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Assessment of Lower Segment Ceasarean Scar by Transvaginal Ultrasound and MRI.

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ABSTRACT

Background: Objective: To assess lower segment scar on ultrasound and MRI followed by comparing with the intra-operative findings of scar in lower uterine segment. **Methods:** This was a prospective observational comparative study with a sample size of 40. Patients were recruited from the antenatal clinic. The study included women with previous one lower segment cesarean section and not willing for trial of labour after birth and those with previous one lower segment cesarean with no H/O previous vaginal birth. Routine obstetric examination was done at 36-37 weeks POG. A detailed obstetric ultrasound was performed. Patients before undergoing elective repeat lower segment cesarean section had Transvaginal ultrasonography (TVS) and MRI for evaluation of previous cesarean uterine scar. **Result:** The mean age of study group was 29.28 ± 3.48 yrs. The mean scar thickness in study group on TVS was 3.36 mm ± 1.2 mm. Mean scar thickness on MRI was 3.5 mm± 1.12mm. During intra-operative assessments of scar, in 82.5% cases scar was intact while in 15% cases scar was dehiscent. There was a positive correlation between all three modalities i.e. TVS , MRI and intra-operative findings. **Conclusion:** In this observational comparative done to correlate scar thickness measured on TVS and MRI with the intra-operative scar thickness, based on the findings we conclude that both TVS and MRI can be used for measurement of scar thickness.

Keywords: Ceasarean Scar, Transvaginal Ultrasound, MRI.

INTRODUCTION

Cesarean section is the most common surgical intervention performed in modern obstetrics.[1] Due to rise in Cesarean rate in past few years, the number of pregnancies with previous Cesarean section has also increased repeat Cesarean section accounting for one-third of all cesarean deliveries.[2] Therefore decreasing the repeat caesarean section will reduce caesarean section rate. Now the importance of more patients being allowed for vaginal birth after caesarean comes. As the increased concerned about the previous cesarean scar rupture or dehiscence playing pivotal role in deciding mode of delivery in patients with previous cesarean scar. There are no uniform guidelines in whom VBAC /TOLAC can be allowed.[3] ACOG recommended that facility for emergency cesarean section should be available during trial of labour after caesarean.[4] Attempted vaginal birth after cesarean section was advocated as a means of reduction of cesarean delivery rate but its acceptance is not uniform due to risk of scar rupture.[5]

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So women with previous cesarean section when pregnant next time poses dilemma whether they should be considered for elective cesarean or given trial of integrity of scar. The present study is to assess lower segment scar on ultrasound and MRI followed by comparing with the intra-operative findings of scar in lower uterine segment.

Objectives-

1. Measurement of lower segment thickness in women with previous cesarean section at 37 weeks by transvaginal sonography and comparing with intra-operative findings
2. Measurement of lower segment thickness in women with previous cesarean section at 37 weeks by MRI and comparing with intra-operative findings.

MATERIALS AND METHODS

Study Design-
Prospective observational comparative study
Sample size-40

Study procedures:
Patients were recruited from the antenatal clinic of obstetrics and gynaecology department in period of two years from Nov 2012 -Nov 2014 after taking ethical clearance from the institute.

Inclusion criteria-

1. Women with previous one lower segment cesarean section not willing for trial of labour after birth
2. Women with previous one lower segment cesarean with no H/O previous vaginal birth.

Exclusion criteria –

1. Women with two or more lower segment cesarean section
2. Women with H/O previous classical cesarean section or myomectomy
3. Women with H/O of wound infection, post op fever or endometritis
4. Women with prosthetic heart valves or any related disease like cardiac pacemaker or cochlear implant which is contraindication for MRI.

Patients who fulfilled inclusion criteria were recruited in study after informed written consent and assessed at 24-28 weeks period of gestation. Detailed obstetric H/O of all previous conception and previous cesarean section which included pre-operative, intra-operative and post-operative complications noted.

Routine obstetric examination done at 36-37 weeks POG. A detailed obstetric ultrasound was performed. Patients before undergoing elective repeat lower segment cesarean section had Transvaginal ultrasonography and MRI for evaluation of previous cesarean uterine scar.

The transvaginal sonography and MRI for uterine lower segment scar thickness measurement done at 37 weeks period of gestation. TVS performed on 5MHz to 9MHz transvaginal transducer of HD 11 Philips USG machine and GE Voluson E8 USG machine. The scar/lower uterine segment was seen juxtaposed to the bladder. Measurements taken at 3 sites of lower uterine segment to minimize error and average of 3 readings taken as scar thickness.

