2.68	

Inference: It was observed that the higher-grade intraoperative findings (Grades 3 and 4) were more common in patients with thinner scars (<2 mm and 2-2.5 mm), with 37.5% and 62.5% in Grade 3 and 4 for <2 mm, respectively, and 60% in Grade 3 for 2-2.5 mm. On the other hand, 64.43% of individuals with larger scars (>3 mm) had lower-grade results. The intraoperative findings were significantly associated with scar thickness(p-value<0.001).

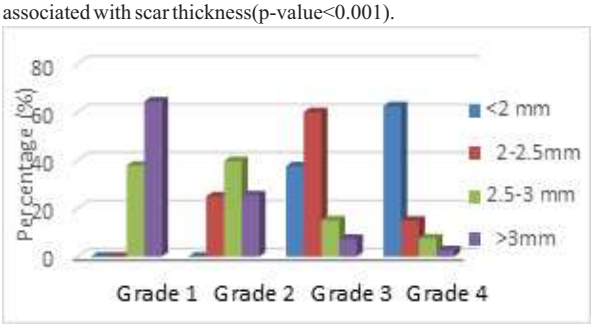

Figure 8: Distribution of study participants based on intraoperative findings of caesarean scar in relation to ultrasonographic scar thickness (N=265)

DISCUSSION

Ultrasonography is a non-invasive technique useful for visualizing uterine morphology and evaluating caesarean scar thickness, particularly near term when the lower uterine segment (LUS) is fully developed. Studies like Patil et al. (2023)[7] have used ultrasound to assess scar integrity, which helps predict Caesarean Scar Defect (CSD) severity. The findings obtained from our research have been discussed below :

In TABLE 1, the gestational age distribution of patients was observed as follows: 4.53% were at 35-35+6 weeks, 13.96% at 36-36+6 weeks, 48.68% at 37-37+6 weeks, and 32.83% at 38-38+6 weeks. Patil et al. (2023) found a similar distribution, with most participants between 37 and 38 weeks (48.3%), followed by 38 and 39 weeks (41.7%), and over 39 weeks (10.0%). Our mean gestational age was 37.78 ± 0.86 weeks. Pahirah et al. (2021)[8] also reported a mean gestational age close to delivery at 38.5 ± 0.6 weeks. Tazion et al. (2018)[9] found a gestational age range of 27 to 40 weeks, with a mean of 37 ± 2.126 weeks, supporting the validity of late third-trimester studies. These findings align with previous research, underscoring the importance of monitoring patients close to delivery for accurate assessment of lower uterine segment (LUS) thickness and scar integrity to aid clinical decision-making for those with a history of CS.

In TABLE 2, we observed that 67.92% of study participants had scar thickness greater than 3.0 mm, 21.51% had scar thickness between 2.6 to 3.0 mm, 7.55% had scar thickness between 2 to 2.5 mm, and 3.02% had scar thickness less than 2 mm. The mean scar thickness was 3.29±0.64 mm. This suggests that most patients had thicker scars, indicating better healing and fewer complications related to scar integrity. Similar findings were reported by Vedantham et al. (2019)[10] and Patil et al. (2023), who found mean scar thicknesses of 3.41±0.623 mm and 3.4±1.4 mm, respectively. Kok et al. (2013)[11] also noted individual differences in scar healing, with a mean thickness of 3.1 mm in their study. Differences in suturing techniques, nutritional status, and sonographic protocols may explain slight variations in scar thickness measurements across studies.

In TABLE 3, the study showed that participants with thinner scars (<2 mm and 2-2.5 mm) were more likely to undergo repeat CS at a rate of 100% in both categories, while those with scars thicker than 3 mm had a higher success rate for VBAC at 17.22%. Although the outcomes of CS and VBAC were not significantly associated with scar thickness, these findings are consistent with studies by Patil et al. (2023) and Basic et al. (2012)[12], which reported that thicker scars were more likely to result in successful VBAC. Thicker lower uterine segments can better withstand labor stresses, improving VBAC outcomes. Cheung et al. (2004)[13] also found a positive correlation between scar thickness and VBAC success using sonographic testing. Kok et al. (2013) indicated that larger lower uterine segment scars are linked to a reduced risk of rupture and higher VBAC success rates. Our findings align with this literature, suggesting that while patient characteristics also play a role, scar thickness is an important predictor of VBAC outcomes.

In TABLE 4, the distribution of study participants based on sonographic scar thickness in relation to intraoperative scar status indicated that higher grade intraoperative findings, such as scar dehiscence and rupture, were more prevalent among patients with thinner scars (<2 mm and 2-2.5 mm). Specifically, 37.5% and 62.5% of patients with <2 mm scars experienced scar dehiscence and rupture, respectively, while 60% of those with 2-2.5 mm scars experienced scar dehiscence. These poor intraoperative outcomes were significantly related to scar thickness. Supporting this, studies by Sen et al. (2004)[14] and Patil et al. (2023) also found that thinner scars tend to result in poor intraoperative scar status, leading to dehiscence and rupture.

CONCLUSIONS

We found that mean gestational age of study participants was 37.78±0.86 weeks. Ultrasonographic measurements showed that 67.92% had a scar thickness >3 mm, and 21.51% had a scar thickness between 2.6 to 3 mm, with a mean scar thickness of 3.29±0.64 mm. Despite the operator dependency of ultrasonographic measurements, using a single ultrasonologist removed potential bias. Of the study population, 82.78% underwent LSCS, while 17.22% had VBAC, and all patients with a scar thickness less than 2 mm underwent LSCS. The association between scar thickness and pregnancy outcome was significant (p-value=0.034). The association between scar thickness and intraoperative scar status was found to be highly significant (p-value < 0.001).

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