Evaluation of The Lower Uterine Segment Thickness Via Sonogram In Pregnant Women With Previous One Cesarean Delivery

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Abstract:

Background: Vaginal birth after cesarean section is a healthy issue. The success rate ranges from 50-77%. Several ultrasound studies have been performed to predict the appropriate lower uterine segment thickness for a safe trial of labour and the risk of uterine rupture during a trial of labor after cesarean section by measuring Lower Uterine Segment thickness.

Objective*:* To evaluate the appearance of the lower uterine segment by ultrasound in pregnant women with previous cesarean delivery and to compare it with that in women with unscarreduteri.

Methods: A prospective study was conducted from the beginning of March 2010 to the end of June 2011 in the department of Obstetrics and Gynecology at AL- Kadhimiya Teaching Hospital, Sonographic examination was performed on107 pregnant women: 53 pregnant women with history of previous cesarean delivery(study group), 31nulliparas (nullip-control), and 23 women who had 1 or more childbirths with unscarred uteri (multip-control)with gestational age 36 and 39 weeks of gestation both study and control groups were subjected to sonography to assess & compare lower uterine segment. In the cesarean group, the sonographic findings were correlated with the delivery outcome and the intraoperative Lower uterine segment appearance.

Results The study revealed44 patients (83.0%) had a normal-appearing lower uterine indistinguishable from that of control group. 2patients (3.8%) had a sonographically very thin lower uterine segment thickness measurement suggestive of future dehiscence; and 7 patients (13.2%) had thickened areas of increased ecohogenicity with or without myometrial thinning. Although the cesarean group had a thinner lower uterine segment (3.6 ±0.9 mm) when compared with both the nullip-control group (3.8± 0.8 mm; *P* = .02) and the multip-control group (4.01± 1.3 mm; *P* = .04). Only the latter difference achieved statistical significance. One of the 2 patients who had a sonographically suspected lower uterine segment defect had confirmed uterine dehiscence during surgery. An intra-operatively diagnosed paper-thin lower uterine segment, when compared with a lower uterine segment of normal thickness, had significantly smaller sonographic lower uterine segment measurement.

Conclusion*:* Prior cesarean delivery is associated with a sonographically thinner lower uterine segment when compared with those with prior vaginal delivery. Prenatal sonographic examination is potentially capable of diagnosing a uterine defect and determining the degree of lower uterine segment thinning in patients with previous cesarean delivery.

Key words*:* Sonography, Lower uterine segment thickness, Pregnant, Previous one caesarean delivery.

Introduction:

Management of the women who has undergone a previous cesarean delivery has been –for good reasons –a controversial topic for more than 100 years. By the beginning of the 20th century, cesarean delivery had become relatively safe. But, as women survived the first operation and conceived again, they were now at risk for uterine rupture. Delivery planning for the women who has had a previous cesarean delivery can begin with preconception counseling, but should definitely be addressed early in prenatal care. [1]

Delivery by cesarean section accounted for 28% in Iraq (I.A report 2014) and24.3%0f delivery in England 2006-2007. In many units, emergency cesarean section rate for primigrvidae of 24% are seen. Consequently, the problem of management of women with a scarred uterus in subsequent pregnancies is one of the most common reasons for hospital referral in multigrvidae.[2]

A brief and rapid survey of C-sections in Baghdad Teaching Hospital, a tertiary referral hospital, indicated that the emergency C-sections account only for 62.2% of the total number of C-sections performed outside the working hours during April.[3]

The predictors of a successful trial of labor after cesarean delivery are: Previously successful vaginal birth after cesarean section (>90% success rate) [4] Prior vaginal delivery, Spontaneous labor Favorable cervix, Non recurrent indication of cesarean section (breech, previa, herpes), Preterm delivery (82% vs. 74%).**[5]**

Studies have shown that the risk of uterine rupture in the presence of a defective scar is related directly to the degree of thinning of the lower uterine segment. Although lower uterine segment thickness as measured by sonography at or near term is being used by 16% of obstetrician in Canada to determine which women are good candidates for vaginal birth after caesarean section. The value of applying lower uterine segment thickness measurement of vaginal birth after caesarean section remains unclear.[6]

Women with prior caesarean delivery have increased rate of uterine rupture in subsequent pregnancy compared with those with only prior vaginal delivery. However, the risk of rupture is low (about 0.3%). Significant number of women with

previous caesarean birth end up having repeat caesarean deliveries. In parous women previous caesarean has been found to be the most common indication for caesarean delivery in as high as 67% of cases.[7] Myometrial thickness at all uterine sites is less in the second and third trimesters compared with the first trimester.[8]

The aim of the study was to evaluate the thickness of lower uterine segment in pregnant women with previous cesarean delivery with its intraoperative appearance and to compare the lower uterine segment thickness with unscarred uteri.

Patients and methods:

This prospective study was conducted from the beginning of March 2010 to the end of June 2011 in the department of Obstetrics and Gynecology of Al- Kadhimiya Teaching Hospital, Baghdad, Iraq. The study was approved by the ethical committee of Iraqi scientific medical specialization of Obstetrics and Gynecology.

It includes 120 women with a singleton pregnancy of gestational age between 37-39 or 40 week who underwent labor, in cephalic presentation, adequate pelvis presented before active delivery phase. The study group includes 64 pregnant women with previous one lower segment cesarean delivery and different parity collected from the antenatal outpatient clinic to follow their pregnancy and discuss the mode of delivery. The control groups include 56 women with no previous uterine surgery including cesarean section consist of nulliparas and multiparas. The participants informed about the aim of the study and acquiring their individual consent. History obtained from the study group about current gestational age calculated by last menstrual period or early ultrasound, Inter delivery interval (time period between previous cesarean section and present delivery, Indication of Previous cesarean section, parity and place and mode of delivery she want to attempt.

