Al-Azhar International Medical Journal

Volume 5 | Issue 4 Article 19

4-30-2024
Section: Obstetrics and Gynecology

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How to Cite This Article

Farahat, Mohamed Mahamed Ibrahim; Altabakh, Ahmed Abd El Kader Mohamed; and Abdel Gwwad, Mohamed Abd El Gwwad Abd El Raouf (2024) "Comparative study between Transabdominal and Transvaginal sonography in the Assessment of Lower Uterine Segment Scar at Term in recurrent Caesarian Sections," *Al-Azhar International Medical Journal*: Vol. 5: Iss. 4, Article 19.
DOI: https://doi.org/10.58675/2682-339X.2363

ORIGINAL ARTICLE

Comparative study between Transabdominal and Transvaginal sonography in the Assessment of Lower Uterine Segment Scar at Term in recurrent Caesarian Sections

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Abstract

Background: ***In current years, there has been a concerning global rise in the incidence of cesarean section(CS). The majority of pregnant women who seek the care of obstetricians have a history of CS. In addition, prior CS is increasingly recognized as a leading indicator of CS.***

Aim and objectives: ***To evaluate the efficacy of transvaginal ultrasound (TVS) vs transabdominal ultrasonography (TAS) in assessing the thickness of the lower uterine cesarean scar at term in individuals who have undergone multiple CS.***

Patients and methods: ***This was prospective observational research performed on one hundred (100) pregnant females who have a history of prior scar at the Obstetrics and Gynecology Department at Al-Aazhar University Hospital (Al-Hussein) from January 2023 to July 2023.***

Results: ***Our results showed that A mean BMI of 26.92 kg/m2 was observed among patients aged from twenty to thirty-nine years. Avg. GA: 38.24 weeks. With an INR of 1.14, grade I comprised 51.7 percent of the patients, grade II comprised 41.5 percent, and grade III constituted 6.8 percent. A substantial increase in LUS thickness was observed between the two methods (TAS & In terms of age, BMI, parity, & GA, important distinctions existed among the groups.***

Conclusion: ***The measurement of lower uterine segment (LUS) scar thickness is more precisely determined using TVS than TVS and TAS. Evaluation by ultrasonography enables a more accurate valuation of the risk of intrapartum complications in cases attempting VBAC, which may facilitate safer delivery management.***

Keywords: Transabdominal sonography; Transvaginal sonography; Lower Uterine Segment Scar at Term; Recurrent ceaserian sections

1. Introduction

In current years, there has been a concerning global increase in the incidence of CS. [1] The preponderance of pregnant women who seek the care of obstetricians have a history of CS. In addition, prior CS is increasingly recognized as a leading indicator of CS.[2] Previous CS scars carry a 0.2-1.5 percent risk of rupture.[3]

LUS ultrasound estimation is a relatively uncomplicated and non-invasive technique that can be utilized to forecast the incidence of scar dehiscence or rupture.[4]

In females with a history of CS, the result of a labor trial is contingent on the scarring of the previous CS, the thickness of which is directly proportional to the result.[5]

Accepted 14 April 2024.
Available online 30 April 2024

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https://doi.org/10.58675/2682-339X.2363

The assessment of LUS thickness has been identified as a possible predictor of scar dehiscence. Sonographically, the LUS appears as a two-layered structure in late pregnancy, comprised of mucosa and echogenic muscularis of the bladder wall, which includes a portion of the visceral-parietal peritoneum, & myometrial layer, which is relatively hypoechoic. Typically, the decidualized endometrial layer, as well as the chorioamniotic membrane, are not discernible in isolation from the myometrium.[3]

As LUS thinning increases the likelihood of scar dehiscence or rupture, this risk is correlated. Comparisons of LUS thickness measurements via trans-vaginal versus trans-abdominal modalities are, however, poorly documented.[6]

This study aims to evaluate the efficacy of transvaginal ultrasound vs. transabdominal ultrasonography in assessing the thickness of the lower uterine cesarean scar at term in individuals who have undergone multiple CS.

