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Original Research Article

Ultrasound evaluation of caesarean section uterine scar and its correlation to intraoperative scar thickness

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ABSTRACT

Background: The number of caesarean sections performed has skyrocketed in recent decades. The most frequent indication for a caesarean section is a previous caesarean birth. The goal of the current study was to compare the lower uterine scar thickness in pregnant with history of previous caesarean delivery as determined by sonography with the actual scar condition at the time of surgery.
Methods: The study involved 100 pregnant women between gestational age of 35 completed weeks and 38 weeks with history of previous caesarean delivery and were attended to OPD for antenatal checkups in the department of obstetrics and gynaecology, SCBMCH, over a period of one year from 1st June 2019 till 31st June 2020. Who underwent transabdominal ultrasonography. The lower uterine segment [LUS] thickness was measured by measuring the interphases between the myometrium, the Chori amniotic membrane, and the bladder wall. The patients were followed up and correlated ultrasound findings of lower uterine segment thickness with intra-operative finding of lower uterine segment thickness. Pearson correlation is the statistical method used to measure correlation.
Results: Correlation of ultrasound scar thickness and intra-operative scar thickness was evaluated by correlation coefficient (r value) i.e., 0.405 and p value i.e., 0.001.
Conclusion: According to the current study, decreased uterine scar thickness, as determined by sonography, is a reliable indicator of scar defect in women who have had prior caesarean operations. Thus, sonographic measurement of the thickness of the lower uterine segment can properly assess scar status and the choice to offer women a trial of vaginal birth and precautions can be taken.

Keywords: Lower uterine segment, Sonography, Scar thickness, Caesarean section, Interpregnancy interval

INTRODUCTION

During the last quarter of the 20th century in particular, caesarean section rates increased worldwide. Continued improvement in anaesthetic techniques along with the emergence of specialists in obstetric anaesthesia has greatly increased the effectiveness and safety of this component of caesarean delivery. Improvements in blood transfusion, antibiotics and thromboprophylaxis have increased the perioperative safety. Improved surgical techniques have reduced not only the immediate perioperative complications of caesarean section, but also lessened the risks in subsequent pregnancy.[1] Advanced maternal age, infertility and assisted reproductive technologies have led to a rise in the number of so-called 'premium' pregnancies. These women also tend to have more complications in pregnancy and labour. Although not common there is an increasing demand on the part of some women for elective delivery by caesarean section for what regards as trivial clinical or social reasons. These may include a fear of labour and vaginal delivery, and the perceived benefits of reducing or eliminating rare fetal risk

in labour and long-term sequelae of pelvic floor damage. Dramatic advances in neonatal care and outcome have lowered the gestational age at which intervention for fetal indications is appropriate. Caesarean delivery rates are increasing nationally in India. The 2015-2016 India National Family Health Survey (NFHS-4) estimates that 17.2% of all births nationwide are delivered by caesarean.[2] The estimated rates by rural and urban residence are 12.9% and 28.3%, respectively. Since 2015-16, the rate of Caesarean sections has increased, from 17% to 22% in 2019-21 according to the India National Family Health Survey (NFHS-5).3 The estimated rates by rural and urban residence are 32.3% and 17.6% respectively. Antenatal care (ANC) and delivery care services are the key components of safe motherhood. ANC services help pregnant woman and her family to interact with the formal health care system.

The women who had gone for full ANC are significantly more likely to have an emergency caesarean section. This may not because of the ANC that caesarean is more, but it may be because those having more number of ANC visits may be more likely to have delivery related complications and hence substantially larger proportion of them might have gone for voluntary or emergency C section deliveries in India.[4] The main concern in cases of pregnancy with previous caesarean section are uterine scar rupture, abnormal placentation, scar dehiscence, shock ,maternal mortality, difficulty in opening abdomen, difficulty in separation of bladder.[5]

Prior evaluation of uterine scar thickness by ultrasonography associated with mode of delivery and outcome.[6] Ultrasound is an effective method to monitor the defect closely throughout pregnancy to help predict uterine rupture or neonate complications.[7] Ultrasound evaluation of position of placenta and prior detection of placenta previa, acreta helps in reducing the postpartum haemorrhage, intraoperative complications, maternal mortality.

