

# Correlation between Inter-pregnancy Interval and Sonographically Measured Lower Segment Caesarean Scar Thickness

FARAH ALMAS<sup>1</sup>, ANJUM TAZEEN<sup>1</sup>, NAVEED ASAD<sup>1</sup>, MEHREEN FATIMA<sup>1</sup>, TALHA LAIQUE<sup>2</sup>

<sup>1</sup>Department of Radiological Sciences and Medical Imaging Technology, University of Lahore, Lahore-Pakistan

<sup>2</sup>Department of Pharmacology, Lahore Medical and Dental College, Lahore-Pakistan

Correspondence to Dr. Talha Laique, Email: talhalaique51@gmail.com Tel:+92-331-0346682

## ABSTRACT

**Background:** Uterine scar rupture is a serious complication of trial of labor after Caesarean section.

**Aim:** To correlate interpregnancy interval & sonographically measured lower segment Caesarean scar thickness.

**Study design:** Analytical, cross sectional.

**Methodology:** Female patients (n=50) were enrolled in present study held at University Ultrasound Clinic, Green Town, University of Lahore as a reference placement for 6 months. Informed consent was taken from all of them. In this study, pregnant women who were gravida 2, with singleton pregnancy having one prior lower segment Caesarean section and the age between 20 and 35 years, were selected for the study. The interpregnancy interval of all women was calculated in months from the date of previous Caesarean section and conception of current pregnancy. Data analyzed by SPSS 22.0v.

**Results:** Out of 50 subjects, 32(64%) females belonged to the group A, with mean scar thickness of  $5.25 \pm 0.54$  mm and 18(36%) females were in the group B, with mean scar thickness of  $3.93 \pm 0.65$  mm. The scar was found to be thicker in women of group A than of group B. The value of Pearson correlation coefficient was  $r = 0.71$  with  $p$ -value =  $0.000 < \alpha = 0.05$ .

**Conclusion:** This study concluded that Sonographically measured lower segment Caesarean scar thickness has significant positive correlation with interpregnancy interval.

**Keywords:** C- section, Lower uterine segment, Inter pregnancy interval, Transabdominal ultrasound

---

## INTRODUCTION

Management of women with prior Caesarean section (CS) becomes difficult when obstetricians have to decide about the mode of delivery in their subsequent pregnancy<sup>1</sup>. Uterine rupture at previous CS scar site is a life threatening complication of trial of labor after Caesarean section (TOLAC)<sup>2</sup>. Although the risk of post CS scar rupture is very low (0.2-1.5%) and the success rate of vaginal birth after Caesarean section (VBAC) is (60-80%), considering its adverse fetomaternal outcomes, the decision of elective repeat Caesarean section has to be made. According to the WHO documents, the rate of Caesarean deliveries should be as low as 10-15% but in recent years it has exceeded the WHO recommendations in many countries<sup>3,4</sup>. To reduce the rate of repeat CS, assessment of scar integrity is important. If the risk of uterine rupture is predicted near term, it could help in the selection of patients for trial of labor<sup>5</sup>.

With the advancement in ultrasound technology, prenatal assessment of scar integrity is possible and with more precise approach, a cut off value of scar thickness may be established beyond which successful VBAC is possible<sup>4,6</sup>.

The post Caesarean uterine scar thickness is significantly influenced by the time interval between the date of previous CS and conception of current pregnancy, defined as interpregnancy interval (IPI). The interval of less than or equal to 18 months is considered as short interpregnancy interval, whereas the IPI of 18-23 months is suggested to be ideal for successful birth outcome<sup>7-10</sup>. A positive correlation has been found between IPI and scar

thickness whereas negative correlation with scar dehiscence or rupture is reported<sup>11</sup>. With the increase in IPI >18 months, the scar thickness is increased with less risk (1%) of uterine rupture, whereas with the decrease in IPI to less than 6 months, thinning of scar is observed with higher risk (3.05%) of scar dehiscence<sup>12,13</sup>. At present there is no agreement on post Caesarean scar thickness above which trial of labor can be given safely<sup>14</sup>.

