

## Research Article

### Accuracy of Prenatal Ultrasound in Determining the Uterine Scar Thickness

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#### Abstract

**Background:** To evaluate the accuracy of prenatal sonography in measurement of Caesarean section scar thickness and comparing the measurement with intraoperative visual assessment of uterine scar.

**Methods:** This was a comparative cross sectional study. It was conducted in the department of Gynecology and Obstetrics at Fatima Memorial Hospital, Lahore. Sonographic examination was performed in 90 pregnant patients with one previous Caesarean section, between 34 weeks and 40 weeks of gestation to assess the scar thickness.

**Results:** The study showed that scar thickness of 2.5 mm or more, scar volume verified by 3-dimensional (3D) ultrasonography correlate with intraoperative finding of visual assessment of scar and risk of scar dehiscence.

**Conclusion:** Based on the obtained results we conclude that evaluation of scar by ultrasound and quality of the scar can be applied clinically and practically while deciding the mode of delivery in women who had previously given birth by Caesarean section.

**Received** | 17-01-2018: **Accepted** | 25-02-2019

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**Keywords** | Caesarean section, ultrasound, Caesarean scar thickness.

#### Introduction

In Obstetrics, Caesarean section (CS) is the most frequently performed surgery with a rising caesarean section rate and it poses both short and long-term complications. To reduce these complications the vaginal birth after caesarian (VBAC) should be offered. Hence by minimizing the chances of repeating Caesarean section will also reduce the chances of Caesarean section rate. Therefore, the significance of patients allowed to attempt vaginal birth after caesarian (VBAC) is well understood. There has been a long debate about the mode of delivery in patients who had previous Caesarean section. Recently it has been seen that there has been a

rising trend in morbidity when given a chance of labor after previous caesarean, especially the higher chances of uterine rupture.<sup>1</sup>

It has been observed that after Caesarean section the chances of vaginal birth have dramatically compressed and there are more chances of Caesarean section but increasing Caesarean section are associated with increased morbidity, like in short term there can be increased blood loss, post partum hemorrhage, wound morbidity and blood transfusion and when we see in long run there are higher chances of placenta previa, repeat need of Caesarean section and possibly uterine rupture.<sup>2-4</sup> Hence trial of labour following Caesarean section should be attempted to

minimize the chances of CS and so the associated morbidity but there is high risk of scar rupture as well.<sup>5</sup>

There are various factors that can affect the main outcome of vaginal birth after caesarian (VBAC). List of those factors is as follows like time duration between previous Caesarean and current pregnancy, indication of previous Caesarean section, previous successful vaginal deliveries, postoperative wound sepsis and so forth. Unfortunately, there have been no clear-cut guidelines for Obstetricians about patients who had previous Caesarean section to opt for vaginal birth after caesarian (VBAC).<sup>6</sup>

Accurately predicting the results after a trial of vaginal birth after caesarian has remarkable value clinically as failure is strongly linked with increased maternal and fetal morbidity.<sup>7</sup> A consensus is being proposed that complete healing of the Caesarian section (CS) scar and myometrial thickness of the lower uterine segment are strongly linked with chance of achieving a vaginal delivery in a subsequent pregnancy.<sup>8</sup>

Ultrasound assessment of previous scar has practical application as it predicts the thickness of scar and can be performed in patients with previous scar reliably.<sup>9</sup> Radiological findings of scar make a small mark as decider for mode of delivery. Unfortunately, the criteria for radiological evaluation as when and how to measure scar thickness are not standardized. Our study was designed to study the accuracy of prenatal ultrasound in measurement of uterine scar thickness and was compared by surgeon intraoperatively.

### Material and Methods:

This was a comparative cross sectional study. Our study included 90 patients. Patients having age between in 25-40 years were taken and those who had singleton pregnancy with intact membranes with previous one lower segment Caesarean section at gestational age between 34 weeks and 40 weeks to assess the scar thickness, who attended antenatal clinic of tertiary care hospital. Patients who had history of placenta previa or Patients with contracted pelvis elective Caesarean section and any other uterine surgery were excluded from the study.