METHODS

This study involved 100 pregnant women between gestational age of 35 completed weeks and 38 weeks with history of previous caesarean delivery and were attended to OPD for antenatal checkups in the department of obstetrics and gynaecology, SCBMCH, over a period of one year from 1st June 2019 till 31st June 2020.

Inclusion criteria

Women who are single-ton pregnant, have a history of single caesarean sections, are between 36- and 40-weeks' gestation.

Exclusion criteria

Women who have finished all previous pregnancies vaginally. Less than 35 weeks of gestation. Ladies who have undergone uterine surgery in the past due to unidentified scars or other causes.

Study tool

Before the ultrasonographic examination, a performa comprising questions regarding the mother's age, history of pregnancy, indication for the previous caesarean section, number of previous vaginal births, and inter-delivery interval was completed. A trans abdominal ultrasound of the lower uterine region was performed between 36 and 40 weeks of pregnancy using a Toshiba colour doppler ultrasound machine (Model SSA-340a, Toshiba, Japan). A convex array transducer running at 3.75 MHz was used in ultrasonography. The test was stopped if a contraction was felt during it, and it was resumed when it passed.

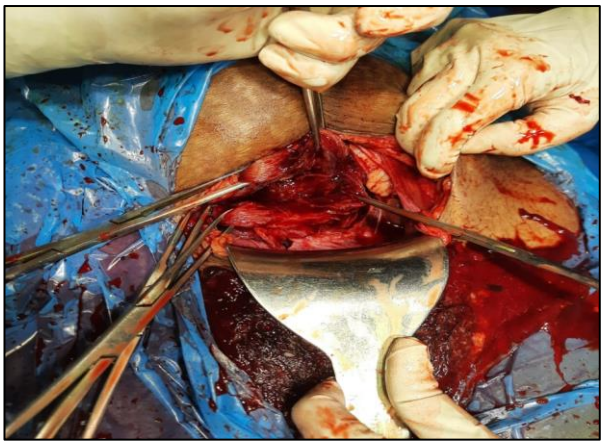

Figure 1: Healthy lower uterine segment.

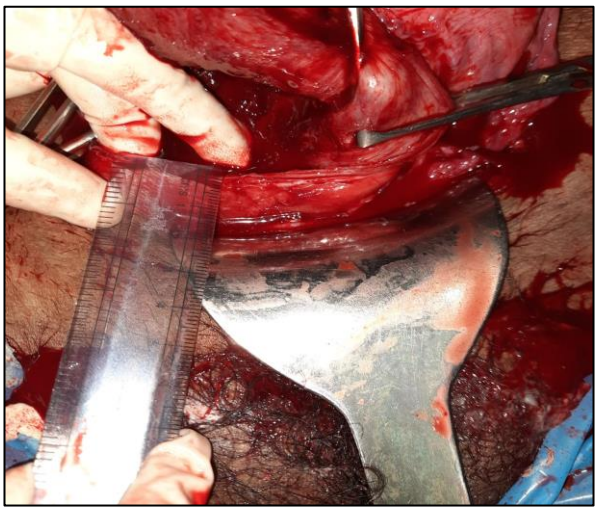

Figure 2: Extremely thinned out <2 mm.

To measure the thickness of the scar, a full sonographic examination of the lower uterine area was carried out with the bladder slightly dilated. The thickness of the scar was graded in millimetres, starting at normal: 3-3.5 mm, moderately thin 2-3 mm, extremely thin <2mm. To limit

and prevent interobserver variations, the research was carried out by a single senior sonologist using standard standards. Until the caesarean section, the people were under observation. Second, the scar thickness was measured during the repeat caesarean operation using measuring scale. From the data collected, by using Pearson correlation test is used to calculate the correlation between ultrasound scar thickness and intraoperative scar thickness.

