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ORIGINAL ARTICLE

Comparison of Clinical and Radiological Findings for Prediction of Scar Integrity in Women with Previous LSCS

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ABSTRACT

Background: To compare the accuracy of clinical signs and radiological parameters in predicting scar integrity in women with a history of LSCS.

Methods: This cross-sectional study was conducted at the Department of Gynaecology/ Obstetrics, Cantonment General Hospital, Rawalpindi from January 2022 to January 2023 and included 64 term pregnant women with prior cesarean delivery. Clinical features such as scar tenderness and onset of labor were recorded. Preoperative transabdominal ultrasound was used to measure lower uterine segment (LUS) and myometrial thickness and detect niche formation. Intraoperative findings at repeat cesarean delivery were used to determine scar integrity. Data were analyzed using SPSS version 26, with p-values <0.05 considered statistically significant.

Results: Scar tenderness ($p = 0.003$) and induced or elective labor onset ($p = 0.041$) were significantly associated with dehiscent or thinned scars. On ultrasound, LUS thickness <2.5 mm and myometrial thickness <2 mm were strong predictors of scar defects, with sensitivities of 88.9% and 83.3%, respectively (both $p < 0.001$). Niche presence had the highest specificity (93.5%). Radiological markers outperformed clinical indicators in predictive accuracy.

Conclusion: Ultrasound-based assessment, particularly measurement of LUS and myometrial thickness, provides a more reliable method for predicting scar integrity than clinical signs alone. Incorporating sonographic evaluation into pre-delivery planning can enhance maternal safety and guide the decision regarding mode of delivery.

Keywords: LSCS scar integrity, lower uterine segment, ultrasound, scar dehiscence, clinical assessment, repeat cesarean, niche, uterine rupture prediction

INTRODUCTION

Cesarean delivery rates have steadily risen worldwide over recent decades, making the assessment of uterine scar integrity a crucial component of obstetric care. Women with a previous lower segment cesarean section (LSCS) are at potential risk for complications such as scar dehiscence or uterine rupture, particularly when considering a trial of labor in subsequent pregnancies. Accurate pre-delivery evaluation of scar condition is therefore essential to prevent adverse maternal and fetal outcomes[1-3].

Clinical assessment primarily based on patient history and physical signs such as scar tenderness has traditionally guided decision-making. However, the reliability of these signs is limited, particularly in the absence of labor. Radiological imaging, especially ultrasound, has emerged as a promising non-invasive tool to assess scar morphology. Parameters such as LUS thickness, myometrial thickness, and the presence of a niche have been investigated for their ability to predict scar weakness[4-6].

Several international studies, including those by Rozenberg et al. and Jastrow et al., have proposed threshold values for LUS and myometrial thickness below which the risk of scar rupture increases significantly. Locally, however, data remain sparse and inconsistent. Most healthcare centers lack standardized protocols for scar assessment, and the reliance on clinical judgment alone continues to influence cesarean decision-making[7,8]. This highlights the need for region-specific evidence comparing clinical and radiological methods in predicting scar integrity[9,10].

The present study aims to evaluate and compare the diagnostic value of clinical signs and sonographic findings in predicting uterine scar integrity among term pregnant women with previous cesarean section. By identifying accurate and accessible predictors, this research seeks to support safer obstetric practices and reduce unnecessary repeat cesarean deliveries.

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METHODOLOGY

This was a descriptive cross-sectional study conducted over a period of one year, from January 2022 to January 2023. The primary objective was to compare clinical and radiological indicators to predict uterine scar integrity in women with a history of lower segment cesarean section (LSCS).

The study was carried out at the Department of Gynaecology/Obstetrics, Cantonment General Hospital, Rawalpindi. Approval for the study was obtained from the Institutional Ethical Review Committee prior to data collection. All participants were informed about the objectives and procedures of the study, and written consent was secured. Patient confidentiality and data anonymity were maintained throughout.

A total of 64 pregnant women with a history of previous LSCS were recruited for the study. The sample size was calculated using an expected proportion of scar dehiscence of approximately 20%, with a 95% confidence level and 10% margin of error. A non-probability consecutive sampling technique was used to enroll eligible participants who fulfilled the inclusion criteria during the study period.

Inclusion Criteria:

- Pregnant women with singleton term pregnancies (≥37 weeks gestation)
- History of one or more previous lower segment cesarean deliveries
- Consent for elective cesarean section at term
- Availability for both clinical assessment and preoperative ultrasound

Exclusion Criteria:

- Women with placenta previa or accreta spectrum
- History of classical cesarean section or uterine surgery other than LSCS
- Multiple gestations
- Signs of active labor or uterine rupture at presentation
- Refusal to provide informed consent

After obtaining written informed consent, all participants were assessed both clinically and radiologically prior to undergoing repeat cesarean section. A detailed obstetric history was obtained,

including age, parity, number and type of previous cesarean deliveries, and inter-delivery interval. Clinical examination focused on the presence or absence of scar tenderness, mode of labor onset, and cervical status.

