

ORIGINAL ARTICLE

SONOGRAPHIC LOWER UTERINE SEGMENT THICKNESS MEASUREMENT AND RISK OF UTERINE SCAR DEFECT IN WOMEN WITH PREVIOUS CAESAREAN SECTION.

Habiba Sharaf Ali ^{1*}, Dr Shahina Ishtiq², Bina Fawad³, Rabel Gul⁴
Department of Obstetrics & Gynaecology, Ziauddin University, Karachi, Pakistan.

ABSTRACT

Background: Risk of scar defect is inversely correlated with lower uterine segment thickness. The study aims to assess the diagnostic accuracy of sonographic measurement of the lower uterine segment thickness near term in predicting uterine scar defect in women with prior Caesarean section and ascertain the best cut-off value for predicting uterine rupture in our country.

Methods: This observational case series study was carried out at Department of Gynecology and Obstetrics, Ziauddin University and Hospitals from January 2015 to June 2015. Women carrying singlet on pregnancy of 36-38 weeks with history of previous C-section were included in the study. Lower uterine segment measurement was done by transabdominal ultrasound at 36-38 weeks gestation and these women are followed up to the time of delivery.

Results: A total of 180 patients based on inclusion criteria were recruited in the study. Significant association ($p=.001$) was found between LUS thickness values measured during pregnancy and status of scar at the time of delivery. No significant association was found between scar thickness and mode of delivery ($p= .390$). Scar dehiscence was noted in only one study participant.

Conclusion: We support the proposition that antenatal measurement of lower uterine segment measurement in women with previous caesarean section is a reliable tool in deciding which women should be given a trial of labor.

KEY WORDS: Previous Caesarean Section, Lower Uterine Segment (LUS), Ultrasound Measurement, Pakistan

INTRODUCTION

There is worldwide increase in the rates of cesarean births over the last many years and decrease in vaginal births. The most common reason of Caesarean section is previous caesarean delivery with a reported incidence of 67%¹. The main reason to operate for this is fear with regards to the integrity and status of previous Caesarean section scar. It is also unsafe to give trial of labor as there is a potential risk of scar rupture^{2,3}. The American College of Obstetricians and Gynecologists (ACOG) Committee on Obstetric Practice declared vaginal birth after Caesarean Section as a safe option in women with previous Caesarean section⁴.

Accurate forecast of uterine rupture would therefore be extremely important in foretelling and predicting women suitable for a trial of labor or Caesarean section³. Various studies⁵ have suggested sonographic measurement of lower uterine segment in the antenatal period and thinning of previous Caesarean section scar as a predictor of uterine rupture.

Lower uterine segment in the third trimester comprises of two layers one layer of hyper echogenic muscularis and bladder mucosa and a relatively hypoechogenic myometrial layer. Rozenberg et al; 1996⁶ suggested that sonographic measurement of the LUS at term might be useful in identifying women

Corresponding Author: Habiba Sharaf Ali*

who are at risk of uterine dehiscence during labor. It was assumed that there is an inverse relationship between LUS thickness and the risk of uterine scar defect.

There are several methods to assess the lower uterine segment such as postoperative echographic evaluation of uterine wound, interval hystero-graphy and magnetic resonance imaging. However evaluation by mean of sonography is considered to be the most favored and practical method⁷. The ultrasound evaluation can be done abdominally or transvaginally. Although ultrasound evaluation could be useful in evaluating the LUS to assess the risk of uterine dehiscence or uterine rupture, a risk scale and standardized cutoff values are not yet available. However different authors have given values from 2mm to 3.5 mm at which a trial of labor can be given.^{5, 6, 8}, but the best cut off values remains controversial. In this study which is to the best to our knowledge the first study in Pakistan we attempt to determine the LUS thickness by trans-abdominal sonography at term pregnancy and appreciate its effectiveness to determine the integrity of previous caesarean section scar. Our primary outcome is to see the association of lower uterine segment thickness in the antenatal period with the status of LUS at the time of Caesarean section. The secondary outcome is to appreciate a correlation between the status of scar and mode of delivery. We also aimed to predict the cut off values of scar dehiscence.

Additional purposes of this study is to evaluate the obstetrical factors such as prior vaginal delivery, labor at previous CS and inter delivery interval involved in promoting a thinner LUS after CS deliveries.

METHODS

This observational case series study was carried out at department of gynecology and obstetrics, Ziauddin Hospital Kemari tertiary care center affiliated with Ziauddin University and Hospitals from January 2015 to June 2015. A sample size of 185 was calculated using the standard formula for calculating sample size on the basis of prevalence.

$$N = \frac{(Z)^2 \times P (1-P)}{d^2}$$

Prevalence was taken at 15%⁹ which is caesarean section rate for Pakistan. The bond of error was taken at 5% with 95% confidence interval. Women carrying a singleton pregnancy of 36-38 weeks with history of previous C-section were included in the study through convenience sampling. Women having absolute indication for Caesarean section,

previous uterine surgery for reasons other than child-birth, having any uterine anomaly, multiple gestation, placenta previa and age more than 40 years were the exclusion criteria.