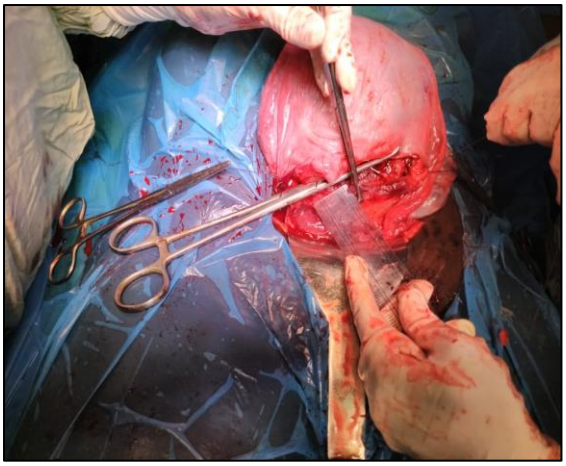

Figure 3: Moderately thinned out 2-3 mm.

Ethical approval

The study was approved by the institutional ethics committee.

RESULTS

In the present study, 100 obstetric patients with previous history of caesarean deliveries admitted. In all cases through history taking and clinical examination was done. Lower uterine scar thickness was measured by ultrasound. They were followed up until repeat caesarean section and intra-operative findings were observed. Results thus obtained were analysed and expressed in tablets.

Table 1: Age distribution of patients (n=100).

Age (in years)	No. of patients	Percentage
<19	3	3
20-24	21	21
25-30	59	59
31-35	15	15
36-40	2	2

76% of women were aged more than 25 years. 17% of women were aged more than 31 years.

Most common indication for previous caesarean section was oligohydramnios 29% in this study. Others includes twin pregnancy, infertility, antepartum haemorrhage 4%.

Table 2: Indication for the previous caesarean section for selected patients in this study.

Indication of previous caesarean delivery	No. of patients	Percentage
Oligohydramnios	29	29
CPD	18	18
NPL	22	22
Fetal distress	9	9
PIH	6	6
Obstructed labour	3	3
Abnormal lie	9	9
Others	4	4

Table 3: Birth spacing between previous pregnancy and current pregnancy.

Birth spacing (in years)	No. of patients	Percentage
<2	4	4
2-3	31	31
3-5	44	44
>5	21	21

In patients with birth spacing less than 2 years, 1 patient had uterine rupture with fetal mortality. Out of 31 patients with 2-3 years of birth spacing 3 patients had scar rupture and scar dehiscence. Out of 65 patients with more than 3 years of birth spacing only 4 patients had scar rupture.

Table 4: Ultrasound measurement of scar thickness.

Ultrasound scar thickness	No. of patients	Percentage
Normal (>3 mm)	53	53
Moderately thin (2-3 mm)	42	42
Extremely thin (<2 mm)	2	2
Couldn't measured	3	3

In 100 patients it was seen that 18 cases had anterior placenta, 5 cases had low lied placenta and observed that no placental vascularity encroaching to lower uterine segment.

Out of 100 patients in whom caesarean section was performed 7 cases had abnormal placentation. In that placenta praevia -2, placenta accrete-2, placenta increta-1, placenta percreta-1 and in these 7 patients 4 had postpartum hysterectomy including 1 maternal mortality.

The association between the sonographically measured scar thickness and the actual observed scar findings at the time of surgery is depicted in Figure 3. Correlation of ultrasound scar thickness measurement and intra-operative scar thickness was evaluated by correlation coefficient (r

value) i.e., 0.405 and p value i.e., 0.001*. which is significant.

Table 5: Intra-operative scar findings.

Intra-operative scar thickness	No. of patients	Percentage
Normal scar(>3mm)	39	39
Moderately thin (2-3 mm)	24	24
Extremely thin (<2 mm)	25	25
Scar dehiscence	2	2
Scar/uterine rupture	8	8
Couldn't measured	2	2

Table 6: Result of correlation.

Correlation	Correlation coefficient (R value)	P value
Intra op scar thickness-USG scar thickness	0.405	0.001

*pearson correlation test

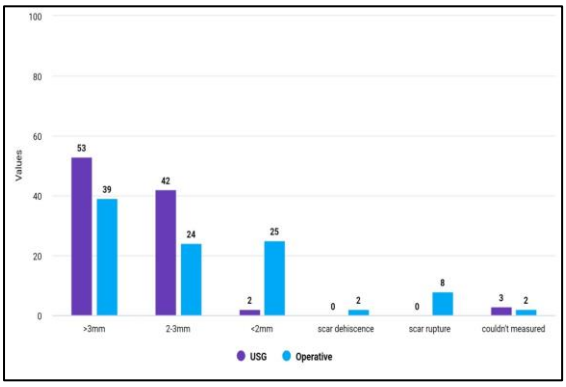

Figure 4: Lower uterine segment thickness findings in USG and intraoperative.