A comprehensive scan of lower uterine segment in various planes was done to look for any asymptomatic uterine dehiscence.

MRI of all patients done on 1.5 Tesla magnet (Avantis and Phillips Acheiva) using CP array surface coil. T1W and T2W sequences were obtained in sagittal and axial plane. The thinnest portion of the lower uterine segment was considered to be scar and its measurement taken in sagittal plane.

Elective Repeat Cesarean Section- All patients admitted to labour room for repeat LSCS at 37-38 weeks POG. All patients underwent repeat LSCS and per operative scar thickness measured using calliper [Figure 1] sterilised in cidex solution with marking of 1-20 mm. Measurement of lower segment done after giving incision over previous scar and rupturing membranes but before the delivery of baby. Intra operative findings of scar thickness and intraoperative complications if any noted and if there is dehiscence or rupture of scar seen no measurement taken. Maternal outcome noted in terms post-operative complication like febrile morbidity, maternal blood transfusion, post-operative wound sepsis, bladder injury and hospital safety. Fetal outcome documented in terms of Apgar score, birth weight, admission to NICU, neonatal morbidity and mortality.

Stastical Analysis

Descriptive statistics such as mean, SD, median, minimum to maximum values were calculated for all statistical analysis. For comparing the data in two groups with a third independent variable Pearsons coefficient of correlation was used. All the statistical analysis carried out using SPSS-IBM version 19.0. For all statistical test pro .05 was considered significant.

RESULTS

The distribution of population on basis of age and educational status depicted below in table 1. The mean age of study group was 29.28 ± 3.48 yrs. The minimum age was 21 yr and maximum was 38 yr. Frequency distribution on basis of interval between previous caesarean and current pregnancy depicted below in [Table 1]. Maximum number of patients (65%) had 13-24 months interval between previous and current pregnancy. No patient had interval more than 48 months.

Table 1: Baseline characteristics of the study population (N=40)

Variables	Number (%)
Age in years	
<20	0 (0.0)
20-24	14 (35.0)
25-29	18 (45.0)
≥30	8 (20.0)
Educational status	
Illiterate	3 (7.5)
Primary	4 (10.0)
Secondary	6 (15.0)
Senior secondary	11 (27.5)
Graduate	12 (30.0)
Post-graduate	4 (10.0)
Socio-economic status	
Upper class	1 (2.5)
Upper middle class	11 (27.5)
Lower middle class	10(25.0)
Upper lower class	13 (32.5)
Lower class	5 (12.5)
Interval between previous caesarean and current pregnancy (months)	
≤12	3 (7.5)
13-24	26 (65.0)
25-36	8 (20.0)
37-48	3 (7.5)
>48	0 (0.0)

Scar thickness was measured on transvaginal sonography by taking 3 reading to minimize the measurement error. The mean scar thickness in study group was 3.36 mm ± 1.2 mm. Minimum scar

thickness on TVS was 1.2 mm and maximum was 5.1 mm. Among all, maximum (37.5%) number of patients had scar in range of 3.1-4.0 mm [Table 2]. Figure 2 shows the image obtained and subsequently interpreted on TVS. Mean scar thickness on MRI was 3.5 mm± 1.12mm. Minimum scar thickness measured on MRI seen was 1.6 mm maximum thickness measured was 5.7 mm. Similar to TVS findings maximum (32.5%) patients had scar thickness seen in range of 3.1-4.0 mm [Table 2]. [Figure 3] shows the image obtained and subsequently interpreted on MRI.

Table 2: Table showing scar thickness and characteristics on transvaginal ultrasonography, MRI and Intra-operative scar thickness measured by calliper (N=40)

Scar thickness (mm)	Number (%)
On transvaginal ultrasound	
1-2	5 (12.5)
2.1-3	9 (22.5)
3.1-4	15(37.5)
4.1-5	10 (25.0)
5.1-6	1 (2.5)
On MRI	
1-2	3 (7.5)
2.1-3	10 (25.0)
3.1-4	13 (32.5)
4.1-5	11 (27.5)
5.1-6	3 (7.5)
Intra-operative scar thickness measured by calliper	
Intact	33(82.5)
Rupture	1 (2.5)
Dehiscent	6 (15.0)

The scar integrity and thickness during repeat lower segment caesarean was noted. In 82.5% cases scar was intact and scar thickness was measured using calliper while in 15% cases scar was dehiscent [Table 2].