2. Patients and methods

This was prospective observational research performed on one hundred (100) pregnant females with a history of previous scars at the Obstetrics and Gynecology Department at Al-Azhar University Hospital (Al-Hussein) from January 2023 to July 2023.

Inclusion criteria

Prior CS of the lower segment, unintended pregnancy, gestational age (thirty-forty weeks), as well as mean amniotic fluid volume.

Exclusion criteria

Numerous pregnancies, Females who have previously undergone uterine procedures like myomectomy, lower segment cesarean for the delivery of a premature infant, or classical cesarean (vertical midline incision of the upper segment), Abnormal volume of amniotic fluid (oligohydramnios, polyhydramnios), active labor, & placental abruption, accretion, or previa as suspected conditions.

Methods

All cases were subjected to the following:

Complete history collection: (Individual history, Complaint & its duration, Current History, Previous Medical history, Past operational history, Menstrual history included and Obstetric history).

General examination (Investigational Studies)

A transabdominal ultrasound was performed for Standard obstetrical evaluation.

Equipment: The examination involved imaging the abdomen using a transabdominal convex array transducer and an ultrasound probe (Versa essential VAEG Medical system).

Bladder Preparation: (The examination was performed with a partially full bladder. This could mean that the patient was instructed to have a certain), (amount of liquid in their bladder before the procedure, which can help provide a clear view of the uterus during the ultrasound).

Positioning: (The ultrasound probe was used to obtain a clear view of the LUS in the midsagittal plane. This typically involved placing the transducer on the lower abdomen, just above the pubic bone, in the midline).

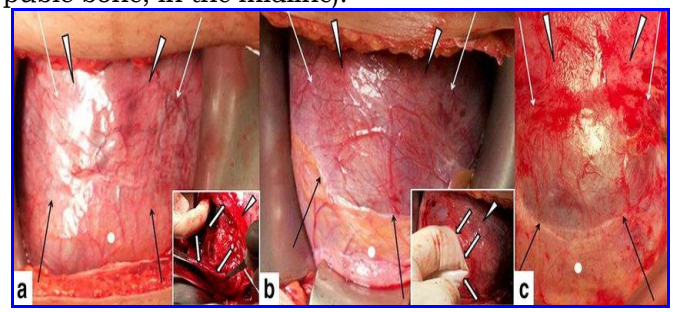

Figure 1. Photos of intraoperative measurement of LUS scar.

Magnification: (The ultrasound image was adequately magnified to get a detailed view of LUS).

Measurement: (The thickness of LUS was measured as a single measurement. This Measurement was taken from the mucosa (inner lining) of the bladder on the outer side to the chorioamniotic membrane (the membrane that surrounds the amniotic sac). It was recorded in tenths of a millimeter (0.1 mm).

Transvaginal ultrasound: (Patient Positioning, Transvaginal Probe Insertion, LUS Identification and Measurement).

Procedures: Intraoperative: (Two (Allis) Forceps Placement, Grasping Forceps Placement, Sterile Ruler Placement, Measurement).

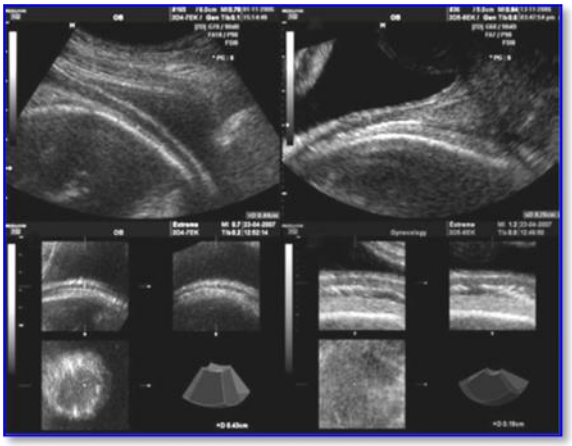

Figure 2. Images showing measurement of the whole thickness of LUS using transabdominal 2D (a) & 3D (c) ultrasound, as well as measurement of muscular layer of LUS using transvaginal 2D(b) & 3D (d) ultrasound. (Martins, et al.)[7]