Data was collected using a proforma which included sonographically assessed uterine scar thickness, gestational age, mode of delivery and birth weight of child as main variables. A standard protocol for evaluating the LUS thickness was developed and a single senior designated obstetrician-sonologist performed all the scans, Ultrasound examinations were performed by a single Ultramark 4 plus ultrasound unit equipped with 3.5 MHz curvilinear array transducer to measure the LUS thickness. The ultrasound was performed Trans abdominally with full bladder. Lower uterine segment was identified by the ultrasonologist as a two layer structure consists of an echogenic layer which include bladder wall and a less echogenic layer representing myometrium. All women were followed up to the time of delivery.

Data was analyzed using SPSS version 20. Frequencies and percentages were calculated for categorical variables. For numerical variables mean and standard deviation was calculated. Chi square was used to determine association between different categorical variables P value of <0.05 was considered statistically significant.

Prior permission was taken from all the study participants explaining fully the objective and methodology of the study. Ethical review committee approval of Ziauddin University has been obtained.

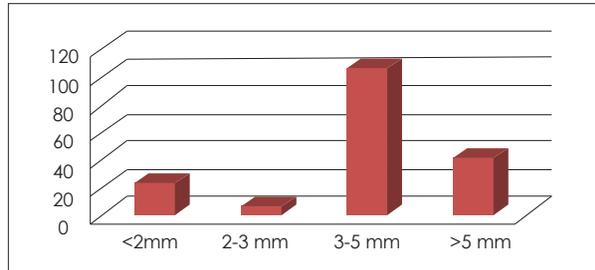
RESULTS

A total of 180 patients based on inclusion criteria were recruited in the study. 71.1 % (n=128) of the study participants were less than 30 years of age. Gestational age was 37-40 weeks in 73.9 % (n=133) of the participants, while 24.4 % (n=44) had pre term weeks delivery (i-e 35-36). Birth weight was between 2-5-3.9 Kg in 77.2 % (n=139) of the study participants. Mean scar thickness found in study participants was .40±.09. Out of 180 study participants, 33.3 % (n=60) had Emergency C-section, 23.3 % (n=38) had vaginal delivery and 43.3 % (n=78) had elective C-section.

The Lower uterine segment scar thickness was 3-5 mm in 60 % (n=108) of the subjects out of which 23 had vaginal delivery. Ultrasonographic thickness of less than 2mm was found in 13.3 % (n=24) and 6 were able to deliver normally vaginally. No significant association was found between scar thickness and mode of delivery (p= 0.390). (Table I)

TABLE I: Scar Thickness in millimeters and Mode of delivery

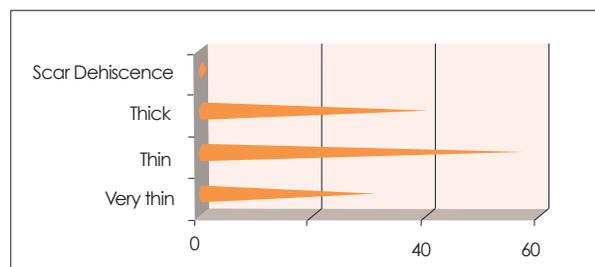
Scar Thickness in millimeters	Elective C-section (ELLSCS)	Emergency C-section (EMLSCS)	VBAC	Total	Pearson Chi-Square
Less than 2mm	5	13	6	24	.284
2-3 mm	3	2	1	6	
3-5 mm	52	31	25	108	
More than 5 mm	18	14	10	42	

**Figure 1: Scar thickness in millimeters**

Regarding the previous delivery 35 % (n=63) gave history of prior vaginal delivery and a significant association was found between prior vaginal delivery and mode of delivery ($p = .001$), that is more patients had VBAC if they had previous vaginal delivery. Status of scar when evaluated at the time of surgery revealed a very thin scar in 17.2 % (n=31) of the study participants, while it was thin in 31.7 % (n=57) of the cases. Scar dehiscence was noted in only one study participant. (Table II)

TABLE II: Cross tabulation between scar thicknesses measured during pregnancy and status of scar at time of surgery

Mode of delivery	Status of Scar at the time of delivery					Chi square value	p-value
	Thick	Thin	Very thin	Scar Dehiscence	Not assessed		
Emergency CS	17	27	15	1	0	60	170.96 0.001
Elective CS	24	35	18	0	1	78	
Vaginal delivery	0	0	0	0	42	42	