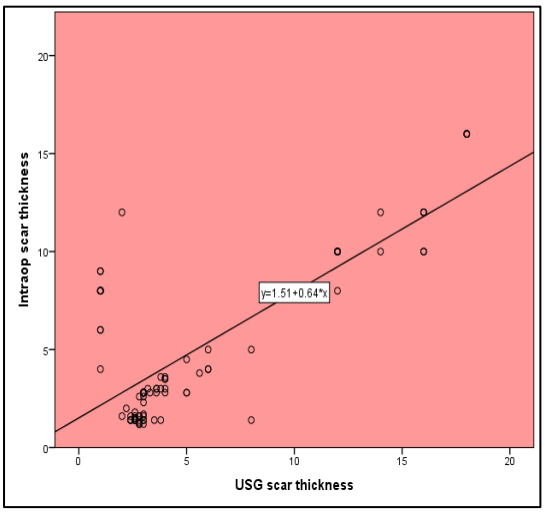

Figure 5: Correlation.

DISCUSSION

In the study conducted by Ghayath Janoudi et al concluded that the prevalence of previous caesarean section, primiparity, conception by means of assisted reproductive technology, chronic hypertension, gestational diabetes, diabetes mellitus, preeclampsia increased with advancing maternal age, yet mothers aged more than 35 with one or more health conditions and obstetrical complications had higher CS rates than mothers aged 20-34 with same conditions.[8] In the present study women 76% of women were aged more than 25 years and 17% of women were aged more than 31 years.

In the study conducted by Roberto Matorrus the analysis was, the uterine rupture rate can be modelled by a formula corresponding to a hyperbolic curve. There was no clear cut-off in uterine rupture in relation to Caesarean section-pregnancy interval (CSPI) i.e., birth spacing. The curve showed a sharp decrease in uterine rupture until the 10th month of CSPI (uterine rupture rate 0.7%), then a moderate and steady decrease until the 40th month (uterine rupture rate 0.4%) and afterwards a very mild decrease.[9] In study conducted by Heta T. Jani et al wo groups of pregnant women were considered.[10] 70 pregnant women with an interpregnancy interval of ≤18 months after previous delivery were included in the study. For controls, 70 pregnant women with an Interpregnancy Interval between ≥19 months to ≤59 months as normal interpregnancy interval, were included in the study. In those 34 pregnant women with short IPI and 18 pregnant women with NIPI, in those 24 pregnant women with short IPI had Scar dehiscence/tenderness and 4 pregnant women with NIPI had scar dehiscence/tenderness. In present study out of 100 pregnant women ,35 women with IPI less than 3 years and 65 women with IPI more than 3 years. Higher proportion of patients with short IPI had Scar dehiscence/scar rupture.

In study conducted by S Momon Singh et al the incidence of primary CS in emergency and elective cases was 74.7% and 25.3% respectively. Maternal and fetal indications contributed 44% and 56% of the total cases respectively. Fetal distress (26.7%), malpresentation (18.7%) and failed induction (14.7%) for various co-morbidities were the commonest indications of primary CS. Fetal distress is a major contributor to primary CS in multigravida. In study conducted by Tahmina begum et al the major indications of C-sections included: repeat C-section (24%), foetal distress (21%), prolonged labour (16%), oligohydramnios (14%) and post-maturity (13%). In the present study, oligohydramnios and prolonged labour are the major indications of previous caesarean section.[11,12]

In the study conducted by Ejub Basic et al concluded that thickness of the lower uterine segment from 3.0 to 3.5 mm is associated with very low risk of uterine scar separation from previous cesarean section and in these patients allows the vaginal childbirth. Patients in whom the lower uterine segment thickness is below 2.0 mm have a high risk of uterine scar separation.[13] In present study, we used the

terminology normal, moderately thin, extremely thin for the ultrasound measurement of lower uterine segment >3 mm, 2-3 mm and <2 mm respectively. Observed over 100 women with GA >35 weeks. Normal thickness (>3 mm) in 53%, moderately thin (2-3 mm) in 42% and extremely thin (<2 mm) in 2% were noticed. In 3% of patients lower uterine segment couldn't be measured. There was no placental vascularity encroaching to lower uterine segment, and anterior placenta (18%), low lying placenta (5%) observed.

