

TRANSVAGINAL ULTRASONIC EVALUATION OF LOWER UTERINE SEGMENT TO PREDICT INTEGRITY OF CAESAREAN SCAR DURING PREGNANCY AND ITS CORRELATION WITH OBSTETRIC OUTCOME

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ABSTRACT

Objective: To evaluate lower uterine segment thickness by transvaginal ultrasonography (TVS) and its correlation with obstetrical outcome and to derive a critical cut off above which vaginal delivery is safe.

Method: A prospective study included 140 antenatal women with history of previous caesarean with gestational age 37-40 weeks in study group and 100 antenatal women without history of any uterine surgery with same profile in control group. Lower uterine segment (LUS) was scanned using TVS. All the women were followed till delivery and further divided into two groups for mode of delivery. Statistical analysis was done by applying chi square test.

Results: Overall vaginal birth after caesarean (VBAC) rate and VBAC success rate was observed as 48.57% and 65.38% respectively. The critical cut-off value for safe lower segment thickness derived from receiver operator characteristic curve was 2.5 mm.

Conclusion: TVS measured thickness of lower uterine segment allows assessment of scar complications and thus safer management of patient.

Key Words: Transvaginal ultrasonography, caesarean section, lower uterine segment, vaginal birth after caesarean

INTRODUCTION

The Caesarean birth rate is rising primarily due to the incidence of elective Caesarean sections (CS) which primarily accounts for one third of CSs. In India too, depending upon the institute, caesarean section rates varies from 7 to 25%. "Once a caesarean always a caesarean" was once a famous obstetrician's dictum.¹ Vaginal birth after caesarean (VBAC) and trial of labor (TOL) emerged as an option to reduce the alarmingly rising caesarean rates. The American College of Obstetricians and Gynecologists (ACOG) Committee on Obstetric Practice declared that most women with one previous caesarean delivery with a low transverse incision are candidates for and should be counseled regarding VBAC, and should be offered TOL².

The most feared complication with TOL is scar rupture and its associated morbidity and mortality for mother and/or fetus. However, the risk of uterine rupture in laboring women with a previous CS

varies between 0.2 and 1.5% after induction of labor, compared to 0.5% in women with spontaneous labor after a previous CS³.

The success of VBAC depends mainly upon indication for primary caesarean. Success rates were higher for non-recurrent indication rather than recurrent one. Several diagnostic modalities have been used to predict integrity of lower uterine segment (LUS) and also to ascertain safety of VBAC.

Here Transvaginal Ultrasonography (TVS) has been used to evaluate lower uterine segment (LUS) thickness, its correlation with obstetric outcome and to derive a critical LUS thickness above which safe vaginal delivery is predictable.

METHODS

A prospective case control study was carried out in the Department of Obstetrics and Gynecology, B.R.D. Medical College, Gorakhpur (U.P.) between January '12 to March '14 with 140 antenatal

women (gestational age 37- 40 weeks) with history of one caesarean delivery in study group and 100 antenatal women with no previous caesarean or uterine surgery as control.

Selection criteria for Trial of labor (TOL) were non recurrent indication for previous caesarean section, previous low transverse incision, clinically adequate maternal pelvis, no absolute indication for caesarean section, vertex presentation, favourable Bishops score or any medical obstetrical complication.

Exclusion criteria for Trial of labour after caesarean (TOLAC) were malpresentation, multiple gestation, low lying placenta, abnormal amniotic fluid volume, leaking per vaginam, previous classical caesarean section, previous inverted T uterine incision, previous uterine rupture, previous contracted pelvis or anticipation of CPD in present pregnancy.

All women underwent a thorough history taking and detailed examination (general, systemic and obstetrical) followed by transabdominal (TAS) and transvaginal ultrasonography (TVS). Scanning was done with Medison Model SA 8000 LV consisting of transabdominal convex array transducer with a frequency of 3.5 MHz and a transvaginal probe with a frequency of 7 MHz. In TAS variables observed were estimation of gestational age, placental localization and grading, liquor, fetal cardiac activity and any gross congenital anomaly. TVS was done with partially full bladder and LUS was evaluated for thickness of thinnest area and localized defect. On USG, LUS is found as three layered structure (i) chorioamniotic membrane with decidualised endometrium (ii) middle layer of myometrium and (iii) uterovesical peritoneal reflection juxtaposed to muscularis and mucosa of bladder.