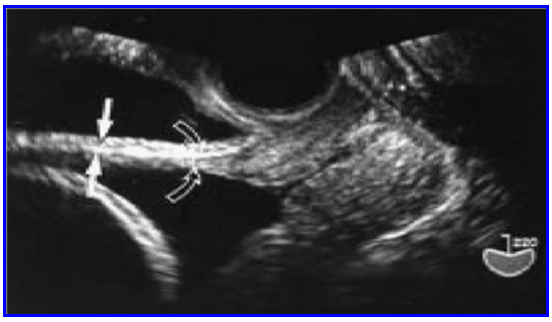

Figure 3. The TVS displayed the LUS and indicated that the bladder was full. The arrow with the open end points to the uterine wall, whereas the arrow with the closed end points to the bladder wall. Lower uterine segment ultrasonography abbreviated as LUS; transvaginal ultrasound abbreviated as TVS. (Sen, et al.)[8]

Ethical consideration

The research protocol had been submitted to the Institutional Review Board (IRB) of the Al-Azhar University Faculty of Medicine for approval. Inscribed informed consent was obtained from every participant who agreed to participate in the research. Personal confidentiality and privacy were upheld throughout the research.

Statistical analysis

The computer programs Microsoft Excel version 7 (Microsoft Corporation, NY, USA) as well as SPSS version for Windows will be utilized to perform all statistical calculations. SPSS is an acronym for Statistical Package for the Social Sciences, which SPSS Inc. in Chicago, Illinois, USA developed. Descriptive statistics, as well as analytical statistics, were employed, with the corresponding levels of significance denoted by P-values (P- value: level of significance, P more than 0.05: Nonsignificant (NS), P below 0.05: Significant (S), P below 0.01: Highly significant (HS)).

3. Results

Table 1. Demographic characteristics of the examined cases.

	CASES (N=100)
AGE OF MOTHER (YEARS) MEAN ± SD RANGE	32.54 ± 4.81 20 – 39
AGE OF PREGNANCY (WEEKS) MEAN ± SD RANGE	38.24 ± 1.33 37 – 40
BMI (KG/M^2) MEAN ± SD RANGE	26.92 ± 2.65 22 – 32

This table showed that cases' age ranged twenty to thirty nine years with mean BMI 26.92 kg/m2, average GA 38.24 weeks.

Table 2. Obstetric characteristics among the patients.

	N	%
SINGLE PREVIOUS CS	60	60
DOUBLE PREVIOUS CS	20	20
THREE PREVIOUS CS	15	15
FOUR OR MORE PREVIOUS CS	5	5
LENGTH OF LAST PRIOR CS (YEARS) MEAN ± SD	3.92 ± 3.14	

This table shows that more about 60% of cases had single prior CS, about 20% of cases had double prior CS, 15% of cases had 3 prior CS & about 5% cases had 4 or more prior CS.

Table 3. Operative laboratory data of the studied cases.

		PATIENTS (N=100)
HEMOGLOBIN (G/DL) MEAN ± SD		10.50 ± 0.91
TLC (10^3 /ML) MEAN ± SD		10.46 ± 2.33
PT (SEC) MEAN ± SD		11.19 ± 0.589
INR MEAN ± SD		1.14 ± 1.01
RH	Positive	140 (95.2%)
	Negative	7 (4.8%)

This table indicated that operative routine laboratory investigations that mean Hb value was12.00 g/dl, mean TLC 10.46 x103/uL. INR is 1.14.

Table 4. Grades of LUS identified intraoperatively in the cases examined.[7]

	PATIENTS (N=100)	
	N	%
GRADE I	60	60
GRADE II	30	30
GRADE III	10	10

The data presented in the table indicated that 51.7 percent of the cases met the criteria for grade I, 41.5 percent for grade II, as well as 6.8 percent for grade III.

Table 5. LUS thickness as measured by TAS in comparison to that as measured by TVS.

	TAS	TVS	T	P
LUS THICKNESS (MM) MEAN ± SD	3.8 ± 1.6	3.5 ± 1.9	12	.0001

The data presented in this table indicates that the LUS thickness identified by TAS was considerably greater than that identified by TVS.