In study conducted by Neeti Nisha S Jha et al that is ultrasonographic assessment of strength of previous caesarean scar during pregnancy.[14] Their objective was to evaluate the accuracy of ultrasonography (USG) in determining the LUS thickness in women with previous caesarean section (CS) and to assess its usefulness in predicting the risk of uterine rupture during a trial of vaginal birth. This study was conducted on 100 women between 37 to 40 weeks of gestation with a previous CS and 100 primigravidae women serving as control. Thickness of LUS was measured by transabdominal USG. Patients undergoing CS were considered for analysis. Mean LUS thickness was higher in the control group (primigravidae). 71% patients of control group underwent repeat CS, in which 47 (66.1%) had normal intraoperative finding.[24] (33.7%) had abnormal LUS intraoperatively (LUS thinning). Of these, 20 (28.6%) showed abnormal LUS on USG (<5 mm), but 4 (5.6%) had normal ultrasonographic finding. They concluded that Prenatal scar assessment by USG is useful in evaluation of previous caesarean scar and in most cases a near accurate evaluation was possible.

In present study, conducted on 100 women with history of previous caesarean section with gestational age more than 35 weeks, in this 53% of women are showing normal LUS on USG (>3 mm) but 44% had abnormal (<3 mm) LUS on USG and 3% of women LUS couldn't be measured on USG and their placenta was low lying and covering internal os. On further follow up of these women, 39% of women had normal LUS and 49% of women had thinned (<3 mm) LUS intra-operatively and remaining 10% of women had scar rupture and 2% of women had abnormal placentation. Correlation of ultrasound scar thickness and intra-operative scar thickness was evaluated by correlation coefficient (r value) i.e., 0.405 and p value i.e., 0.001*, which is significant. we can conclude that assessment of LUS by USG is useful in evaluation of previous caesarean scar intra-operatively before going for operation, and placental abnormality and prior precautions can be taken.

In study conducted by Lei Ye et al Systematic review of the effects of birth spacing after caesarean delivery on maternal and perinatal outcomes.[15] Fifteen studies were included in this study in that eight reported that interpregnancy interval (IPI) shorter than 6 months or birth interval (BI) shorter than 16-18 months increased the risk of uterine rupture during trial of labour after previous caesarean. Birth interval shorter than 12 months was associated with increased risk of placenta praevia and placental abruption. Few studies examined the effect of birth spacing after previous caesarean on perinatal outcomes. They concluded that interpregnancy interval longer than 18 months was related to decreased risk of maternal morbidity and failed vaginal delivery after previous caesarean. In present study, I have observed if there is any correlation between birth spacing and scar findings in both ultrasound and intra-operative. In study conducted by Haripriya vedantam et al transabdominal USG done between 36-38 weeks. Mean LUS thickness was 3.41±0.623 mm (range 2-7 mm). Mean LUS thickness in the scar dehiscence group and non-dehiscence group was 2.98±0.55 mm and 3.48±0.60 mm (p value<0.05) respectively.[16] Their study reported 27 (13.5%) cases of scar dehiscence. They have concluded that ultra-sonographic evaluation of LUS thickness correlated significantly with intraoperative LUS appearance. USG evaluation of LUS can be used as a screening test to predict the LUS scar integrity. Risk of dehiscence is increased in women with thin LUS i.e., sonographic LUS thickness of <3.5 mm and needs to be further evaluated. Women with previous one LSCS with thick LUS i.e. sonographic LUS thickness of >3.5 mm, can be counselled regarding TOLAC if not contraindicated.

