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Role of Ultrasonography (TVS) to Increase Number of Vaginal Birth after Cesarean (VBAC & TOLAC)

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Abstract
Aim: *To evaluate the efficacy of Transvaginal Sonography (TVS) to measure the thickness of scarred Lower Uterine Segment (LUS) in antenatal women at term and it association with obstetrical outcome.*
Methods: *This prospective study included 100 antenatal women with previous caesarean at term in study group and 100 antenatal women without H/O any uterine surgery of same profile in control group. LUS was scanned using TVS. All women were followed till delivery & further divided unto 2 groups for mode of delivery.*
Results: *Out of the total 100 antenatal women in study group 28 were kept for repeat elective caesarean for repeat indications for C.S. Rest 72% women underwent trial of labour with continuous maternal and fetal monitoring. Out of 72 women kept for TOL, 26 had emergency caesarean and 46 had successful VBAC. At a cut off value of scar thickness 2.5mm, the sensitivity, specificity, positive predictive value and negative predictive value was 80.6%, 83%, 70% and 90.3% respectively. It suggested that if the thickness of LUS was 2.5 mm or more, chances of vaginal delivery following trial of labour was high.*
Conclusion: *Antenatal ultrasonographic (2D/3D) assessment of LUS thickness near term can result a successful trial of labour is women with previous caesarean section.*
Keywords: *Transvaginal Sonography, Lower uterine segment, caesarean section scar, vaginal birth after cesarean section (VBAC).*

Introduction

Caesarean section rates have been steadily increasing, in most countries of world. At all India level cesarean section rate has increased 2.9% of child birth in 1992-93 to 7.1% in 1998-99 and further rise to 8.5% in 2005-06 and a steady rise to 17.2% in 2015-16 and an average annual rate of increase(AAIR) of 8%[1]. WHO Global survey conducted in 9 countries of Asia revealed that most common indications of CS (24.2%), CPD (22.6), FD(20.5%), breech and other abnormal presentation(12.5%)[2]. There has been a debate over increasing cesarean delivery in private hospitals. Health ministry is taking several steps to crub the practice and now onwards all the hospitals empanelled under CGHS (Central govt health scheme) have to display number of cesarean and vaginal delivery in the hospital, at the reception area. The FOGSI has also been sounded about the harmful effect of unwarranted cesarean. In addition state have been conducted prescription audit of health facility on this issue. Vaginal birth after caesarean (VBAC) and trial of labour after cesarean (TOLAC) emerged as an

option to reduce the alarmingly rising caesarean rates. Although VBAC may be associated with a risk of uterine rupture[3] and the maternal and fetal consequence of uterine rupture can be serious & life threatening [4,5,6].

So there is a need to assess the integrity of uterine scar and risk factors before planning for trial of vaginal delivery after cesarean (TOLAC). Several methods have been used to evaluate the lower uterine segment after caesarean section. Hysteroscopy, hysterography, ultrasonography and MRI along with detailed history and abdominal as well as pelvic examination could give important information regarding strength of scar in a non pregnant woman[7]. Sonographic methods can be used to evaluate the lower uterine segment thickness in pregnant women too. The purpose of this study is sonographic evaluation of lower uterine segment at term and its association with obstetrical outcome.

Methods

This prospective case control study was carried out in the department of SN Medical College, Agra from, July 2015 to June 2017 with 100 antenatal women (gestational age 37 – 40 weeks) with history of one caesarean delivery for non recurrent cause in study group and 100 antenatal women with no previous caesarean or uterine surgery as control.

Inclusion criteria were all antenatal patients with history of previous caesarean section for non recurrent cause, 37 weeks – 40 week with vertex presentation while exclusion criteria includes non-vertex presentation, placental complications, multiple gestation, abnormal AFI, leaking per vaginum, previous classical caesarean section, uterine scar for any other surgery and patients with active labour. All the patients underwent a thorough history taking and complete examination followed by transabdominal (TAS) and Transvaginal sonography (TVS) scanning was done with LOGIQ[TM] 200CE0459, consisting of transabdominal convex array transducer with a frequency of 3.5 MH$_z$ and a transvaginal probe

with a frequency of 7 MH$_z$. In transabdominal sonography 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 blander & LUS was evaluated for thickness of thinnest area and localized defect. On USG, LUS is found as 3 layered structure (1) chorioamniotic membrane with decidualised endometrium (2) middle layer of myometrium and (3) 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 saggital 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 the mode of delivery. Women with recurrent indications 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, colour of liquor, bleeding pervaginum, scar tenderness and colour of urine. Patients who developed any maternal of fetal distress were taken for emergency caesarean section.

Statistical evaluation was done by using appropriate tests p value <0.05 was considered significant.

Result

Most of the antenatal women were found in the age group of 21 to 30 years with mean age of 25.07 +- 3.13 years in study group and 24.66 +-

3.36 years in control group. Mean parity seen was 1.28 in study group and 1.34 in control group. Mean gestational age was found to be 39.46 wks. in study group while 39.28 wks. in control group. Average latent and active phase of labour in study group was found to be 6.82 hrs. and 3.60 hrs. respectively (table - 1).

