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## RESEARCH ARTICLE

### COMPARISON OF PREOPERATIVE AND INTRAOPERATIVE EVALUATION OF LOWER UTERINE SEGMENT CESAREAN SCAR

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#### ABSTRACT

**Objectives:** To study Lower Uterine Segment cesarean scar using transabdominal ultrasound and clinical parameters in previous cesarean section antenatally at term. To study the physical nature of scar at repeat section and find the association between preoperative and intraoperative evaluation.

**Methods:** This was a cross sectional observational study undertaken in VMMC & SJH, New Delhi. One twenty six women with previous cesarean section were enrolled in the study to evaluate the correlation between clinical and ultrasonographic parameters determined antenatally with the physical nature of scar intraoperatively.

**Results and Conclusions:** In the study, the women with ICP $\leq$ 2 years, had significantly weaker scar (grade III/IV=55.56%). In women with post operative wound sepsis in previous LSCS, especially the one's who underwent healing of wound by secondary intention were found to have a higher incidence of weaker scar (grade III/IV=33.4%). A higher percentage of weaker scar, i.e. 34.7% was found in women with maternal tachycardia  $>100$  per minute and 88.89% in women with scar tenderness in peripartum period. Using the ROC curve a cut off of 2.4mm was derived for LUS USG scar thickness. Association of TAS USG LUS scar thickness and per operative grade of scar was found to be significant ( $p=0.0003$ ). The study revealed a short ICP $\leq$ 2 years, healing of previous scar by secondary intention, pulse rate $>100$ , scar tenderness, scar thickness $<2.4$ mm, adversely affect the scar, recommending avoidance of TOLAC in such cases. Scar thickness should be measured routinely using TAS USG.

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#### INTRODUCTION

Lower Segment Caesarean Section (LSCS) is one of the common surgical procedures done worldwide in obstetric practice (Shrestha, 2015). The rate of LSCS are increasing worldwide, thus creating an expanding high risk obstetric sub-population "Women with scarred uterus (Gyamfi *et al.*, 2004; Martel *et al.*, 2004). As such, vaginal birth after cesarean (VBAC) has become an integral component of modern obstetrics, however, it remains a controversial issue due to the associated risk of uterine rupture, with the associated serious and potentially life threatening fetal and maternal consequences (Mohammed, 2010).

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It is generally considered that, among carefully selected patients who have full participation in decision making, most pregnant females with one previous LSCS are suitable candidates for VBAC and should be offered a trial of labor (Martel, 2004; ACOG, 2004). But to establish the efficacy and safety of VBAC, there are no reliable methods to predict the risk of uterine rupture in this group of women. It has been suggested that risk of rupture in a defective LSCS scar is related directly to the thinning of lower uterine segment (LUS) (Mohammed *et al.*, 2010). This emphasises the significance of evaluation of the LSCS scar to predict optimal fetomaternal outcome. A number of modalities have been used to evaluate the LUS after LSCS, like hystero-graphy of uterine scar, per vaginal exploration of lower uterine segment scar, amniography, X-ray pelvimetry but none of them was proved to be useful in estimating the risk of uterine rupture (Indira,

2014). Out of these ultrasonography (USG) provides a fairly simple and non invasive method, which has been most widely studied for evaluation of the LUS to assess the critical thickness above which safe vaginal delivery is predictable and safe (Mohammed, 2010).

## MATERIALS AND METHODS

This was a cross sectional observational study conducted in department of Obstetrics and Gynaecology, VMMC and Safdarjung hospital after being approved by ethical committee of hospital. One hundred and twenty six pregnant women coming to Safdarjung hospital for delivery and undergoing repeat cesarean section (C/S) were included in the study. Patients excluded were polyhydramnios, twin pregnancy, anterior placenta, previous uterine surgery other than lower uterine segment C/S including myomectomy, polypectomy, lysis of uterine synechae, hysteroscopic metroplasty and classical caesarean section. Thorough counselling was done and written informed consent from females participating in study was taken. A detailed obstetric history was taken with special reference to number and indication of previous cesarean section, place of LSCS, per op and post op complications including periparturient sepsis or wound infections, interconception period and fetal outcome. Previous records, if available, were reviewed for type of incision, single vs double layer closure, any history of post operative sepsis and whether the patient was in labour at the time of LSCS.