An informed consent was taken from all the patients

who were willing to participate in the study. The transabdominal ultrasonographic evaluation of the lower uterine segment was performed between 34 weeks and 40 weeks of gestation. The thickness of uterine scar was measured with the urinary bladder being partially distended by the researcher and findings were confirmed by the senior Radiologist who had vast experience in dealing such cases to avoid any bias.

A detailed scan of the lower uterine segment (LUS) in different planes was done in patient having a partially full bladder. It was our keen interest to look for any evidence of asymptomatic uterine dehiscence on lower uterine segment (LUS). At term gestation vaginal examination was performed for pelvic assessment to decide the mode of delivery and avoiding any bias. This was done to empower or let the women decide to undergo vaginal birth after caesarian (VBAC) based on clinical parameters. Women with thin scar were given choice for elective Caesarean.

Statistical analysis was done using SPSS version 23.0. Interval between Caesarean section was correlated with intraoperative assessment of scar and also scar thickness was also correlated with intraoperative assessment. Chi square test was applied between scar thickness with interval between caesarian section, intra-operative inspection and p-value <0.05 was taken a statistically significant.

### Results:

We enrolled total 90 patients. The mean scar thickness when measured sonographically between 34 and 40 weeks of gestation. Minimum age was 25 years and maximum age was 38 years with a Mean±SD age of the patient was 30±3.395 year. Minimum scar thickness was 1.7 mm and maximum scar thickness was 4.7 mm and Mean±SD scar thickness was 2.75±0.53mm. Minimum interval between caesarean section was 1 year and maximum was 3.5 years with a

**Table 1:** Age, Scar Thickness, and Interval Caesarian Thickness Mean and Standard Deviation

Variables	Mean±SD
Age (in years)	30.33±3.395
Scar Thickness (in mm)	2.7544±0.52684
Interval Caesarean Section (in Years)	1.7500±0.71206

**Table 2:** Relation of Scar Thickness with Intraoperative Assessment

	Intraoperative Assessment			Total (N=90) (%)	P-value
	Normal Scar (N=66) (%)	Thinned out Scar (N=20)	Scar Dehiscence (N=4) (%)		
<b>Scar Thickness</b>	10 (33.3%)	17 (56.7%)	3 (10.0%)	30 (100%)	0.001
· <b>1.5 - 2.5</b>	51 (92.7%)	3 (5.5%)	1 (1.8%)	55 (100%)	
· <b>2.6 - 3.5</b>	5 (100.0%)	0 (.0%)	0 (.0%)	5 (100%)	
· <b>&gt;3.5</b>					

**Table 3:** Relationship of Scar Thickness with Interval between Caesarean Section

	Scar Thickness (mm)			Total (N=90) (%)	p-Value
	1.5 - 2.5 (N=30) (%)	1.5 - 2.5 (N=55) (%)	1.5 - 2.5 (N=5) (%)		
<b>Interval Between Caesarean Section</b>					0.62
· <b>Up-to 1 Year</b>	14 (46.7%)	12 (21.8%)	00 (00%)	26 (28.9%)	
· <b>1 - 2 Year</b>	09 (30.0%)	33 (60.0%)	03 (60%)	45 (50.0%)	
· <b>2 - 3 Years</b>	04 (13.3%)	08 (14.5%)	01 (20%)	15 (16.7%)	
· <b>More than 3 year</b>	03 (10.0%)	02 (3.7%)	01 (20%)	06 (6.6%)	

**Table 4:** Correlation between Intervals and Intraoperative Assessment

	Intraoperative Assessment			Total (N=90) (%)
	Normal Scar (N=66) (%)	Thinned out Scar (N=20) (%)	Scar Dehiscence (N=4) (%)	
<b>Interval Between Caesarean Section</b>				
· <b>Up-to 1 Year</b>	13 (19.7%)	11 (55%)	02 (50%)	26(31.1%)
· <b>1 - 2 Years</b>	39 (59.1%)	04 (20%)	02 (50%)	45 (50.0%)
· <b>2 - 3 Years</b>	11 (16.6%)	02 (10%)	00 (00%)	13 (14.5%)
· <b>More than 3 years</b>	03 (4.5%)	03 (15%)	00 (00%)	06 (6.7%)

Mean  $\pm$  SD interval of  $1.75 \pm 0.75$  year (Table 01).