LUS was examined longitudinally and transversely, to identify the previous uterine scar. Thinning zone of LUS was identified in mid sagittal plane along the cervical canal. This area was magnified for accurate measurement, and the measurement of scar thickness was taken with the cursors at urinary bladder wall myometrial interface and myometrium/chorioamniotic membrane

amniotic fluid interface. Two measurements were taken and average was taken as scar thickness. LUS was scanned to detect any dehiscence, ballooning, funneling or wedge defect. All women were followed till delivery. Women in study group were further segregated into two groups according to mode of delivery. Women with recurrent indication were posted for elective repeat caesarean section and women with no contraindication for vaginal delivery were allowed to go into spontaneous labour or induced. Women undergoing TOL were continuously monitored regarding maternal pulse, FHR, color of liquor, bleeding per vaginam, scar tenderness and colour of urine. Patients who developed any intrapartum maternal or fetal distress were shifted for emergency caesarean section.

Statistical evaluation was done by using chi-square test wherever applicable and significance of the result has been recorded. For finding out the cut off value in the present study ROC curve i.e. receiver operating characteristic curve was constructed.

RESULTS

Most of the antenatal women were in age group 21-30 years with mean age 25.2 years. Mean parity observed was 1.2 and average gestational age at delivery was 38-39 weeks. Maximum number of women reported with hemoglobin (Hb) level 8-9 gm%. Considering duration, average latent and active phase of labour was found to be 6.8 hrs and 3.59 hrs respectively (Table-1). Out of the total 140 antenatal women in study group 36 (25.71%) were kept for elective repeat caesarean.

All the women who underwent TOL were monitored with continuous external fetal monitoring. Out of 104 (74.28%) women kept for TOL, 36 had emergency caesarean, 68 had successful VBAC. Overall VBAC rate was 48.57% and VBAC success rate was 65.38% (Table-2). On transvaginal sonography, mean LUS thickness was 3.23 ± 0.911 mm and 3.59 ± 0.63 mm ($p < 0.05$) in study and control group respectively (Table-3). At LUS thickness < 2.5 mm VBAC success rate was zero whereas at LUS thickness 2.5-3.0 mm VBAC success rate was 67.74% (Table-4).

At a cut off of 2.5 mm the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) was

81.3%, 84%, 69.2% and 91.3% using transvaginal ultrasound respectively (Table-5.)

Table 1: Patient profile

| Patients characteristics | Study group | | Control group | | P value |
|---|-------------|------|---------------|-------|---------|
| | Mean | S.D. | Mean | S.D. | |
| Age (years) | 25.20 | 3.19 | 24.70 | 2.85 | >0.05 |
| Parity | 1.26 | 0.50 | 1.36 | 0.63 | >0.05 |
| Period of gestation (weeks) | 38.40 | 0.85 | 38.66 | 0.946 | >0.05 |
| Hb (gm/dl) | 9.5 | 0.5 | 9.2 | 0.5 | >0.05 |
| Duration of latent phase of labor in patients with vaginal delivery (hours) | 6.86 | 2.70 | 6.95 | 2.27 | >0.05 |
| Duration of active phase of labor in patients with vaginal delivery (hours) | 3.59 | 1.47 | 3.90 | 1.46 | >0.05 |

Table 2: Mode of Delivery

| Mode of delivery | Study group | | Control group | |
|------------------------------|-------------|-------|---------------|----|
| | No. | % | No. | % |
| Elective repeat caesarean | 36 | 25.71 | - | - |
| Trial of labor group | 104 | 74.28 | - | - |
| a) Successful trial of labor | 68 | 65.38 | 92 | 92 |
| b) Emergency caesarean | 36 | 34.61 | 8 | 8 |

Table 3: Lus thickness on transvaginal ultrasonography

| Scar thickness (mm) | Study group | | Control group | |
|---------------------|-------------|-------|---------------|----|
| | No. | % | No. | % |
| <2.0 mm | 11 | 7.8 | - | - |
| 2.1-2.5 mm | 17 | 12.14 | 2 | 2 |
| 2.6-3.0 mm | 42 | 30 | 16 | 16 |
| 3.1-3.5 mm | 28 | 20 | 20 | 20 |
| 3.6-4.0 mm | 17 | 12.14 | 38 | 38 |
| 4.1-4.5 mm | 14 | 10.00 | 10 | 10 |
| 4.6-5.0 mm | 3 | 2.14 | 6 | 6 |
| 5.1-5.5 mm | 6 | 4.28 | 2 | 2 |
| >5.5 mm | 2 | 1.43 | 6 | 6 |
| Mean LUS thickness | 3.23 | | 3.59 | |
| SD | 0.94 | | 0.633 | |
| P value | <0.05 | | <0.05 | |