**Figure 2: Status of Scar at Delivery**

Significant association ($p = .001$) was found between LUS thickness values measured during pregnancy and status of scar at the time of delivery. Out of 78 patients undergoing elective cesarean section 35 had thin and 18 had very thin scar. Among the 60

patients undergoing emergency cesarean section 27 had thin and 15 had very thin scar

DISCUSSION

A major challenge faced by obstetrician in modern obstetric practice is to offer trial of labor to women with previous Cesarean delivery. The main concern is the uterine rupture or scar dehiscence the frequency of which varies between 0.3 and 3.8 %⁷. There is a risk that thin LUS with scar is likely to rupture during labor resulting in severe morbidity and mortality for both mother and fetus. Its evaluation has become very essential before delivery, so that low risk women can have a trial of labor and high risk women can have planned Caesarean section. Several studies have proposed that thinning of the lower uterine segment (LUS) measured by ultrasound at different times in pregnancy is a predictor of uterine rupture. Jastrow et al, 2010⁵ in a meta-analysis of 12 articles on LUS status and risk of uterine scar defect showed a strong association between the degree of LUS thinning and the risk of uterine defects.

Measuring scar thicknesses at different times during pregnancy is considered as a useful tool and method to give a trial of labor to women with previous one Caesarean section. Singh et al. 2014⁹ measured scar thickness at both late second and third trimester and found that latter has better correlation with mode of delivery. Rozenberg et al.1996⁶ found thickness more than 3.5 mm protective against rupture with an inverse correlation to the risk of rupture. They found a LUS thickness between 1.6-2mm as the risk of uterine rupture. Baliga et al.1999¹⁰ and Tanik et al.1996¹¹ took 3mm thickness as cut off as a risk for uterine rupture. Some authors have concluded myometrium thickness more than 1.5 mm to 2 mm as potentially safe to take trial of labor¹³⁻¹⁵. Uharček et al. 2015¹² in a recent study on 336 women considered 2.5mm as the critical cut-off value of the LUS thickness while another study done considered thickness less than 1.8mm to be a valid cut-off value to identify patients with a higher risk of thin uterine scar¹⁵. In a study by Pralhad Kushtagi et al. 2011¹⁶ LUS thickness of 3 mm study showed a high negative predictive value suggesting that obstetrician should consider vaginal birth in women with previous cesarean delivery. Qureshi et al. 1997⁸ considered 2mm as good healed scar. N. Kok et al. 2013³ in his meta-Analysis has shown full LUS cutoff value of 3.1-5.1mm as a strong negative predictive value for the occurrence of a defect scar during trial of labor. In our study women with history of previous Caesarean section had normal vaginal delivery with LUS thickness of 23.61 mm. these findings are similar to those reported by other authors.

In our study we could not predict which patient can be considered for trial of labor as no significant

association was found between LUS and mode of delivery as many women had caesarean section for indications other than thin scars. We found that 6 women with scar thickness of 2 mm had normal vaginal delivery.

The present study showed that ultrasound evaluation is well correlated with the operative findings at the time of surgery as 94 out of 180 patients with thin or very thin scars on ultrasound had Caesarean section.

Trans abdominal and transvaginal approaches as well as combinations are used for the measurement of LUS thickness in pregnant women. We used trans abdominal approach for the measurement of uterine scar defect as it was not only convenient for our patients but also being used in large number of studies because of better visualization of scar and its integrity¹⁷.

However in a comparative analysis transvaginal ultrasound was found to be more reliable in LUS measurements than trans abdominal ultrasound¹⁸.while Jastrow¹⁹ observed better intra observer agreement when TVS was used.

We decide 36 to 39 weeks' time to measure the scar integrity as this is the time when decision is taken regarding the mode of delivery. However an opinion varies from 16 weeks⁸, to 28-36¹⁹⁻²¹ weeks regarding when ultrasound can be carried out to assess scar thickness.

A significant association was found between prior vaginal delivery and mode of delivery ($p=0.001$), in our study, Similar finding were reported by Salvatore gizzo et al. 2013¹⁷ in his study. We could not found association with prior vaginal deliveries and prior labor.

A recent study showed significant association among thin lower uterine segment and short inter Caesarean interval, increased maternal age and caesarean performed during labour²³ Najj et al. 2013²⁴ looked for other factors than these such as smoking, infection following a previous CS and the number of previous CSs and found no significant association with thin scar.

There is a strong need that large studies should be done to see the effects of different factors such as interval between deliveries, prior vaginal deliveries, number of previous Caesarean section and prior labor on the status of scar in women with previous caesarean section.

CONCLUSION

A strong correlation between LUS thickness and status of scar at the time of operation was found in our study. Hence we could say that sonographic

measurement of lower uterine segment thickness is reliable tool in assessing the status of scar and deciding which women to be given the trial of vaginal delivery. However, due to some limitations of our study we could not predict the cut off values at which the women with previous Caesarean section can be given a trial of labor.

Conflict Of Interest: None

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