Out of total 90 patients 30 (33.3%) had scar thickness of 1.5-2.5 mm and out of these 10 patients (33.33 %) had normal scar when seen intraoperatively. Most 20 (66.7%) had abnormal scar and out of these 20 patients 17(56.7 %) had thinned out scar and 03 (10%) had scar dehiscence. There were 55 (61.1 %) patients who were falling in category of 2.6-3.5 mm scar thickness. Out of these 55 patients 51(92.7%) had normal scar when seen intraoperatively, 03(5.5 %) patients had thinned out scar and 01 (1.8 %) had scar dehiscence. When seen scar thickness of  $> 3.5$ mm 05 (5.5 %) patients had normal scar and none had abnormal scar. (p value  $<0.001$ ) (Table 02).

When comparing interval between caesarean section and scar thickness. Upto 1year interval we had 26 (28.8 %) and out of these 26 patients 14 (53.8 %) had scar thickness of 1.5-2.5 mm. 12(46.2%) had scar thickness of 2.6-3.5 mm. and none had scar thickness of  $>3.5$  mm. Majority 45 patients (50%) had interval

of 1-2 years between caesarean section. Out of these 45 patients, 09 (20%) patients had scar thickness of 1.5-2.5 mm. 33 (73.3%) had scar thickness of 2.6-3.5 mm and 3( 6.7%) patients had scar thickness of  $>3.5$  mm. 15( 14.4%) patients had interval of 2-3 years after CS. Out of these 15 patients 4 ( 30.8%) had scar thickness of 1.5 -2.5mm. 8 ( 61.5%) patients had scar thickness of 2.6-3.5 mm and 1( 7.7%) had scar thickness of  $> 3.5$  mm.<sup>6</sup> ( 6.6%) had interval of  $>3$  years between CS. Out of these 6 patients 3 (50%) patients had scar thickness of 1.5-2.5mm and 2 (33.3%) patients had scar thickness of 2.6-3.5mm and 1( 16.7%) patients had scar thickness of  $> 3.5$ mm. (p-value 0.062) (Table 03).

When we compared the interval between Caesarian section and intraoperative assessment of scar, 26 (28.8%) patients had interval of upto 1 year between CS. Out of these 26 patients, 15(50%) patients had normal scar and 11(42.3%) patients had thinned out scar and 02 (7.7%) patients had scar dehiscence. Majority 45(50%) patients had interval of 1- 2 years

between Caesarian section, out of these 45 patients 39 (86.7%) patients had normal scar. 4 (8.9%) patients had thinned out scar and 02 (4.4 %) patients had scar dehiscence.

Minor 15 (14.4 %) patients fell in category of interval of 2-3 years between Caesarian section. Out of these 11(84.6%) patients had normal scar, 2(15.4%) patients had thinned out scar and none had wound dehiscence. Only 06 (6.6%) had interval of > 3 years between caesarian section. Out of these 6 patients, 3 (50 %) patients had normal scar and 3 (50%) patients had thinned out scar and none of our patients falling in the same category had wound dehiscence.

## Discussion

We tried to validate the findings of ultrasound about scar integrity in patients with previous Caesarean section as the ultrasonography identifies those patients having thin and defective scar which carries a higher risk of uterine rupture. There are various methods used for identifying the scar integrity like Hystero-graphy, sonohystero-graphy, hysteroscopy, Magnetic resonance imaging (MRI) and ultrasono-graphy (USG). MRI is a better predictor of scar thickness, but it is expensive and not readily available.<sup>10</sup> Out of all these three-Dimensions USG was used in our study as it is safe, easy, non-invasive, cheap and quick to perform.

In our study the sensitivity and specificity of trans-abdominal ultrasound in predicting the scar dehiscence is like sensitivity of 95% and specificity of 84.8%. A study conducted by Ahmed M Maged et al.<sup>10</sup> revealed the sensitivity and specificity of transabdominal ultrasound in predicting the scar dehiscence was that sensitivity was 100% and specificity of 65.71%<sup>10</sup> which was comparable with our study.