A history of vaginal delivery before or after LSCS was specifically asked for. Comprehensive general and local (per abdomen and per vaginal) examination was carried out. A transabdominal ultrasound scan to evaluate the lower uterine segment scar was done, using Toshiba's model SSA640 A with 3-5 MHz probe. The thinnest zone of the lower segment was identified visually at the midsagittal plane along the cervical canal. This area was magnified to the extent that any slight movement of the caliper would produce a change in measurement by only 0.1 mm. The measurement was taken with the cursors at the urinary bladder wall-myometrium interface and the myometrium/chorioamniotic membrane-amniotic fluid interface. At least 2 measurements were made, and the lowest value taken as the LUS thickness.

Further obstetric management was done according to institutional protocol. Those pregnant women undergoing repeat C/S were evaluated intraoperatively for the physical nature of scar and categorized into four groups, in accordance to Qureshi *et al.* (1997) Class 1: well developed LUS, Class 2: thin LUS, content not visible, Class 3: translucent LUS, content visible, Class 4: well-circumscribed defect, either dehiscence or rupture present in the LUS. Those delivering vaginally and having a normal post natal period were presumed to have a normal previous cesarean scar (grade 1 and 2). The fetal outcome was noted in all the cases. The women were followed until they were discharged from the hospital for any further complications.

### Statistical analysis

Categorical variables were presented in number and percentage (%) and continuous variables were presented as mean  $\pm$  SD and median. Qualitative variables were correlated using Chi-Square test /Fisher's exact test. Receiver operating characteristic curve was used to find out cut off point of USG LUS Thickness and interpregnancy interval for predicting scar

dehiscence. A p value of  $<0.05$  was considered statistically significant. The data was entered in MS EXCEL spreadsheet and analysis was done using Statistical Package for Social Sciences (SPSS) version 21.0.

## RESULTS

Mean age of population was 26.95-/+4.37 years; most, i.e. 47.62% of the women were in the age group 26-30 years, while 3.17% were  $>35$  years. A total of 80.16 % females had single previous LSCS, 18.25% had 2 previous LSCS and 1.59% had previous 3 LSCS. Most i.e. 94.4% of the subjects had no previous vaginal delivery. The range of scar thickness varied from 1.4 to 7mm.

As shown in table 1, the association between ICP and per-op. grade of scar was statistically significant ( $p=0.049$ ). In the study, as per table 2, history of post operative wound sepsis was found to be significantly associated with a thinner per operative scar ( $p=0.002$ ). Table 3 shows, Intrapartum tachycardia was found to be significantly associated with poor per operative grade of scar (III/IV). ( $p=0.001$ ) Scar tenderness was also found to be significantly associated with scar dehiscence /rupture ( $p<0.0001$ ). Table 4 shows the highest proportion of per-op. scar of grade III(dehiscence) was seen in women with USG LUS  $\leq 2.5$ mm i.e. 85.71%, followed by 14.29% in 2.6-3mm; no case of scar grade III was found in women with USG LUS  $>3$ mm. The difference was statistically significant ( $p=0.0003$ ). Per-op. scar grade IV (rupture) was seen in 2.85% (1/35) cases with USG LUS thickness of 2.5-3mm. Using ROC curve, TAS USG for LUS thickness, at a cutoff value of 2.4 mm, the sensitivity, specificity, and positive (PPV) and negative (NPV) predictive values were 86.67%, 85.59%, 44.82% and 97.93% respectively. At a cutoff value of 2 years for ICP, the sensitivity, specificity, and positive (PPV) and negative (NPV) predictive values were 53.33%, 82.88%, 29.61% and 92.93% respectively.