Table 6. Groups' demographic & clinical attributes in accordance with grades identified intraoperatively.

	GRADE I (N=60)	GRADE II (N=30)	GRADE III (N=10)	F	P
AGE (YEARS) MEAN ± SD	32.22 ± 4.11	28.33 ± 4.91	27.56 ± 4.31	.796	.0001
BMI (KG/M^2) MEAN ± SD	27.73 ± 3.69	29.12 ± 3.39	30.8 ± 3.84	3.81	.025*
GRAVIDITY MEAN ± SD	3.74 ± 1.12	3.81 ± 1.19	4.2 ± 1.92	.593	.554
PARITY MEAN ± SD	3.46 ± .724	4.78 ± .708	5.84 ± .758	65.85	0.00*
PRIOR CS NO. MEAN ± SD	1.76 ± .925	2.13 ± .998	2.24 ± 1.14	2.06	.132
GA (WEEKS) MEAN ± SD	38.73 ± .927	37.92 ± .877	36.8 ± .926	22.745	0.0*

The data presented in this table indicated notable variations among the groups in terms of age, BMI, parity, as well as GA.

Table 7. Performance of LUS thickness among females at labor who had previous cesarean section.

	TVS	TAS
AUC 95% CI	78% 69%-87%	85% 79%-91%
SENSITIVITY	75%	90%
SPECIFICITY	50%	92%
POSITIVE PREDICTIVE VALUE	27.3%	90%
NEGATIVE PREDICTIVE VALUE	98.0%	92%
ACCURACY	85%	90%

This table showed that the AUC was 78 % (95 % CI: 69 % -87 %), 85 % (95 % CI: 79 % -91 %), & 88 % (95 % CI: 82 % -93 %), respectively (all with P < .001).

4. Discussion

Globally, the proportion of females who have the option to undergo CS has increased in recent decades. A previous SC is one of the most common reasons for a cesarean birth Betran et al.[9]

In our present study, the cases' ages ranged from twenty to thirty-nine years, with an average BMI of 26.92 kg/m2 and an average GA of 38.24 weeks.

Omar El-Badry et al. conducted a study with the objective of contrasting the precision of TVS and TAS in determining the thickness of the lower uterine cesarean scar at term, & then comparing their results to the actual thickness of the LUS through surgery. One hundred forty-seven pregnant females with a prior history of scarring participated in their study. Patients spanned in age from twenty to thirty-nine and had a mean BMI of 26.92 kg/m2. On average, 38.24 weeks.[10]

The outcomes of our study indicated that over 60% of the patients had experienced at least one CS in the past, twenty percent had experienced two CS, fifteen percent had experienced three CS, and five percent had experienced four or more CS.

The findings of our research were corroborated by Mutlaq and Hamad, who documented that among the cases in their trial cohort, thirty-six sixty percent underwent a single CS, seventeen (28.3 percent underwent two CS, as well as seven (11.7 percent) underwent 3 CS.[11]

According to the findings of Omar El-Badry et al., approximately 44.2 percent of the cases had experienced at least one CS in the past, 27 percent had experienced two CS, 19 percent had experienced three CS, & 10 percent had experienced four or more CS. A total of 6.8 percent of the cases were classified as grade III, while 41.5 percent were classified as grade I.[10]

The current study showed that in operative routine laboratory investigations, the mean Hb value is 12.00 g/dl, the mean TLC is 10.46 x103/uL, and the INR is 1.14.

Our findings were consistent with those of Abosrie and Farag,[12] who reported that 42.9 percent of the patients had experienced CS in the past, 31.4 percent had experienced double CS, & fifty percent had intraoperative LUS of grade I, 44.3 percent had intraoperative LUS of grade II, & 5.7 percent had intraoperative LUS of grade III, as stated by Qureshi et al.[13]

The results of our study indicated that 51.7 percent of the cases met the criteria for grade I, 41.5 percent for grade II, and 6.8 percent for grade III. It was observed that the LUS thickness detected by TVS was considerably lower than that identified by TAS.