Due to increasing incidence of this health issue, we planned the current project to correlate IPI and sonographically measured lower segment Caesarean scar thickness. Research is needed to construct standard guidelines for obstetricians in this regard. This will help in making the decision of whether to undergo trial of labor after Caesarean section in case of healed scar or to conduct a planned elective repeat Caesarean section for thin incompletely healed scar, thus preventing adverse fetomaternal consequences of uterine rupture.

The objective of the study was to correlate the interpregnancy interval and sonographically measured lower segment Caesarean scar thickness.

## METHODOLOGY

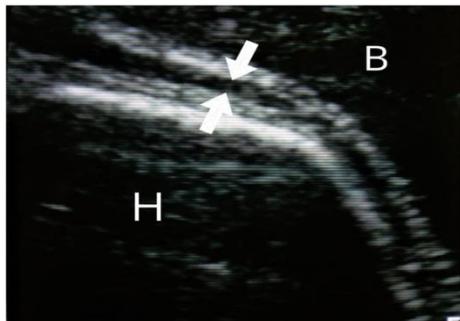
Female patients (n=50) were enrolled in present study held at University Ultrasound Clinic, Green Town, University of Lahore as a reference placement for 6 months. Informed consent was taken from all of them. In this study, pregnant women who were gravida 2, with singleton pregnancy having one prior lower segment Caesarean section and the age between 20 and 35 years, were selected for the study. The interpregnancy interval of all women was calculated in months from the date of previous Caesarean section and conception of current pregnancy. The women were examined by transabdominal ultrasound approach for the

Received on 13-10-2020

Accepted on 23-02-2021

measurement of lower uterine segment Caesarean scar thickness between 30-36 weeks of pregnancy at mean gestational of 31.52±1.68 weeks. With transabdominal approach, full thickness of scar is measured by focusing the thinnest part of lower uterine segment. The scar is measured by placing one cursor at the junction of urinary bladder and uterine wall and the other is placed at the interface of chorioamniotic membrane and amniotic fluid (Figure 1). The vertical bar of the cursor is kept in line with the interfaces<sup>1</sup>. The image was magnified to the level that with minor change in the position of cursor, a distance of only 0.1mm is measured. Average value of 2-3 measurements is taken<sup>15,16</sup>. According to the duration of interpregnancy interval, the recruited women were categorized into two groups, A and B. The group A having an interpregnancy interval of greater than 18 months and the group B with interpregnancy interval of less than or equal to 18 months. The mean scar thickness of the two groups was analyzed.

Figure-1: Sonogram of lower uterine segment showing the measurement of scar thickness between arrows.



**Statistical analysis:** Data analyzed by SPSS 22.0v. Mean±SD was used for age. The mean scar thickness and duration of IPI of group A and group B was analyzed. Independent sample T test was applied to see the

Table-3: Comparison Of Mean Scar Thickness In Both Groups (n=50)

Variables	Categories	Mean difference	Std. Error difference	p-value
Scar Thickness	Equal variances assumed	-1.31979	.17326	<0.000*
	Equal variances not assumed	-1.31979	.18192	

\*Statistically Significant

Table-4: Pearson correlation coefficient between IPI and scar thickness

Variables	Test-applied	Inter Pregnancy Interval	Scar Thickness
Inter-Pregnancy Interval	Pearson Correlation	1	.708**
	Sig. (2-tailed)		.000
	N	50	50

## DISCUSSION

The number of deliveries by Caesarean section is increasing throughout the world. The elective repeat Caesarean section due to the risk of uterine scar rupture is one of the main reasons of rising rate of Caesarean deliveries<sup>17</sup>. VBAC is accepted as a safe obstetrical practice with the success rate of 60%-80%, to reduce the increasing rate of Caesarean section. But trial of labor is associated with a serious complication of uterine scar rupture having adverse fetomaternal outcome. The risk of

rupture is only 0.2%-1.5%, but due to its life-threatening consequences for both mother and the baby, most of the obstetricians remain reluctant for the decision of VBAC and prefer to conduct repeat Caesarean section<sup>4,18</sup>.

## RESULTS

Among 50 enrolled female patients, age with mean±SD was 26.94±3.15 years. The descriptive statistics of all patients were summarized in Table-1.

The mean scar thickness and duration of IPI of group A and group B was analyzed. In this study out of total 50 subject, 32(64%) females belonged to the category A, with mean scar thickness of 5.25±0.54mm, 18(36%) females were in the category B, with mean scar thickness of 3.93±0.65 mm as shown in table-2.