Ultrasound evaluation was performed by a qualified radiologist using a standardized protocol. Measurements included the thickness of the LUS and the myometrial layer at the site of the previous scar. Scar morphology was noted, particularly for the presence of niche or thinning. These parameters were assessed using transabdominal or transvaginal sonography depending on gestational age and visualization quality.

At the time of cesarean delivery, the uterine scar was evaluated intraoperatively by the attending surgeon. Findings were categorized as Intact scar, Thinned scar, Dehiscent scar and scar thickness was measured manually using sterile calipers or estimated visually based on clinical judgment, when not measurable.

Collected data were entered and analyzed using IBM SPSS version 26. Descriptive statistics were calculated for continuous variables (mean ± SD) and categorical variables (frequencies and percentages). The association between clinical/radiological predictors and scar integrity was analyzed using Chi-square test or Fisher's exact test for categorical variables and independent sample t-test for continuous variables. A p-value less than 0.05 was considered statistically significant.

To determine the predictive accuracy of different variables, sensitivity, specificity, and positive predictive values were also calculated for each parameter.

RESULTS

The study enrolled 64 women with a history of at least one previous lower segment cesarean section (LSCS). A majority (59.4%) were aged 30 years or younger, while the remaining 40.6% were older than 30. Most participants were para 1 (64.1%), indicating that this was their second pregnancy, whereas 35.9% had a higher parity. The inter-delivery interval revealed that 70.3% of women had at least 18 months spacing between deliveries, which is considered favorable. Urban residents formed a slight majority (57.8%), with the remaining 42.2% belonging to rural areas. These baseline demographics were important for understanding the distribution and potential risk factors for compromised scar integrity.

Table 1: Demographic Characteristics of Participants (n = 64)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	≤ 30	38	59.4%
	> 30	26	40.6%
Parity	1	41	64.1%
	≥ 2	23	35.9%
Inter-delivery interval	< 18 months	19	29.7%
	≥ 18 months	45	70.3%
Residence	Urban	37	57.8%
	Rural	27	42.2%

When comparing clinical variables with intraoperative scar findings, a significant association was observed for scar tenderness and the onset of labor. Among women with dehiscent or thinned scars, 55.6% had scar tenderness on examination, whereas only 17.4% of those with intact scars reported tenderness (p = 0.003). Additionally, spontaneous labor was more common in women with intact scars (65.2%), while induced or elective labor was more prevalent in those with scar defects (61.1%), showing statistical significance (p = 0.041). Although a higher number of previous LSCS appeared more frequently in women with compromised scars (50%), this was not statistically significant (p = 0.090).

Table 2: Clinical Findings in Relation to Scar Integrity

Variable	Category	Intact Scar (n=46)	Dehiscent/Thinned Scar (n=18)	p-value
Scar tenderness	Present	8 (17.4%)	10 (55.6%)	0.003*
	Absent	38 (82.6%)	8 (44.4%)	
Onset of labor	Spontaneous	30 (65.2%)	7 (38.9%)	0.041*
	Induced/Elective	16 (34.8%)	11 (61.1%)	
Previous LSCS	1	33 (71.7%)	9 (50%)	0.090
	>1	13 (28.3%)	9 (50%)	

*p < 0.05, statistically significant

Ultrasound parameters revealed a strong correlation with intraoperative scar condition. The average LUS) thickness was significantly lower in the dehiscent/thinned scar group (1.6 ± 0.4 mm) compared to those with intact scars (3.1 ± 0.5 mm; p < 0.001). Similarly, the mean myometrial thickness was markedly reduced in compromised scars (1.4 ± 0.5 mm vs. 2.7 ± 0.6 mm; p < 0.001). Sonographic evidence of a scar niche was present in 55.6% of the dehiscent group but only 6.5% of the intact group, indicating a strong association (p < 0.001). These findings underscore the diagnostic value of ultrasound in predicting scar status.

Table 3: Radiological Parameters and Scar Integrity (Ultrasound-Based)

Radiological Variable	Intact Scar (n=46)	Dehiscent/Thinned Scar (n=18)	p-value
LUS thickness (mm)	3.1 ± 0.5	1.6 ± 0.4	<0.001*
Scar myometrial thickness (mm)	2.7 ± 0.6	1.4 ± 0.5	<0.001*
Niche on ultrasound	Present	3 (6.5%)	10 (55.6%)
	Absent	43 (93.5%)	8 (44.4%)

*p < 0.05, statistically significant

Table 4: Predictive Value of Clinical and Radiological Markers

Parameter	Sensitivity (%)	Specificity (%)	p-value
Scar tenderness	55.6	82.6	0.003*
LUS thickness < 2.5 mm	88.9	84.8	<0.001*
Myometrial thickness < 2 mm	83.3	80.4	<0.001*
Niche presence on USG	55.6	93.5	<0.001*