The findings of our research were corroborated by the study conducted by Moustafa et al. At twenty-eight weeks, when they compared the average thickness of CS scars measured by TAS (6.79±1.84 mm) & TVS (4.11±1.29 mm), they discovered a statistically significant disparity (P less than 0.001) between the two methods. At 38 weeks, the average thickness of the CS scar as determined by TAS was 6.79±1.84 mm, whereas TVS obtained 2.9±3.9 mm. This discrepancy among the two measurements was statistically significant (P less than 0.001). The discrepancy between the actual mean thickness (4.12±1.25 mm) and the mean thickness calculated by TAS (6.79±1.84 mm) did not reach statistical significance (P less than 0.001). The discrepancy between the actual mean thickness (4.12±1.25 mm) and the mean thickness

determined by TVS (4.11±1.298 mm) does not reach statistical significance (P<0.05). Hence, in relation to the intraoperative LUS thickness, TVS exhibited greater accuracy than TAS (4.11 mm versus 6.79 mm versus 4.12 mm, respectively).[14]

The study by Gad et al. found that individuals who had undergone a prior CS had a mean thickness of 2.49 ± 0.39 mm for the LUS as measured by TAS, whereas the same group had an average thickness of 2.34 ± 0.39 mm for the LUS as measured by TVS. In individuals without a history of CS, the average thickness of LUS as determined by TAS was 5.19 ± 0.81 mm, while the average thickness as determined by TVS was 5.1 ± 0.930 mm. After comparing both sonographic measurements with the actual measurement taken throughout SC, the average thickness of the LUS was found to be 2.19 ± 0.39 mm & 5.11 ± 0.91 mm, respectively; this indicates that the TVS measurement was in close proximity to the actual.[15]

Age, BMI, parity, and GA exhibited a statistically significant variance among the groups, as demonstrated by this current research. The categories do not differ significantly in terms of birth weight or Apgar score at one minute or five minutes.

Omar El-Badry et al. demonstrated that LUS thicknesses identified by TAS were significantly greater than LUS thicknesses identified by TVS & intraoperatively. A significant variance among the groups concerning BMI, parity & number of prior CS was noted.[10]

Afifi et al. demonstrated that TVS is superior to TAS when it comes to determining the circumference of LUS. A slender scar is defined as a LUS thickness of 3.65 mm or less, while a thickness of 2.85 mm or less correlates with an increased risk of uterine dehiscence.[16]

Our outcomes agree with IBRAHIM et al., who found that This cutoff value must provide optimal sensitivity and specificity so as to prevent an excessive number of CS for exceptionally excellent scars while preventing a futile trial of labor that endangers the lives of the mother & fetus. This inherently influences the prognosis, diagnosis, and approach to treatment.[17]

In our research, a receiver-operator characteristic curve was constructed utilizing the scar thickness in the 3rd trimester (36e40 weeks) & then identifying the sensitivity & specificity with a range of cutoff values. They concluded that the best cutoff value would be at 2.4 mm, & this yields a sensitivity of 75.0% & a specificity of 85.7%. At this cutoff value, the positive predictive value was 27.3%, whereas the negative predictive value was 98.0%, and the accuracy was 85.0%. Our results were consistent with Thomas et al., who stated that the best cutoff value was 2.4 mm (using transvaginal ultrasonography), & this yields a sensitivity of 90.0% & a specificity of 43.5 percent. At this cutoff value, the positive predictive value is 12.5%, whereas the negative predictive value is 98.3%.[18]

5. *Conclusion*

The measurement of LUS scar thickness is more precisely determined using TVS than TVS and TAS. Evaluation by ultrasonography enables a more accurate valuation of the risk of intrapartum complications in cases attempting VBAC, which may facilitate safer delivery management.

5.1 Recommendations

Additional research with a broader geographical scope and a more substantial sample size would strengthen our conclusion. More research is needed to validate the cutoff value for LUS scar thickness and include it in guidelines for the selection of patients for a safe trial of VBAC. Measurement of LUS scar thickness by ultrasound, if it is used for both inpatients and outpatients, could help decision-making concerning the mode of delivery for cases with prior vaginal birth after CS.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article

Funding

No Funds : Yes

Conflicts of interest

There are no conflicts of interest.

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