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Original research article

Assessment of Lower Segment Scar Integrity by Ultrasound in Near Term Pregnant Women with Previous Caesarean Section: A Study

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Abstract

BACKGROUND AND OBJECTIVES: The rate of Caesarean delivery has been increasing steadily over the past two decades and is the most common obstetric operative procedure worldwide. Previous caesarean section has been found to be the most common indication due to the inability to precisely confirm the integrity of the scarred lower uterine segment (LUS). The purpose of this study is to evaluate the accuracy of ultrasonography (USG) in determining the LUS thickness in previous caesarean section patient.

MATERIALS AND METHOD: The present observation study was conducted on 120 pregnant women who had previous caesarean section and were planned for an elective CS in the department of obstetrics and gynecology, ESIC MC & PGIMSR, Rajajinagar, and Bangalore from January 2019 to June 2020. LUS thickness was measured by Transabdominal scan (TAS) and then correlated to scar integrity assessed intraoperatively. The sensitivity, specificity, positive and negative predicted values of the sonographic LUS thickness was determined.

RESULTS: Ultra sonographic LUS thickness assessed correlated significantly with intraoperative LUS thickness. (r value 0.272, $p<0.001$) The mean thickness of LUS in women with normal scar was 4.2 + 0.7 mm and in women with abnormal LUS was 2.8 + 0.5 mm the difference being highly significant ($p < 0.001$). A cut off of 3.5 mm was derived from ROC with sensitivity, specificity, PPV NPV of 90.3%, 82%, 64.2% , 92.6% respectively. In our study the rate of scar dehiscence/rupture noted was 5% and only 1 woman had rupture of uterus.

CONCLUSION: LUS measurement is a useful clinical tool in the prediction of scar integrity. It should be performed routinely in all women who have had a previous caesarean section so that a large proportion of women could be considered for a trial of labour which would decrease the cost of health care and maternal morbidity rate.

KEYWORDS: Caesarean section; lower uterine segment; Transabdominal scan; Scar integrity

Introduction

Cesarean section is the commonest operation performed by the gynecologist and one of the commonest surgical procedures in general. The dramatic increase in the number of women with a scarred uterus has led to greater attention being paid to the problems of the clinical management of pregnancy and delivery after previous Caesarean delivery (CD).[1] Pregnancy and childbirth after CD are associated with an increased risk of complications. For women who

have had previous Caesarean section, choices for mode of birth in their next pregnancy are either trial of vaginal birth after Caesarean (VBAC) or an elective repeat caesarean delivery. (ERCD).

Decreased utilization of VBAC and increased rates of ERCD is one of the major factors behind global increase in Cesarean section rates**.** Both VBAC and ERCD have their own risks and benefits. Due to possible complications on both sides, obstetricians need tools which can accurately and reliably estimate the risks of adverse outcomes for each individual woman which is the cornerstone of the most optimal delivery plan. Complications associated with previous CD are scar pregnancy, placental complications (percreta and accreta) and most feared one uterine rupture.Uterine rupture due to dehiscence of the previous C.S scar is one of the most morbid and catastrophic complications that may happen with VBAC trial.[2]Prediction of scar dehiscence/rupture will help in patient selection for VBAC and refine the care offered to a women with previous caesarean delivery. Studies have shown that sonographic evaluation of LUS can be used effectively to assess its integrity and to predict the risk of intrapartum uterine rupture in women with previous CS. Trans Abdominal Scan (TAS) is a simple, non-invasive, cost effective and a safe tool. There is an inverse correlation between LUS thickness and the risk of uterine scar defect. The optimal cut-off value predicting scar dehiscence varied from 2.0 to 3.5 mm for full LUS thickness.[3] Sonographic evaluation of uterine scar can help in identifying women at risk and a large proportion of women could be considered for a trial of labour which would decrease the cost of health care and reduce maternal morbidity rate. The prognostic value and applicability of ultrasound needs to be studied further.[4]

MATERIALS AND METHODS

SOURCE OF THE DATA

The present study was carried out on pregnant women who had previous caesarean section and were planned for an elective CS at 36-40 weeks in the Department of obstetrics and gynaecology, ESIC-PGIMSR, Bangalore from January 2019 to June 2020.