*p < 0.05, statistically significant

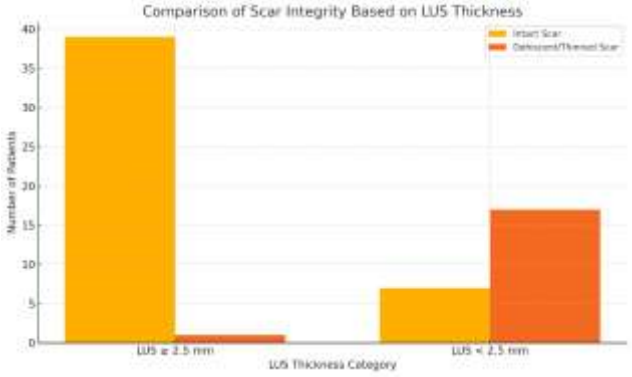

Figure 1: Comparison of Scar Integrity Based on LUS Thickness . It visually compares the number of patients with intact vs. dehiscent scars across LUS thickness categories (≥2.5 mm vs. <2.5 mm). The graph clearly illustrates that scar dehiscence is significantly more common in patients with LUS thickness less than 2.5 mm.

An analysis of the sensitivity and specificity of both clinical and radiological markers revealed that radiological parameters were superior in predicting scar integrity. A LUS thickness below 2.5 mm had a sensitivity of 88.9% and specificity of 84.8% (p < 0.001). Similarly, myometrial thickness below 2 mm showed 83.3% sensitivity and 80.4% specificity (p < 0.001). The presence of a

niche, although less sensitive (55.6%), had a high specificity of 93.5%. Among clinical indicators, scar tenderness showed moderate sensitivity (55.6%) and good specificity (82.6%), with a significant p-value (0.003). These results highlight that ultrasound-based parameters, particularly LUS and myometrial thickness, are strong predictive tools for scar dehiscence.

DISCUSSION

This study aimed to evaluate the predictive value of both clinical and radiological parameters in assessing uterine scar integrity among women with previous lower segment cesarean section (LSCS). Our findings highlight the significant role of LUS thickness and myometrial measurements on ultrasound, along with clinical features such as scar tenderness and labor onset, in identifying women at risk of scar dehiscence or thinning.

The presence of scar tenderness was significantly associated with dehiscent or thinned scars, aligning with findings from studies also reported scar tenderness as a reliable clinical warning sign for scar compromise[11-13]. Although clinical signs alone are not definitive, they can serve as initial red flags, particularly in low-resource settings where radiological facilities may be limited.

The onset of labor was another important clinical factor. Women with spontaneous labor were more likely to have intact scars compared to those with induced or elective onset. This observation was consistent with studies showed that induced labor, especially with prostaglandins, may be linked to higher risks of uterine rupture in women with a previous cesarean delivery[14,15].

Radiological assessment proved to be a more objective and reliable predictor. In our study, women with dehiscent or thinned scars had significantly lower LUS and myometrial thickness values compared to those with intact scars. These findings were in agreement with studies of which demonstrated that an LUS thickness less than 2.5 mm and myometrial thickness below 2 mm significantly increase the risk of uterine rupture during trial of labor[16,17]. In our cohort, LUS thickness below 2.5 mm yielded a sensitivity of 88.9% and specificity of 84.8%, while myometrial thickness below 2 mm also showed excellent predictive accuracy, reinforcing its value in preoperative decision-making.

Moreover, the presence of a niche on ultrasound was strongly associated with scar dehiscence. A similar association was reported by studies found that niche formation was significantly linked to deficient healing of cesarean scars and correlated with reduced scar strength[18,19]. While the niche had moderate sensitivity, its specificity was the highest among all parameters, suggesting its usefulness in ruling in scar defects when present.

Our study supports a growing body of evidence that combining clinical and radiological findings offers a more comprehensive approach to assessing uterine scar integrity. This is particularly important in determining the suitability for trial of labor after cesarean (TOLAC) and minimizing maternal and fetal risks. As noted by a study, careful patient selection is key to reducing repeat cesarean section rates while maintaining safety[20].

One limitation of our study is the relatively small sample size, which may limit the generalizability of findings. Additionally, inter-observer variability in ultrasound measurement and subjective estimation of intraoperative scar condition could introduce bias. Nonetheless, the consistent patterns observed suggest clinical relevance, warranting larger multicenter studies to confirm these associations.

CONCLUSION

This study demonstrates that both clinical and ultrasound-based findings are valuable in predicting uterine scar integrity in women with a history of LSCS. Among the clinical indicators, scar tenderness and labor onset were significantly associated with compromised scars. However, radiological parameters particularly LUS and myometrial thickness proved to be more accurate and objective predictors. LUS thickness <2.5 mm and myometrial thickness <2 mm showed strong sensitivity and specificity, while the presence of a niche on ultrasound had high specificity. These results underscore the importance of incorporating routine ultrasound evaluation into preoperative assessment protocols to improve maternal safety and guide delivery planning.

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