Out of the total 100 antenatal women in study group 28 (28%) were kept for repeat elective caesarean. Rest 72% women underwent trial of labour with continuous maternal and fetal monitoring. Out of 72 women kept for TOL, 26 had emergency caesarean and 46 had successful VBAC. (table – 2)

On transvaginal sonography mean LUS thickness was 3.30 +- 1.05mm and 3.66 +- 0.65mm (p < 0.05) in study and control group respectively (table – 3). At LUS thickness < 2.5mmVBAC success rate was zero. While at thickness above 2.5mm VBAC success rate was 63%. In the present study grade III and grade IV were considered abnormal LUS while I and II were considered normal LUS. Out of 54 (54%) cases who had repeat elective caesarean, 20(39.62%) had grade I LUS, and 14 (28.3%) had grade II LUS while 13 (26.92%) and 7 (15.1%) had grade III and IV LUS paroperatively respectively. (table – 4). At a cut off of 2.5mm the sensitivity, specificity, positive predictive value and negative predictive value was 80.6%, 83%, 70% and 90.3% using transvaginal ultrasound respectively (table – 5).

Table - 1 Patient profile

Patient characteristics	Study group		Control group		P. value
	Mean	SD	Mean	SD	
Age (years)	25.07	3.13	24.66	3.36	>0.0
Parity	1.28	0.50	1.34	0.63	>0.0
Period of gestation	39.36	0.98	39.28	0.92	>0.0
Duration of latent Phase of labour in patients with vaginal delivery (hours)	6.82	2.70	6.96	2.27	>0.0
duration of active phase of labour in patient with vaginal delivery (hours)	3.60	1.46	3.88	1.44	>0.0

Table - 2. Mode of delivery

Mode of delivery	Study group		Control	
	No.	%	No	%
Elective repeat caesarean	28	28%	-	-
Trial of labour group	72	72%	-	-
a. Successful trial of labour	46	63.88%	92	92%
b. emergency caesarean	26	36.11%	8	8%

Table – 3 LUS thickness of transvaginal ultrasonography

Scar thickness (mm)	Study group		control group	
	No	%	No.	%
<2.0 mm	08	8%	-	-
2.1 – 2.5 mm	12	12%	02	2%
2.6 – 3.0 mm	30	30%	16	16%
3.1 – 3.5 mm	20	20%	20	20%
3.5 – 4.0 mm	12	12%	38	38%
4.1 – 4.5 mm	10	10%	10	10%
4.6 – 5.0 mm	02	2%	06	6%
5.1 – 5.5 mm	04	4%	02	2%
>5.5 mm	01	1%	06	6%
Mean LUS thickness	3.30		3.66	
SD	1.05		0.65	
p. value	<0.05			

Table - 4 LUS and outcome

LUS thickness on TVS	Study group	Par operative grading				VBAC		Repeat caesarean Section		VBAC success
(in mm)	No. %	IV	III	II	I	No.	%	No.	%	Rate
<2 mm	8	4(50%)	4(50%)	-	-	-	-	8	8	0
2.1 – 2.5 mm	12	2(16.6%)	4(33.3%)	4(33.3%)	2(16.6%)	-	-	12	12%	0
2.6 – 30 mm	30	-	8(24.60%)	10(33.05%)	12(43.5%)	14	14%	16	16%	63
3.1 – 3.5 mm	20	-	5(25%)	10(50%)	5(25%)	12	12%	8	8%	66
3.6 – 4.0 mm	12	-	-	4(33.3%)	8(66.6%)	6	6%	6	6%	75
4.1 – 4.5 mm	10	-	-	5(50%)	5(50%)	6	6%	4	4%	75
4.6 – 5.0 mm	2	-	-	-	-	2	2	--		100
5.1 – 5.5 mm	4	-	-	-	-	4	4	-	-	100
>5.5 mm	2	-	-	-	-	2	2	-	-	100

Table - 5 LUS thickness and sensitivity pattern

LUS thickness	sensitivity	Specificity	PPV	NPV
<2 mm	61.4	100%	100	52.8
<2.5 mm	80.6	83%	70	90.3
<3.0 mm	88.7	70%	57.8	90.4
<3.5 mm	90.7	54%	46.5	94.5
<4.0 mm	88.7	22%	35.4	82.2
<4.5 mm	92.1	10%	30.2	76.4
<5.0 mm	100	6%	28.6	100

Discussion

In the present study mean age was found to be 25.07 years in study group and 24.66 years in the control group which was comparable to studies performed by *N. Soni et al*[8]. Mean LUS thickness was 3.30 mm in study group and 3.66 mm in control group. The LUS thickness was found to be statistically thicker compared to the study group similar to that observed by *Quereshi et al*[9]

In the present study VBAC rate was 46 out of 72 with success rate of 63%. This was consistent with study conducted by *Singh et al*[10] and *Pathania et al*[11] who found VBAC success rate 65.84% and 67.6% respectively. Similar success rate were reported by *Flam et a1*[12] and *Iyer et al*[13]. LUS thickness imaging on ultrasonography was used to assess the risk for intrapartum rupture or dehiscence. The risk of dehiscence was directly related to degree of thining & risk increases significantly when LUS thickness was 2.5 mm or less.

In the present study, the cut off LUS thickness derived was 2.5mm on transvaginal sonography. At this thickness, the sensitivity was 80.61%, specificity was 83%, positive predictive value was 70% and negative predictive value was 90.3%. These findings were closely matched with that of *Quereshi et al* [9] and *Asakura et al*[14]. The high negative predictive value in the present study implies that a thick LUS is generally strong & may encourage obstetrician to offer trial of labour at LUS thickness of 2.5mm.

We conclude that sonography evaluation of LUS thickness is a reliable, practically useful method to predict the risk of scar rupture in a woman with previous caesarian section and trial of labour should be encouraged under vigilant fetal and maternal monitoring. 3D USG in measuring muscular layer thickness of LUS (lower uterine segment) is most reliable[7].

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