## DISCUSSION

In women with ICP  $< 18$  months, 22.22% had peroperative grade III scar (scar dehiscence), while in those with ICP between 18-24 months, 27.78% had grade III: amongst females with ICP 25-36 months and  $>36$  months, 6.82 % and 7.27% had grade III scar peroperatively, respectively. The association was statistically significant ( $p=0.049$ ). A higher proportion of women in the latter group had peroperative scar grade III and IV as compared to the former i.e. 33.4% vs none. The association was statistically significant with  $p=0.002$ . However, in contrast, Gupta S *et al* reported that the success rate of VBAC in women with history of post-op wound infection in previous LSCS did not differ from those who had no such history (71.4 vs. 64.5 %, respectively,  $p = 0.72$ ).<sup>8</sup>The present study reported a significant association between intrapartum tachycardia and poor per-op. grade of scar observed (grade III/IV)  $p=0.001$ . A higher proportion i.e. 34.7% of women with intrapartum pulse rate  $> 100$  had preoperative scar grade III/IV, as compared to women with pulse rate  $< 100$ , in which only 6% had grade III scar and none had grade IV scar. However, in a study conducted by Gaikwad H *et al* in SJH, maternal tachycardia was not a significant predictor of scar complications in labor ( $p$ -value=0.2), being nearly equally present in cases with and without scar complications (15 vs. 22).

**Table 1. Association of interconceptional period (ICP) with per op grade of scar**

Interconceptional period (months)	Per op grade of scar				P value
	Grade 1	Grade 2	Grade 3	Grade 4	
<18 (n=9)	0 (0.00%)	7 (77.78%)	2 (22.22%)	0 (0.00%)	0.049
18-24 (n=18)	0 (0.00%)	12 (66.67%)	5 (27.78%)	1 (5.56%)	
25-36 (n=44)	3 (6.82%)	38 (86.36%)	3 (6.82%)	0 (0.00%)	
>36 (n=55)	1 (1.82%)	50 (90.91%)	4 (7.27%)	0 (0.00%)	
Total (n=126)	4 (3.17%)	(84.92%)	14 (11.11%)	1 (0.79%)	

**Table 2. Association of post operative wound sepsis with per-op grade of scar**

Post operative complications		Per operative grade of scar				P value
		Grade 1	Grade 2	Grade 3	Grade 4	
Yes	No (n=119)	4 (3.36%)	102 (85.71%)	13 (10.92%)	0 (0.00%)	0.002
	Resuturing (n=1)	0 (0.00%)	1 (100.00%)	0 (0.00%)	0 (0.00%)	
	Secondary intention (n=6)	0 (0.00%)	4 (66.67%)	1 (16.67%)	1 (16.67%)	
	Total (n=126)	4 (3.17%)	107 (84.92%)	14 (11.11%)	1 (0.79%)	

**Table 3. Association of intrapartum factors (pulse rate and scar tenderness) with per operative grade of scar**

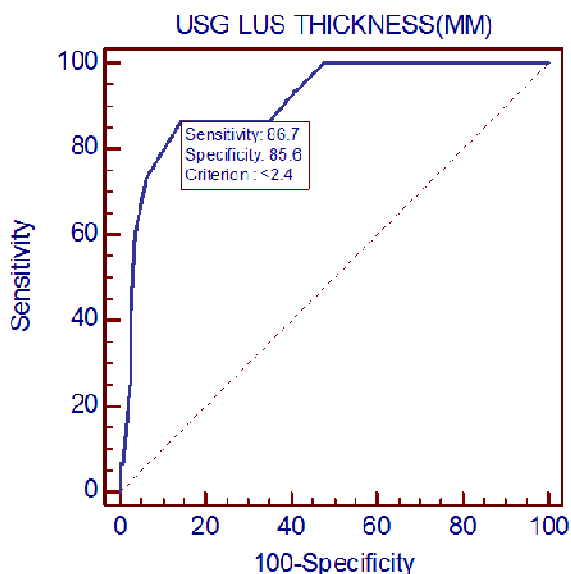
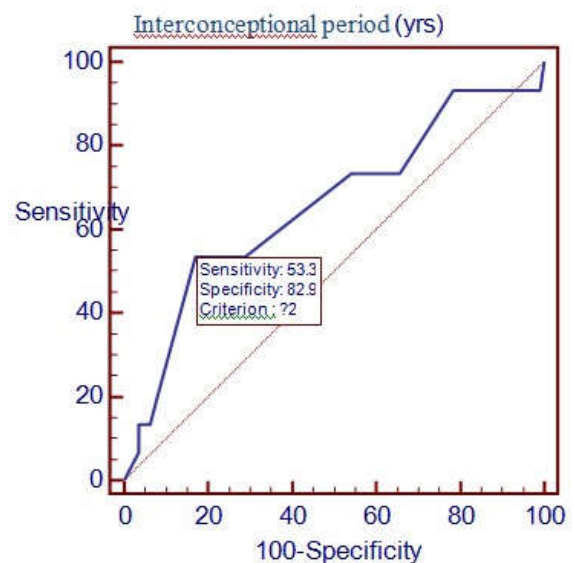
		Per operative grade of scar				P value
		1	2	3	4	
predelivery pulse rate(per minute)	≤100(n=100)	3(3.00%)	91(91.00%)	6(6.00%)	0(0.00%)	0.001
	>100(n=26)	1(3.85%)	16(61.54%)	8(30.77%)	1(3.85%)	
scar tenderness	No (n=117)	4(3.42%)	106(90.60%)	7(5.98%)	0(0.00%)	<.0001
	Yes (n=9)	0(0.00%)	1(11.11%)	7(77.78%)	1(11.11%)	
Total	(n=126)	4(3.17%)	107(84.92%)	14(11.11%)	1(0.79%)	