Independent sample T test showed that there is a significant difference of mean scar thickness (p=0.000) in both groups as shown in Table-3.

The value of Pearson correlation coefficient was r=0.71 with p-value=0.000 <α=0.05 as shown in Table-4 depicting significant positive correlation between inter pregnancy interval and the scar thickness. It means as the IPI increases, scar thickness also increases.

Table 1: Descriptive statistics of Quantitative variables (n=50)

Variables	Mean ± SD
Age (years)	26.94 ± 3.15
Gestational age (weeks)	31.5200 ± 1.68111
Inter-pregnancy intervals (months)	25.0000 ± 13.98250
Scar thickness (mm)	4.7780 ± 0.86503

Table-2: Categorization of IPI among enrolled patients (n=50)

Inter-pregnancy intervals (months)	Parameters	
	N (%)	S. Thickness (mm)
>18	32 (64%)	5.25±0.54
13-18	12(24%)	4.241±0.507
7-12	4 (8%)	3.25±0.394
< 6	2 (4%)	2.9±0

dehiscence near term, giving better guidelines for the obstetricians in selecting the women with thick scar as good candidates for trial of labor or to conduct a planned elective Caesarean section for thin incompletely healed scar<sup>6</sup>. Many previous studies discussed the significance of ultrasound in measurement of CS scar thickness in late third trimester of pregnancy, applying both transabdominal and transvaginal ultrasound techniques. But the methods for measurement of scar thickness vary in different studies<sup>4</sup>. In this study we used transabdominal approach to measure the lower uterine segment scar thickness in 50 pregnant women having age between 20 and 35 years at mean gestational age of 31.52±1.68 weeks. We found the mean scar thickness to be 4.78±0.87 mm with minimum and maximum values of 2.90 mm and 6.20 mm respectively. Some past researchers proved the diagnostic accuracy of ultrasound to predict scar dehiscence in subsequent trial of labor and reported that sonographic thinning of the scar is directly related to the risk of scar dehiscence/rupture<sup>3</sup>. However, there is no agreement on the cutoff value of scar thickness above which trial of labor can be offered safely<sup>19,20</sup>. Ejub basic et al., concluded that women should be given a trial of labor if scar thickness is 3-3.5 mm<sup>21</sup>. Peter Uharček et al., compared the sonographic measurements with visual findings at the time of repeat elective Caesarean section and reported the scar thickness less than 2.5mm was highly associated with uterine rupture<sup>22</sup>. Moreover, Rezai et al and Jastrow et al., proved that scar thickness of 3.5 mm at 36-38 weeks is protective against uterine rupture<sup>20,23</sup>.

Several factors are found to be associated with post CS scar thickness including labor prior to previous Caesarean section, uterine incision closure technique and suture material used for stitching. Other factors include, age of the patient, gestational age, estimated fetal weight and interpregnancy interval. Out of these IPI is found to have significant effect on prior CS scar thickness<sup>7</sup>.

The interpregnancy interval is defined as the time interval between one birth outcome and conception of the subsequent pregnancy. For successful birth outcomes the ideal IPI is suggested to be 18-23 months<sup>9</sup>. The duration of short IPI is reported as less than or equal to 18 months, and long IPI more than 5 years<sup>10</sup>. With short IPI the possibility of uterine scar rupture is increased to an extent of about 1.1 and 6.6 times with a percentage value of (0.1% - 0.5%) and chances of dehiscence increased to (0.5%-1.5%)<sup>24</sup>. Esposito et al. and Anadeep Chandi et al., proposed that women with one prior Caesarean section having an IPI of > 18 months had thick scar and more successful outcomes of trial of labor<sup>4,12</sup>. Stamilio et al., reported that with the increase in IPI >18 months, there is an increase in scar thickness and less risk (1%) of uterine rupture, whereas decrease in IPI < 6 months resulted in thinning of scar and higher risk (3.05%) of scar dehiscence<sup>13</sup>.