Table 3: Distribution of scar thickness and assessment by TVS, MRI and intra-operative calliper (N=40)

Scar thickness (mm)	TVS	MRI	Intra-operative*
	N(%)		
1-2	5 (12.5)	3 (7.5)	10 (30.3)
2.1-3	9 (22.5)	10 (25.0)	14 (42.4)
3.1-4	15 (37.5)	13 (32.5)	9 (27.3)
4.1-5	10 (25.0)	11 (27.5)	0 (0.0)
5.1-6	1 (2.5)	3 (7.5)	0 (0.0)

*7 patients were excluded as 6 had scar dehiscence and one had scar rupture. In these 7 patients, scar thickness was not measured

Table 4: Pearsons correlation coefficient between TVS, MRI and intra-operative calliper measurement for scar thickness

TVS and MRI	+0.962
TVS and intra-operative thickness	+0.675
MRI and intra-operative thickness	+0.650

Scar rupture seen in 2.5% case. Frequency distribution of scar thickness in between transvaginal sonography and intra-operative findings given [Table 3]. Similarly frequency distribution of scar thickness between MRI and intra-operative findings given in [Table 3].

The linear correlation coefficient depicted between 3 modalities to measure scar thickness is given in [Table 4]. We found that there is positive correlation between all three modalities i.e. TVS, MRI and intra-operative findings.

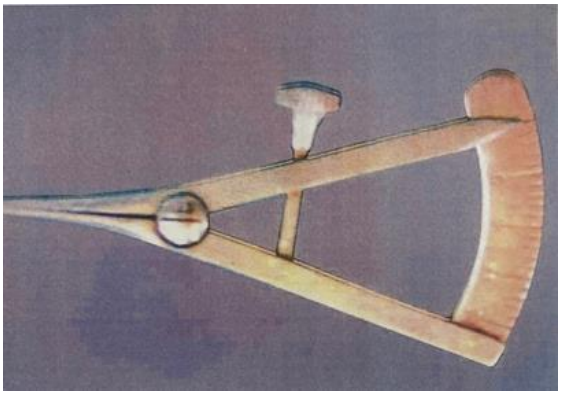

Figure 1: Callipers used to measure scar intra-operatively

Figure 2: Image obtained and subsequently interpreted on TVS

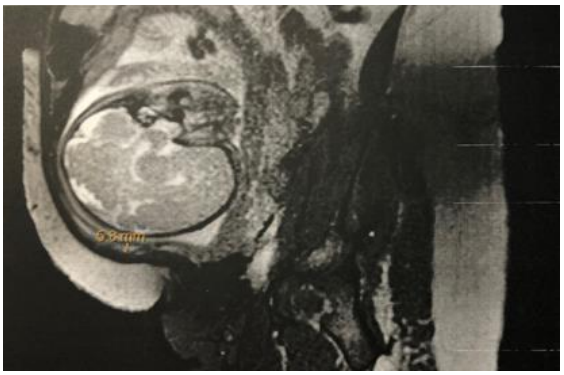

Figure 3: Image obtained and subsequently interpreted on MRI

DISCUSSION

We measured the scar thickness on TVS and MRI and compared with intraoperative scar thickness which can be useful clinically in future in deciding mode of delivery in patients with previous caesarean

section. Despite fact that MRI is a costlier modality, its incorporation in the study was done in an attempt to decide whether it can increase the accuracy of radiological evaluation of previous scar. We measured scar thickness trans-vaginally in partially filled bladder, bladder wall was not included while measuring scar thickness. The mean scar thickness was 3.36 mm ±1.2 mm. 37.5% of patients had scar thickness in 3.1 to 4.0 mm, 25% in 4.1to 5.0mm, 20% had 2.1 to 3.0 mm and 12.5% had 1-2mm scar thickness. Gotoh et al reported scar thickness measured sonographically at 39 weeks POG as 3.0 ± 0.7mm in vaginal delivered group and 2.1 ± 0.7mm in those who had cesarean delivery. On performing MRI for evaluation of scar thickness in the study population, the mean scar thickness was 3.5 ± 1.12 mm. The scar thickness was in range of 3.1 to 4 mm in 32.5% of patients nearly comparable to mean range of scar thickness observed on transvaginal sonography. The scar was in range of 4.1 to 5 mm in 27.5%, 2.1 to 3 mm in 25%, 5.1 to 6 mm in 7.5% and 1 to 2 mm scar in 7.5% of patients. Study by Hebisch et al of scar thickness evaluation by MRI and compared with ultrasonography reported USG as better modality in evaluating uterine scar.[6]