INCLUSION CRITERIA:

1. Patient willing to give written informed consent
2. Singleton pregnancy
3. Maternal age 18-40 years
4. Gestational age 36-40weeks
5. Cephalic vertex presentation
6. Normal amount of liquor
7. Normal placental site
8. Have one or more previous CS

EXCLUSION CRITERIA:

1. Multiple pregnancy
2. History of uterine surgery other than CS
3. Polyhydramnios or Oligohydramnios
4. Low lying placenta
5. Malpresentation
6. Pregnant women in labour
7. Fetal congenital anomaly
8. Congenital anomalies of the uterus

STATISTICAL ANALYSIS

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean± standard deviation (SD) were used. For categorical data, the number and percentage were used in the data summaries and diagrammatic presentation. Chi-square (χ^2) test was used for association between two categorical variables.

The formula for the chi-square statistic used in the chi square test is:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

OBSERVATIONS AND RESULTS

Table 1: Distribution of Cases according to Age

Age (Yrs)	N	%
21-25	25	20.8
26-30	53	44.2
31-35	34	28.3
>35	8	6.7
Total	120	100

Descriptive Statistics	Min	Max	Mean	SD
Age (Yrs)	21	40	29.0	4.1

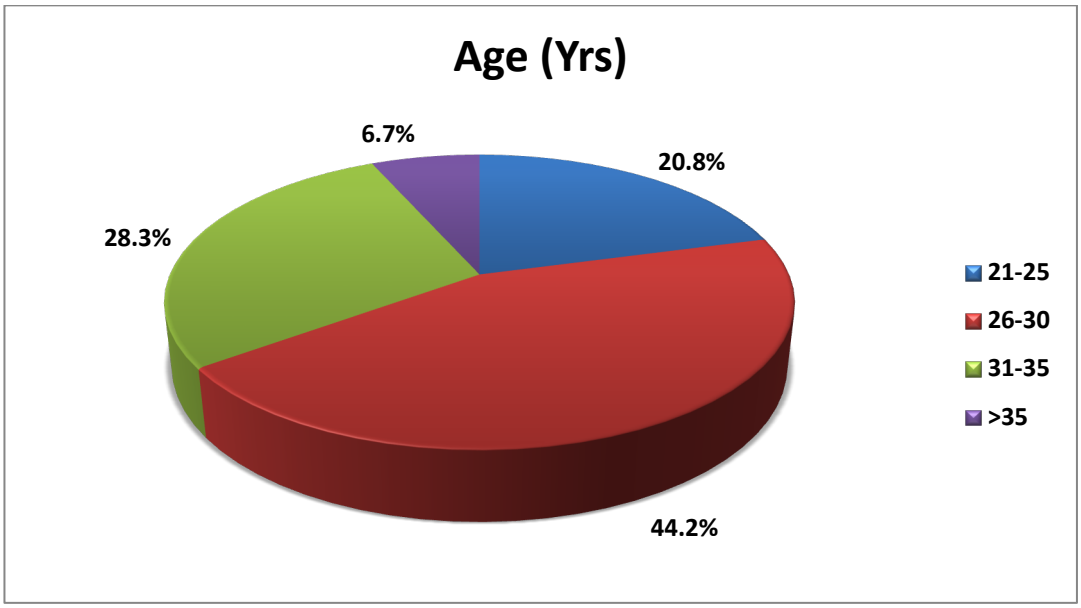

Figure 1 : Distribution of Cases according to Age

In present study, out of 120 women, 25 (20.8%) belonged to the age group 21-25yrs, 53 (44.2%) belonged to 26-30yrs, 34 (28.3%) belonged to 31-35yrs and 8 (6.7%) were above 35 yrs.

The mean age of distribution in our study with a range of 21 - 40 years was 29 years with a SD 4.1 yrs .