This study was designed to correlate inter pregnancy interval and sonographically measured lower segment Caesarean scar thickness. Our findings are comparable with above quoted statistics. In our study out of total 50 subject 32(64%) females belonged to the category of IPI >18 months with mean scar thickness of 5.25±0.54mm. 18(36%) females were in the category of IPI ≤18 months

with mean scar thickness of 3.93±0.65 mm comparable with the scar thickness of less than 3mm in women having inter-delivery interval of less than 18 months observed in the study of Sharma et al<sup>3</sup>. In our study the mean scar thickness observed from the data of group having IPI >18 months was 5.25±0.54 mm, which is greater than the mean scar thickness of 3.93±0.65 mm observed in group with IPI≤18 months. The value of Pearson correlation coefficient was r=0.708 with p-value =0.000 <α =0.05 showing significant positive correlation between inter pregnancy interval and the scar thickness. It means as the IPI increases, scar thickness also increases.

Various studies discussed short IPI in relation to failed trial of labor after Caesarean section due to impending scar dehiscence. Post Caesarean healing of uterine scar requires adequate time and short interpregnancy interval results in impaired healing and strength of scar<sup>25</sup>. So appropriate selection of patients for trial of labor after CS is necessary for successful outcome. The obstetricians must take IPI into account during preconception counselling for the patients with previous Caesarean delivery. Currently awareness regarding birth spacing and consequences of short IPI is needed at individual and community level to reduce fetomaternal morbidity and mortality.

At present there are no standard guidelines for obstetricians to be followed about the mode of delivery in pregnant women with history of prior Caesarean section in relation to IPI. Sonographic evaluation of previous CS scar is an easy and useful diagnostic approach in the assessment of integrity of scar to provide standard guidelines for obstetricians in this regard<sup>6</sup>. Observations of present study verify the fact that sonographically measured thickness of post Caesarean scar correlates with interpregnancy interval. It can be used as a reliable method for the decision of mode of delivery in women with previous Caesarean section.

## CONCLUSION

This study concluded that sonographically measured lower segment Caesarean scar thickness has significant positive correlation with inter pregnancy interval.

**Author's contribution:** FA: Overall supervision, write up and literature review. AT & NA: Statistics application analysis literature review, help in write up. MF & TL: Literature review help in write-up.

**Acknowledgements:** I am thankful to Allah and my colleagues who made it possible for me.

**Conflict of interest:** None

**Funding:** None

## REFERENCES

1. Satpathy G, Kumar I, Matah M, Verma A. Comparative accuracy of magnetic resonance morphometry and sonography in assessment of post-caesarean uterine scar. *The Indian Journal of Radiology & Imaging*. 2018;28(2):169.
2. Kumar I, Verma A, Matah M, Satpathy G. Utility of multiparametric MRI in caesarean section scar characterization and preoperative prediction of scar dehiscence: a prospective study. *Acta Radiologica*. 2017;58(7):890-6.
3. Sharma C, Surya M, Soni A, Soni PK, Verma A, Verma S. Sonographic prediction of scar dehiscence in women with previous cesarean section. *The Journal of Obstetrics and Gynecology of India*. 2015;65(2):97-103.