Lijoi and Maldjian also evaluated uterine scar by MRI in postpartum period and concluded that MRI can be used to identify partial or complete uterine dehiscence in postpartum period but it did not evaluate the antenatal scar thickness in predicting scar dehiscence during labour.[7] Hoffmann J et al,[8] retrospectively analyzed 3 T MRI scans of 164 pregnant women in their second or third trimester, with (patient group, n = 60) and without previous CS (control group, n = 104). Sagittal T2-weighted images were studied. Normal findings of the lower uterine segment (LUS) in MRI, reliability of MRI measurements, as well as factors influencing LUS thickness were assessed. MRI findings were compared to intraoperative findings. The authors concluded that variability in anatomy, thickness and morphology seem to limit common prenatal LUS imaging diagnostics. An additional MRI might be useful for altered anatomy and impaired ultrasound conditions. Another study by Satpathy G et al,[9] affirms the finding that MRI can be a useful adjunct tool to evaluate lower segment caesarean scar. The authors conducted a study to compare the diagnostic accuracy of magnetic resonance imaging (MRI) with that of ultrasonography (USG) for the measurement of lower segment cesarean scar during trial of labor after cesarean (TOLAC). This was a prospective case-control observational study conducted with a cohort of 30 participants being considered for TOLAC but eventually proceeding to lower segment cesarean section (LSCS) at a university-based teaching institute over a period of 2 years. The diagnostic accuracy of USG for differentiating a normal from an abnormal uterine scar was 96.7% while that of MRI was at a slightly lower level of 90%. A strong level of agreement between the two modalities was observed. The authors concluded that MRI offers advantage in diagnostic accuracy for the measurement of LSCS scar thickness during consideration of TOLAC.

Gad MS et al,[10] conducted a study with the aim to correlate lower uterine segment (LUS) thickness measured by both transvaginal (TVS) and transabdominal ultrasonography (TAS) after completion of 36 weeks of pregnancy with that measured manually using a caliper at the time of cesarean delivery and to determine minimum LUS thickness indicative of its integrity in women who have undergone a previous cesarean section. They affirmed that evaluation of the LUS by TVS and TAS and comparison of the results of both with the results obtained by actual measurement intraoperatively indicated that TVS was more reliable and accurate. Cheung VY,[11] conducted a study to evaluate the accuracy of prenatal sonography in determining the lower uterine segment (LUS) thickness in women with previous Caesarean section and to assess the usefulness of measuring LUS thickness in predicting the risk of uterine rupture during a trial of vaginal birth. Sonographic examination was performed in 102 pregnant women with one or more previous Caesarean sections at between 36 and 38 weeks' gestation to assess the LUS thickness. The author concluded that sonography permits accurate assessment of the LUS thickness in women with previous Caesarean section and therefore can potentially be used to predict the risk of uterine rupture during trial of vaginal birth.

The rate of scar rupture in our study was 2.5% and of asymptomatic uterine scar dehiscence detected per operatively was 15%. Scar thickness was measured intra operatively using calliper in which 35% patients had 3mm and 20% had 2mm thickness. Scar dehiscence was seen in 100% of patients with scar thickness of ≤ 2.5 mm measured on TVS. Ebrashy also measured scar thickness by calliper and found statistically significant correlation between USG and actual scar thickness. In present study,[12] incision was given over previous scar each time for actual scar thickness measurement which gave a standard value with which we compared radiological findings. TVS found to be better correlating than MRI with actual scar thickness. Also the delineation of scar was found better on TVS. Therefore TVS being cheaper and better modality for measurement of scar thickness. However scar integrity during labour not only depends on its prelabour thickness but also on elasticity of scar tissue and its capacity to undergo stress.

CONCLUSION

In this observational comparative done to correlate scar thickness measured on TVS and MRI with the

intra-operative scar thickness concluded both TVS and MRI can be used for measurement of scar thickness. Since MRI is costlier modality, scar thickness of lower uterine segment measured at term can be utilised in selected cases to decide whether the patient with previous cesarean section is at risk of scar dehiscence or rupture. This is likely to improve predictability of scar integrity and deciding further management of patients.

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