Table 2 : Distribution of Cases according to BMI

BMI(kg/m$^{2)}$	N	%
Normal (18-24.9)	13	10.8
Overweight(25-29.9)	85	70.8
Obese(>30)	22	18.4
Total	120	100

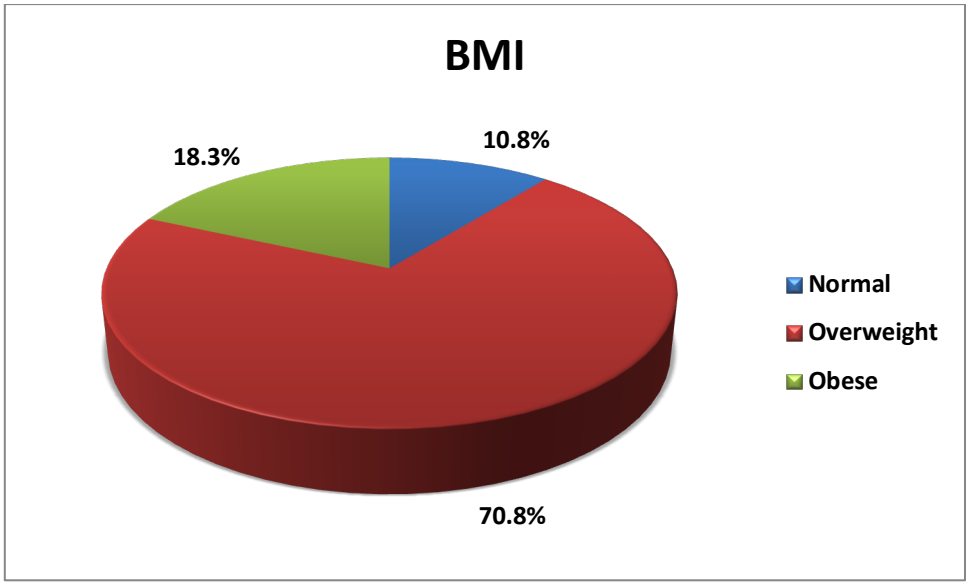

Figure 2 : Distribution of Cases according to BMI

In present study out of 120, 13 women (10.8%) had normal BMI, 85 (70.8%) were overweight and 22 (18.4%) were obese.

Table 3 : Distribution of Cases according to POG

POG (wks)	N	%
36-37	6	5
37+1 - 38	23	19.2
38+1- 39	63	52.5
>39wks	28	23.3
Total	120	100