4. Chandi A, Sirohiwal D, Yadav S. Trial of labor in patients with previous caesarean delivery and significance of scar thickness and inter-caesarean interval. *BAOJ Gynaecology*. 2016;1(004).
5. Mohammed AB, Al-Moghazi DA, Hamdy MT, Mohammed EM. Ultrasonographic evaluation of lower uterine segment thickness in pregnant women with previous cesarean section. *Middle East Fertility Society Journal*. 2010;15(3):188-93.
6. Sumbul, Ali HS, Jaffer M. Correlations between sonographically measured lower segment scar thickness and actual incision site scar status after repeated caesarean section. *Isra Medical Journal*. 2017;9(5): 314-19.
7. Gizzo S, Zambon A, Saccardi C, Patrelli TS, Di Gangi S, Carrozzi M, et al". Effective anatomical and functional status of the lower uterine segment at term: estimating the risk of uterine dehiscence by ultrasound. *Fertility and sterility*. 2013;99(2):496-501.
8. Bérubé L, Ariel M, Gagnon G, Brassard N, Boutin A, Bujold E. Factors associated with lower uterine segment thickness near term in women with previous caesarean section. *Journal of Obstetrics and Gynaecology Canada*. 2011;33(6):581-7.
9. Bigelow CA, Bryant AS. Short interpregnancy intervals: an evidence-based guide for clinicians. *Obstetrical & Gynecological Survey*. 2015;70(7):458-64.
10. Ashfaq M, Mateen A, Mateen H, Hanif A. Frequency of short interpregnancy interval in females with preterm birth. *Pakistan Journal of Medical & Health Sciences*. 2017;11(2):582-4.
11. EL Gharib MN, Awara AM. Ultrasound evaluation of the uterine scar thickness after single versus double layer closure of transverse lower segment caesarean section. *Journal of Basic and Clinical Reproductive Sciences*. 2013;2(1):42-5.
12. Esposito MA, Menihan CA, Malee MP. Association of interpregnancy interval with uterine scar failure in labor: a case-control study. *American Journal of Obstetrics and Gynecology*. 2000;183(5):1180-3.
13. Stamilio DM, DeFranco E, Paré E, Odibo AO, Peipert JF, Allsworth JE, et al". Short interpregnancy interval: risk of uterine rupture and complications of vaginal birth after cesarean delivery. *Obstetrics & Gynecology*. 2007;110(5):1075-82.
14. Jastrow N, Chaillet N, Roberge S, et al". Sonographic lower uterine segment thickness and risk of uterine scar defect: a systematic review. *Journal of Obstetrics Gynaecology Canada*. 2010;32:321–7.
15. Cheung VY. Sonographic measurement of the lower uterine segment thickness in women with previous caesarean section. *Journal of Obstetrics and Gynaecology Canada*. 2005 Jul;27(7):674-81.
16. Bujold E, Jastrow N, Simoneau J, et al". Prediction of complete uterine rupture by sonographic evaluation of the lower uterine segment. *American Journal of Obstetrics and Gynaecology*. 2009; 201:320.
17. Tahseen S, Griffiths M. Vaginal birth after two caesarean sections (VBAC- 2)—a systematic review with meta- analysis of success rate and adverse outcomes of VBAC- 2 versus VBAC- 1 and repeat (third) caesarean sections. *BJOG: An International Journal of Obstetrics & Gynaecology*. 2010;117(1):5-19.
18. Yeh J, Wactawski-Wende J, Shelton JA, Reschke J. Temporal trends in the rates of trial of labor in low-risk pregnancies and their impact on the rates and success of vaginal birth after cesarean delivery. *American Journal of Obstetrics and Gynecology*. 2006 ;194(1):144-e1.
19. Sen S, Malik S, Salhan S. Ultrasonographic evaluation of lower uterine segment thickness in patients of previous cesarean section. *International Journal of Gynaecology and Obstetrics*. 2004;87(3):215-9.
20. Jastrow N, Antonelli E, Robyr R, Irion O, Boulvain M. Inter- and intraobserver variability in sonographic measurement of the lower uterine segment after a previous Cesarean section. *Ultrasound in Obstetrics and Gynecology: The Official Journal of the International Society of Ultrasound in Obstetrics and Gynecology*. 2006;27(4):420-4.
21. Basic E, Basic-Cetkovic V, Kozaric H, Rama A. Ultrasound evaluation of uterine scar after cesarean section. *Acta Informatica Medica*. 2012;20(3):149.
22. Uharček P, Brešťanský A, Ravinger J, Máňová A, Zajacová M. Sonographic assessment of lower uterine segment thickness at term in women with previous cesarean delivery. *Archives of Gynaecology and Obstetrics*. 2015;292(3):609-12.
23. Rezaei S, Labine M, Gottimukkala S, Karp S, Sainvil L. Trial of labor after cesarean (TOLAC) for vaginal birth after previous cesarean section (VBAC) versus repeat cesarean section: A review. *Obstetrics and Gynecology International Journal*. 2016;4(6):00135.
24. Thomas A, Rebekah G, Vijayaselvi R, Jose R. Transvaginal ultrasonographic measurement of lower uterine segment in term pregnant patients with previous caesarean section. *Open Journal of Obstetrics and Gynaecology*. 2015;5(11):646.
25. Landon MB. Predicting uterine rupture in women undergoing trial of labor after prior cesarean delivery. In *Seminars in Perinatology* 2010;34(4):267-271.