Ahmed M Maged et al<sup>11</sup> found in their study that 3-D transvaginal ultrasound had sensitivity of 100% with higher specificity of 87.14% than transabdominal ultrasound. So transvaginal was observed as the best predictor for uterine scar dehiscence for measuring the thickness of uterine segment. Ahmed M Maged et al<sup>11</sup> concluded that the use of 3D ultrasound to measure the thinnest part of uterine segment had remarkably increased the sensitivity, but at the same time specificity was minimized so making the test better negative than positive one.

In our study the sensitivity and specificity of trans-abdominal ultrasound in predicting the scar dehiscence is like sensitivity of 95% and specificity of 84.8% with positive predictive value of 88.4% and negative predictive value of 93.3% making it more reliable test and a study conducted by Thomas et al<sup>12</sup> who did the largest study on sonographic examination of lower uterine segment, A cut-o value of 2.4 mm was taken for scar dehiscence prediction, our study had cut o of 2.5 mm which is comparable with our study, moreover it revealed sensitivity of 90.9%, specificity 43.5%, with a positive predictive value of 12.5% and a negative predictive value of 98.3% which is high yield and very significant in ruling out the disease and it is highly comparable with our study.

In our study the sensitivity of 95% and specificity of 84.8% was found with a negative predictive value of 93.3% and a study conducted by Mangla D et al.<sup>13</sup> had cut o of 2.46 mm with 88.7% sensitivity and specificity, with a high negative predictive value of 97.5%, which is highly comparable with our study. A number of studies have proved that uterine scar thickness is strongly linked to the increased risk of scar dehiscence/rupture<sup>14,15</sup> Study conducted by Mangla D et al.<sup>13</sup> proposed a cut o value of 3.5 mm for scar thickness on which VBAC can be offered and in our study the cut o value predicting scar dehiscence was taken as 2.6 mm which is comparable with our study.

In our study Mean age of the patients was 30 years  $\pm$  3.39 and in study conducted by Singh N et al had mean age of the patients was 27 years  $\pm$  2.56, which is comparable with our study. In our study more than 70% patients had interval of more than 1 year in previous cesarean section and in the study by Singh N et al<sup>16</sup> revealed that 80% patients had more than 1 year interval between cesarean section which is almost similar to our study. In our study as the interval between ceasarean section increased and chance of dehiscence was decreased and it was seen in none of the patient after 3 years of interval between CS and over all scar dehiscence was seen in 4.4% patients while in study by Singh N et al<sup>16</sup> it was 2.2%, smaller difference can be linked to patients who had scar thickness of more than 3.5 mm and in the study by Singh N et al<sup>16</sup> had lengthier range of scar thickness categories.

In our study Mean scar thickness was 2.75 mm SD  $\pm$  0.53 and in a study conducted by Singh N et al<sup>16</sup> Mean scar thickness in patients who underwent repeat cesarean section was 2.9  $\pm$  0.9 mm, after 36 weeks of gestation in patients which is comparable with our study. In our study most of the patients fell in category of having scar thickness of 2.6-3.5mm (61%). In study conducted by Singh N et al<sup>16</sup> al patients who had scar thickness of 2.1-3 mm were 41.5% and patients with scar thickness of 3.1-4 mm were 35.2 % which is comparable with our study.

Our study concludes that as the scar thickness increases the chance of scar dehiscence decreases as evidenced by patients who had scar thickness of > 3.5 mm, none of these patients had wound dehiscence and a study conducted by French authors about scar thickness in around 642 patients and in the end it was concluded that the risk of rupture of the scar is strongly associated with thin scars at 37 week of gestation<sup>13</sup> which is comparable with our study.

## Conclusion

Our study concluded that women can have successful vaginal birth after caesarian who had thicker scars. It was also concluded from our study that scar thickness can easily be measured via transvaginal ultrasonography in pregnant patients who had history of previous cesarean section, as this can be attributed to marking structures like bladder wall and decidual membranes. Scar thickness measurement in third trimester is more reliable. Further larger and multi centered studies are required to see whether scar thickness measurement can be taken into account while taking decision about mode of delivery in these women.

**Ethical Approval: Given**

**Conflict of Interest: None**

**Funding Source: None**

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