**Table 4. Association of USG LUS scar thickness and per operative grade of scar**

Per op grade of scar		USG LUS thickness(mm)				P value
		<2 (n=2)	2-2.5 (n=35)	2.6-3 (n=48)	>3 (n=41)	
1 (n=4)	0 (0.00%)	0 (0.00%)	1 (25.00%)	3 (75.00%)	0.0003	
	2 (n=107)	1 (0.93%)	23 (21.50%)	45 (42.06%)		38 (35.51%)
	3 (n=14)	1 (7.14%)	11 (78.57%)	2 (14.29%)		0 (0.00%)
	4 (n=1)	0 (0.00%)	1 (100.00%)	0 (0.00%)		0 (0.00%)

Overall tachycardia was present in 57.6% women with scar complications (Gaikwad *et al.*, 2016). The present study found a highly significant association was found between scar tenderness and per-op. grade of scar ( $p < 0.0001$ ). In women having intrapartum scar tenderness, 77.78% had grade III scar preoperatively and 11.11% had grade IV.

These proportions were significantly higher as compared to those without scar tenderness in which only 5.98% had grade III scar and none had grade IV scar. In the present study, the highest proportion of per-op. scar of grade III (dehiscence) was seen in women with USG LUS  $\leq 2.5$ mm i.e. 85.71%, followed by 14.29% in 2.6-3mm; no case of scar grade III was found in women with USG LUS  $> 3$ mm.

**Figure 1. Receiver operator characteristic curve for Trans abdominal ultrasound (TAS USG)****Figure 2. Receiver operator characteristic curve for Interconceptional period (ICP)**

The difference was statistically significant ( $p=0.0003$ ). Per-op. scar grade IV (rupture) was seen in 2.85% (1/35) cases with USG LUS thickness of 2.5-3mm; this case had history of two previous cesarean sections. Similar observations have been made by Mangla *et al* who reported that the 1 case of per-operative rupture (grade IV) had pre-operative LUS scar thickness of 1mm, while 5 cases which had scar dehiscence (grade III) had TVS measured scar thickness in the range of 1-2 mm (Mangla, 2016). The critical cut off value for safe LUS thickness measured by TAS observed in the present study was 2.4mm. The sensitivity, specificity, and positive (PPV) and negative (NPV) predictive values were 86.67%, 85.59%, 44.82% and 97.93% respectively. This observation is similar to those of Mohammad *et al* and Sen *et al* who reported a cut off value of 2.5mm in Egyptian and Indian females with previous LSCS, respectively (Mohammed, 2010; Sen *et al.*, 2004).

## Conclusion

- Per-op. evaluation of LUS by TAS should be carried out at term in all women with previous LSCS.
- Women with short ICP should not be offered trial of labour.
- Women with history of wound sepsis, specially those in which wound healed by secondary intention, after previous LSCS, should be counseled against TOLAC. In women who have post LSCS wound sepsis, resuturing should be offered after control of infection, rather than allowing the wound to heal by secondary intention, as this leads to a thinner scar.
- All women with previous LSCS, should be strictly monitored for maternal tachycardia and scar tenderness during intrapartum period. Development of any of these 2 parameters should raise a high index of suspicion of risk of scar dehiscence/ rupture.
- A critical cut off of 2.4mm of LUS thickness by TAS USG can be considered reasonably safe for trial of vaginal delivery, provided there are no other risk factors.

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