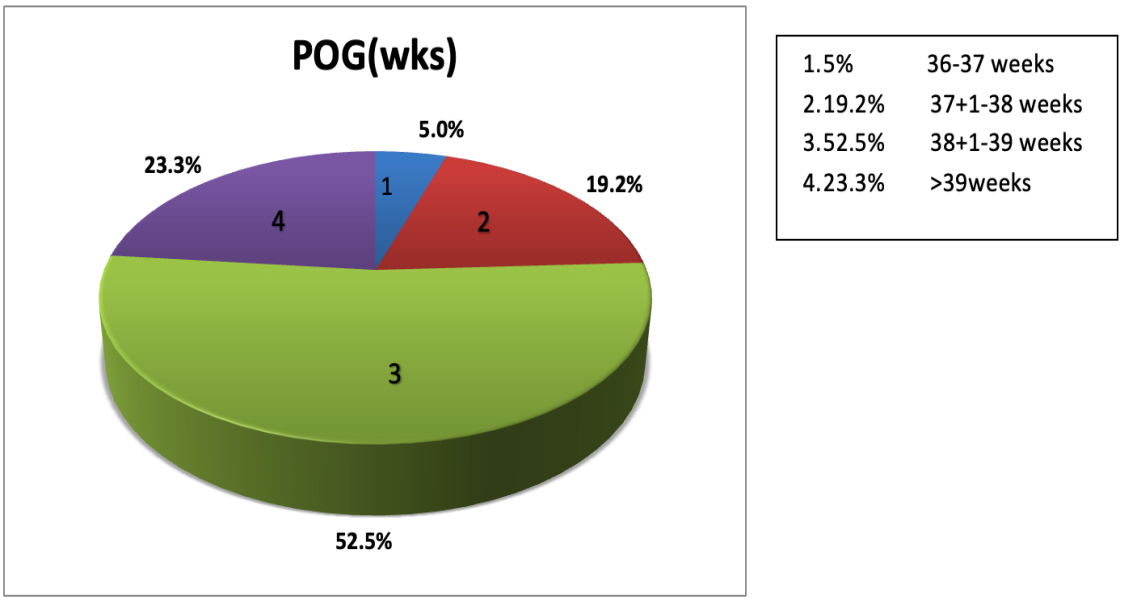

Figure 3: Distribution of Cases according to POG

in present study 6(5%) belonged to the gestational age of 36 – 37 weeks, 23 (19.2%) belonged to 37+1 - 38 weeks, 63 (52.5%) belonged to 38+1- 39 weeks and 28 (23.3%) belonged to > 39 weeks. Period of gestation ranged from 36- 40 weeks, majority belonged to >38 weeks POG.

Table 4: Distribution of Cases according to Parity

Parity	N	Percentage
1	99	82.5%
2	18	15%
3	3	2.5%

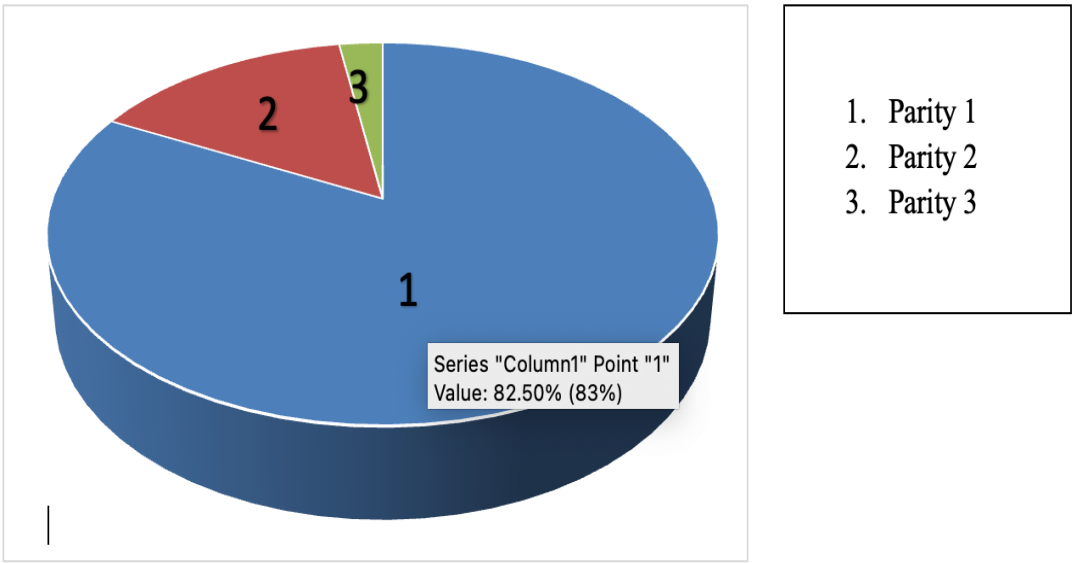

Figure 4 : Distribution of Cases according to Parity

In the present study, 99(82.5%) were para1 with previous 1 LSCS, 18(15%) were para2 out of which 13 had previous 2 LSCS and 5 had previous 1 LSCS and 3 (2.5%) were para3 out of which 2 had previous 2 LSCS and 1 had previous 1LSCS