Table 4: Correlation of lus thickness with successful vbac

| LUS thickness in TVS (in mm) | Study group | | VBAC | | Emergency caesarean | | Elective caesarean | | VBAC rate | VBAC success rate |
|------------------------------|-------------|-------|------|-------|---------------------|-------|--------------------|-------|-----------|-------------------|
| | No. | % | No. | % | No. | % | No. | % | | |
| <2.0 | 11 | 7.8 | - | - | 6 | 54.5 | 5 | 45.0 | 0 | 0 |
| 2.1-2.5 mm | 17 | 12.14 | - | - | 9 | 52.94 | 8 | 47.05 | 0 | 0 |
| 2.6-3.0 mm | 42 | 30 | 21 | 50 | 10 | 23.8 | 11 | 26.2 | 50.00 | 67.74 |
| 3.1-3.5 mm | 28 | 20 | 18 | 64.28 | 5 | 17.85 | 5 | 17.85 | 64.28 | 78.26 |
| 3.6-4.0 mm | 17 | 12.14 | 9 | 52.99 | 4 | 23.52 | 4 | 33.53 | 52.93 | 69.23 |
| 4.1-4.5 mm | 14 | 10 | 9 | 64.28 | 2 | 14.28 | 3 | 21.43 | 64.28 | 81.81 |
| 4.6-5.0 mm | 3 | 2.14 | 3 | 100 | - | - | - | - | 100.00 | 100.00 |
| 5.1-5.5 mm | 6 | 4.28 | 6 | 100 | - | - | - | - | 100.00 | 100.00 |
| >5.5 mm | 2 | 1.43 | 2 | 100 | - | - | - | - | 100.00 | 100.00 |

Table 5: Sensitivity, Specificity, Ppv and Npv at Corresponding Lus Thickness

| LUS thickness | Sensitivity | Specificity | PPV | NPV |
|---------------|-------------|-------------|------|------|
| ≤ 2.0 mm | 63.6 | 100 | 100 | 86.2 |
| 2.1-2.5 mm | 81.8 | 84 | 69.2 | 91.8 |
| 2.6-3.0 mm | 90.9 | 72 | 58.8 | 94.7 |
| 3.1-3.5 mm | 92.9 | 56 | 47.6 | 93.3 |
| 3.6-4.0 mm | 90.9 | 24 | 34.5 | 85.7 |
| 4.1-4.5 mm | 90.9 | 12 | 31.3 | 75 |
| 4.6-5.0 mm | 100 | 8 | 32.4 | 100 |

DISCUSSION

In the present study most of the women were of mean age 25.2 years which was comparable to studies performed by N. Soni et al⁴.

In the present study VBAC rate and VBAC success rate was observed as 48.57% and 65.38% respectively and was comparable with the studies performed by Flam et al⁵ who reported 36% VBAC rate and 74% success rate. Similar success rates were reported by Singh et al,⁶ Pathania et al⁷ and Iyer et al⁸.

In the present study, the critical cut off LUS thickness derived by transvaginal ultrasound was found to be 2.5 mm above which safe VBAC is possible. At 2.5 mm sensitivity, specificity, PPV and NPV was 81.8%, 84%, 69.2% and 91.3% respectively and is in concordance with study performed by Qureshi et al⁹ who took 2 mm as cut off.

There was very high correlation between peroperative grading of LUS and LUS thickness measured on USG. All dehiscence in study group occurred at <2 mm. The LUS thickness in control were all greater than 2 mm similar to that observed by Qureshi et al.⁹

CONCLUSION

LUS thickness serve as an excellent predictor of uterine scar defect in women contemplating VBAC. However, at present ideal cut off value cannot be recommended, underlining the need for more standardized measurement techniques. Current medical evidence indicates that 60- 80% of women can achieve a successful vaginal birth after caesarean. Thus, Trial of labor should be encouraged under vigilant fetal and maternal monitoring.

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