In the study conducted by Okendrajit Singh et al (2020), they studied abnormal placentation followed by previous caesarean section, in a group of 91 peripartum hysterectomy cases received in the Department of Pathology, Regional Institute of Medical Sciences (RIMS), Imphal, Manipur, during a ten-year study period (January 2009 to December 2018).[17] They concluded that abnormal placentation which includes placenta praevia, placenta accreta, placenta increta and placenta accreta is one of the most important causes of intractable postpartum haemorrhage necessitating a peripartum hysterectomy. Previous caesarean delivery has a 5.82 times higher risk of developing placentation abnormalities in subsequent pregnancies than previous vaginal delivery.

In present study conducted on 100 women with previous caesarean section ,7% of women had abnormal placentation, placenta praevia 3%, placenta accrete 2%, placenta increta 1%, placenta percreta 1% and in over all 7 women with abnormal placentation ,4 women had postpartum hysterectomy including 1 maternal death. concluded that previous caesarean delivery has higher risk of developing placentation abnormalities in subsequent pregnancies.

In study conducted by Korobi Morang et al Common complications were adhesions (38.25%), thinned lower uterine segment (27%), advance bladder (19.50%), uterine dehiscence (14.75%), excess blood loss (12.75%), extension of uterine incision (8.25%), uterine rupture (1%), placenta accrete (0.75%), and bladder injury (0.5%). Intraoperative complications like adhesions, uterine dehiscence, delivery and operating time were significantly higher in women with 2 prior caesarean section compared

to 1 prior caesarean section (p<0.001).[18] Alshehri KA et al increasing number of CSs leads to an increase of the complications risk. Among the complications, adhesions were the most common.[19] Aparajita Mishra et al study data shows a significant increase in maternal morbidity with repeat caesarean section. Placenta previa and adhesions seems to play a central role in all the risks.[20] The risks of rare but potentially serious maternal morbidities such as visceral injury, haemorrhage, abnormal placentation, hysterectomy, or severe adhesions importantly increased with number of multiple repeat caesarean sections.[21] In present study total incidence of scar/uterine rupture/Impending scar rupture was 8%. placenta Increta was 2% and peripartum hysterectomy in 100 women was 4%. As per the latest recommendation of double layer suturing, the double layer closure of the uterus associated with a thicker third-trimester lower uterine segment and reduce the risk of lower uterine segment thickness <2 mm in the next pregnancy.[22] So the closure of uterus with double layer suturing is advisable.

In study conducted by Yadav B found that education of females is a major improving factor leading to increased awareness of need as well as benefits of child spacing.[23] Discussion regarding the optimum inter-pregnancy interval 9,10,23 to be taken up preconceptionally for all women who have undergone Caesarean delivery, keeping in mind the risk of scar dehiscence and rupture in a subsequent pregnancy with a reduced interval. Birth interval correlated significantly with scar integrity. Women should be informed during pregnancy about the effectiveness of different contraceptives, including the superior effectiveness of long-acting reversible contraception (LARC), when choosing an appropriate method to use after pregnancy.[24]

This study has some limitations that is 100 women with single-ton pregnancy with previous caesarean delivery between 36-40 weeks are included in this study and transabdominal ultrasound finding of scar thickness noted, in these 100 women few developed contractions by the time of caesarean section, which may interfere with the intra-operative scar thickness measurement.

CONCLUSION

The significant relationship found between the thickness of the LUS as determined by ultrasonography and the appearance of the LUS during surgery highlights the utility of USG assessment as a screening tool for deciding scar integrity. Particular attention should be paid to the increased risk of dehiscence linked to thin LUS (3 mm), which calls for more in-depth analysis. Additionally, if there are no contraindications, women who have had one LSCS and who have a thicker LUS (sonographic LUS thickness>3.5 mm) may be eligible for counselling regarding the viability of a trial of labor after caesarean (TOLAC). The results of the study underline even more how well lower uterine scar thickness, as determined sonographically, can predict scar abnormalities in those who have had prior caesarean operations. Therefore, it can be conclusively asserted that sonographic evaluation of the thickness of the lower uterine segment is a dependable and valuable technique for comprehensively assessing scar status. This will help make decisions about whether a vaginal delivery trial is appropriate for women who have had a caesarean section in the past, which could have an impact on future obstetric care protocols.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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