Table 5 : Distribution of Cases according to Number of LSCS

No of LSCS	N	%
1	105	87.5
2	15	12.5
Total	120	100

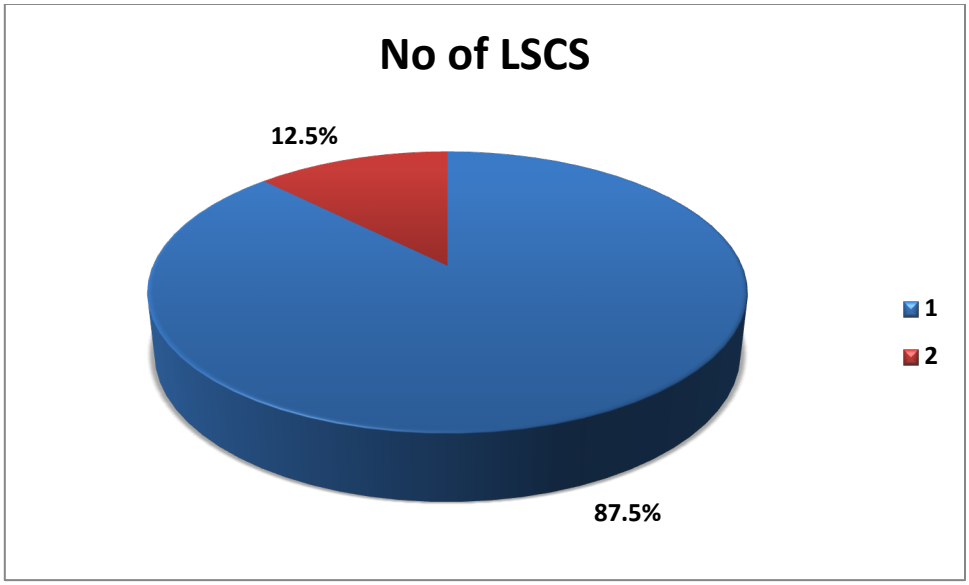

Figure 5 : Distribution of Cases according to Number of LSCS

In present study 105 women (87.5%) had previous one caesarean section and 15 women (12.5%) had previous two caesarean section.

Table 6 : Distribution of Cases according to Inter caesarean delivery interval

Inter caesarean delivery Interval	N	%
<2 years	35	29.1
3 years	26	21.7
4 years	39	32.5
>4 years	20	16.7
Total	120	100

Descriptive Statistics	Min	Max	Mean	SD
Interval (years)	1	8	3.5	1.5

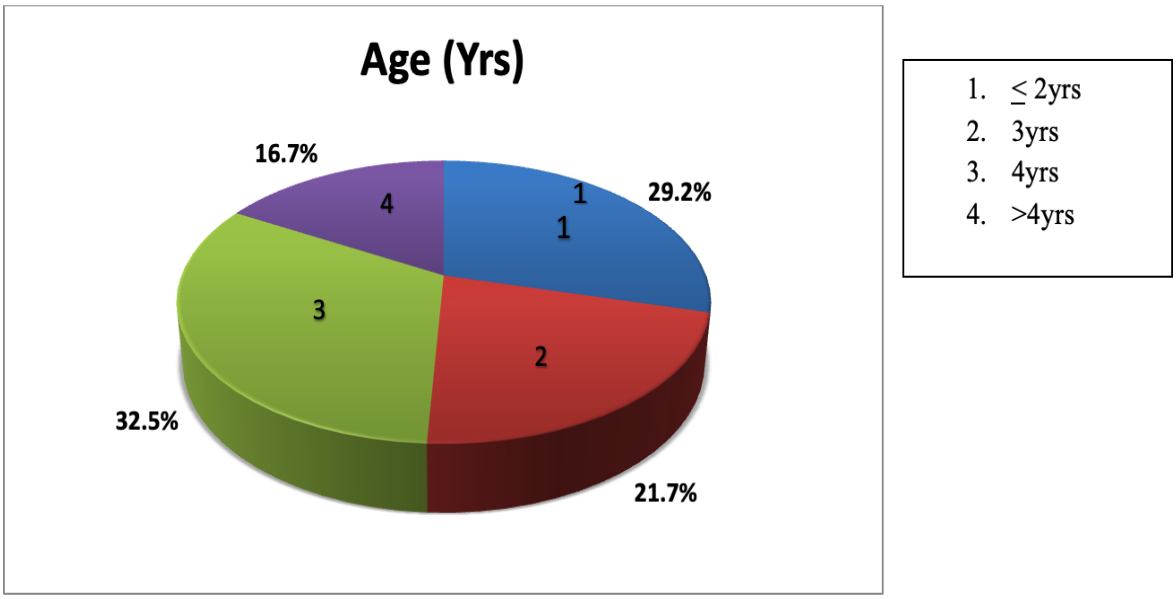

Figure 6: Distribution of Cases according to Interval

In present study out of 120 women, the inter caesarean delivery interval of <2yrs was seen in 35 (29.2%), 3yrs in 26 (21.7%), 4yrs in 39 (32.5%) and >4yrs in 20 (16.7%).
Out of 120 women 35 (29.2%) had < 2 years of inter delivery interval and 85 (70.8%) had inter delivery interval of > 2years.
The inter delivery interval in our study ranged from 1- 8yrs with a mean of 3.5 years and SD of 1.5.

Table 7 : Distribution of Cases according to H/O Vaginal Delivery

H/O Vaginal Delivery	N	%
Yes	6	5
No	114	95
Total	120	100

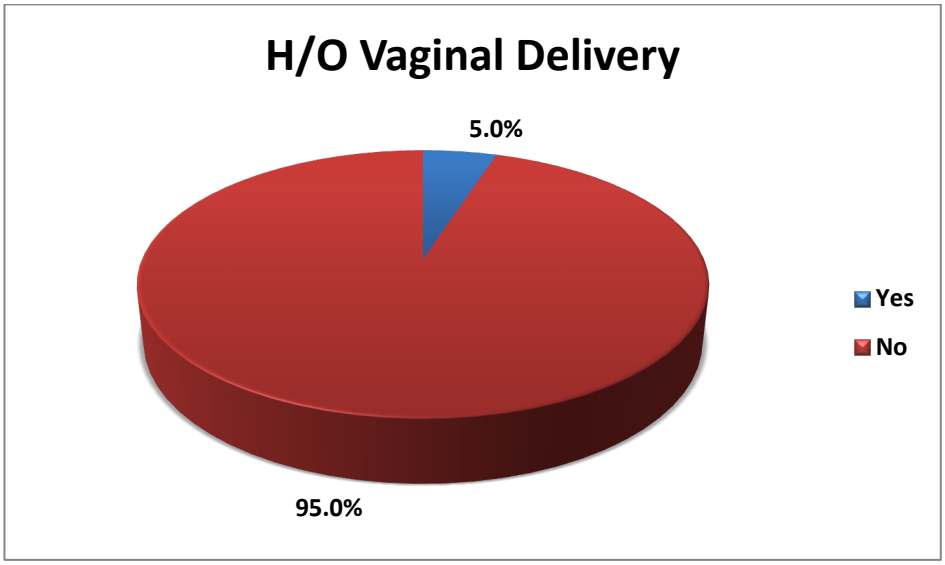

Figure 7 : Distribution of Cases according to H/O Vaginal Delivery

In present study 6 women (5%) had a history of vaginal delivery prior to caesarean section and 114 women (95%) had no h/o vaginal deliveries.

DISCUSSION

Table 8: Comparison of cases according to degree of correlation between sonographic LUS thickness and intraoperative caliper LUS thickness.

	Present study	Azeem A et al [8]	Lahiri S et al [9]	Tazion S et al [6]	Sushma V et al [10]
p value	<0.003	<0.0001	<0.05	<0.001	<0.0001
r value	0.272	0.95	0.63	-	-

In present study there was significant positive correlation between sonographic LUS thickness and intraoperative caliper LUS thickness (p value <0.003, r value 0.272) similar to other studies as in Azeem A et al (p value <0.0001, r value 0.95), Lahiri S et al (p value <0.05, r value 0.63), Tazion S et al (p value <0.001) and Sushma V et al (p value <0.0001).

Sonographic LUS Thickness

Table 9: Comparison of Cases according to mean sonographic LUS thickness

	Present study	Vedantham H et al [5]	Sushma Vet al [10]	Azeem A et al [8]	Tazion S et al [6]
Mean sonographic LUS thickness(mm)	3.8 + 0.9	3.4 + 0.6	3.4 + 1.2	2.5 + 0.4	2.5

In present study the mean sonographic LUS thickness was 3.8 + 0.9mm, Vedantham H et (3.4 + 0.6mm), Sushma V et al (3.4 + 1.2mm), Azeem AA et al (2.5 + 0.4mm) and Tazion S et al (2.5mm).

Table 10: Comparison of Cases according to mean sonographic LUS thickness in abnormal LUS (Grade II, III & IV) [19]

	Present study	Gargy S et al [11]	Vedantham H et al [5]	Azeem A et al [8]
Mean sonographic LUS thickness(mm)	2.8 + 0.5	2.1 + 0.9	2.9 + 0.5	1.9 + 0.5

In present study the mean sonographic LUS thickness in women with abnormal LUS was 2.8 + 0.5mm, in Gargy S et al (2.1 + 0.9mm), Vedantham H et al (2.9 + 0.5mm) and Azeem A et al (1.9 + 0.5mm).

Table 11: Comparison of cases according to cut off value of sonographic LUS thickness indicative of scar integrity.

Sl no	Studies	Cut off value
1.	**Present study**	**3.5mm**
2.	**Gargy S et al [11]**	**3.5mm**
3.	**Rozenberg et al [12]**	**3.5mm**
4.	**Vedantham H et al [5]**	**3.5mm**
5.	**Sushma Vet al [10]**	**3.5mm**
6.	**Jha NNS et al [7]**	**3mm**
7.	**Jajoo SS et al [4]**	**3.9mm**
8.	**Tazion S et al [6]**	**2.5mm**
9.	**Azeem A et al [8]**	**2.4mm**

In the present study the cut off value of sonographic LUS thickness indicative of scar integrity (Grade I) [19] was 3.5mm , Gargy S et al (3.5mm), Rozenberg et al (3.5mm), Vedantham et al

(3.5mm), Sushma V et al (3.5mm), Jha NNS et al (3mm), Jajoo SS et al (3.9mm), Tazion S et al (2.5mm) and Azeem A et al (2.4mm).

Table 12: Comparison of cases according to sensitivity of the cut off value

	Present study	Gargy S et al [11]	Rozenberg et al [12]	Vedantham H et al [5]	Sushma Vet al [10]
Cut off value	3.5mm	3.5mm	3.5mm	3.5mm	3.5mm
Sensitivity	90.3%	90%	88%	92.6%	86.6%

In the present study with a cut off value of 3.5mm the sensitivity of sonographic measurement was 90.3%, Gargy S et al (90%), Rozenberg et al (88%), Vedantham et al (92.6%) and Sushma Vet al (86.6%).

Table 13: Comparison of cases according to specificity of cut off value

	Present study	Brahmalakshmy et al [13]	Rozenberg et al [12]	Vedantham H et al [5]	Montanari et al [14]
Cut off value	3.5mm	3.5mm	3.5mm	3.5mm	3.5mm
Specificity	82%	81.1%	73.2%	74.3%	75%

In the present study with a cut off value of 3.5mm the specificity of sonographic measurement was 82%, Bramhalakshmy et al (81.1%), Rozenberg et al (73.2%), Vedantham et al (74.3%) and Montanari et al (75%).

CONCLUSION

Ultrasonographic evaluation of LUS thickness correlated significantly with intraoperative LUS thickness when measured between 36-40 weeks and risk of abnormal scar increases significantly when thickness is 3.5mm or less. In present study with a cutoff value of 3.5 mm the sonographic measurement of LUS has a Negative predictive value (NPV) of 92.6% and Positive predictive value (PPV) of 64.2% which correlates with other similar studies. High NPV confirms that a thick LUS is usually strong and encourages obstetricians to offer the patient TOLAC when the LUS thickness is > 3.5mm. Hence sonographic assessment of LUS is an excellent, noninvasive and cost effective method for safely predicting scar integrity and can be recommended to be routinely incorporated in antenatal workup of a woman with previous caesarean section for making decision on the mode of delivery.

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