The Exclusion criteria includes women with fetal malformation that may obstruct labor (hydrocephaly, neck tumors), contracted pelvis, large baby estimated body weight more than 4 Kg, antepartum hemorrhage, multiple pregnancy. uterine surgeries other than cesarean section. Women excluded from study group & control group were 13, whom delivery was not done in the hospital (the remaining were 107).

Within a week to two weeks before delivery. The measurements of the lower uterine segment were carried out by abdominal sonography with moderately full bladder to avoid a falsely elongated image and for the purpose of the study, the bladder was considered to be 'moderately full' when abdominal scan revealed bladder length of 6–8 cm in vertical plane. The lower part of the uterus was scanned sagitally to identify the area likely to contain the uterine scar (the thinnest one). The ultrasound probe was then placed transversely to identify the thinnest zone of the lower uterine segment The thickness of the lower uterine segment was measured by placing one caliper at the interface between urine and bladder wall and the other at the interface between amniotic fluid and deciduas. The sonographic measurement was correlated with the delivery outcome and intraoperative lower uterine segment appearance. Sonographers made the measurements of the full lower uterine segment with Ultrasound unit equipped (Semens and Philips) with 3.5 MHz curvilinear array transducer was used.

In women who had repeated cesarean section due to failure of Vaginal Birth after cesarean, the result of lower uterine segment thickness was graded as follows (assessed during the caesarean operation): Grade I: (no thinning of lower uterine segment) Grade II: (thinning of lower uterine segment but fetal hair is not visible) Grade III: (incomplete rupture of uterus; i.e., loss of continuity of lower uterine segment that fetal hair is visible (Dehiscence)) Grade IV: (complete rupture of uterus.)

Findings of full lower uterine segment thickness at sonography and direct observations of lower uterine segment status at cesarean delivery will be compared. We consider 3.5 mm as a cut-off value of lower uterine segment thickness, depending on large prospective studies done by Rozenberg *et al.* and Cheung *et al.*[9,10] who concluded that a thicklower uterine segment thickness of more than 3.5mm had a strong negative predictive value, assuming that there is an inverse correlation between LUS thickness and the risk of uterine scar defect.

I would like to thanks my colleague Dr. Shaima Sabri Athab who is well experienced in ultrasound and do ultrasound for all women in the study and control groups.

For statistical analysis data was reported using Microsoft excel 2007 and SPSS 15.0 for windows data evaluation version as numerical, personal and mean±Standard deviation (SD). ANOVA test to analyze numerical data in tow groups and chi square was used to study association between discreet data. Statistical difference (P value 0.05) was significant.

Results:

A total of 107 women were included in the study examined at 37-39 or 40 weeks of gestation at time when mode of delivery was discussed.

Table 1 shows patient characteristic described by median and range for the study group (previous one CS group) and control group (nullipara & multiparas) include: Gestational age at examination 37-40, 37-40, 37-41 weeks respectively, Gestational age at delivery [about two week and less from the examination], 37-41, 38-41, 38-40 weeks respectively and neonatal birth weight 2700-4000, 2700-3700, 3000-4000 grams respectively and it was

not statically significant between the study group and control group, they were nullipara 29.9%, para one 33.6%, multiparas 29%. In cesarean group, 42 patients (82%) had a normal-appearing lower uterine segment thickness indistinguishable from that of control groups while 9 patients (18%) cases had abnormal LUS thickness.

The mean of lower uterine thickness in women with previous one Caesarean section was 3.66±0.93mm, and it was significantly lower than the control group, compared to nullipara (3.82±0.86; p=0.024), multipara (4.06±1.33; p=0.04), as well as to the control group in general (totally) (3.92±1.08; p<0.015). In the control nullipara, the average lower uterine segment thickness was statistically significantly lower than in the control multipara (p=0.035) as shown in table 2. Fifty-one pregnant women with previous C/S gone into trial of labour in the hospital with gestational age between 37 and 40 weeks, Vaginal birth after cesarean section was successful in 53% of women with no maternal morbidity after birth and discharge in a healthy condition the next days, While failure of trial of labor lead to emergency cesarean in 47% of patient.

Table 3 shows Vaginal birth was successful for patient with more parity but the previous only one birth (C/S) and multiparas have a higher rate of repeat C/S.

Our data also shows that in table (4) higher rate of patient among previous cesarean section group shows a healthy scar with thickness of more than 3.5 mm (79.2% for those repeat cesarean and 92.6% for patient of vaginal birth after cesarean section also we had successful vaginal birth after cesarean section without incidence of rupture uterus with thickness lower than 3.5 mm (7.4%) but it was not statistically significant.

Figure 1shows well-developed lower uterine segment (grade I) was determined in 54.10% of women with one previous Caesarean section. Thinner lower uterine segment with invisible uterine content (grade II) was determined in 33.30%. Lower uterine segment with partial scar defect (grade III) was determined in 12.50%. Complete scar defect (grade IV) was not found in our observed patient through the period of our study.

Cesarean section between37 and 40 weeks of gestation, showed that the risk of uterine rupture is directly related to the degree of thinning of the lower uterine segment; the risk of uterine rupture was higher with a lower uterine segment thickness of <3.5 mm compared with a lower uterine segment thickness of ≥3.5 mm.

Table 1: Characteristics of study and control groups.

	Study group	Control group		P-value
	Previous one cesarean (n=53)	Nullipara (n=32)	Multipara (n=24)	
Maternal age (years)	26(18-37)	25(20-36)	32(23-39)	0.002*
Gestational age examination (weeks)	37(36-39)	38(36-39)	38(36-40)	0.415^{NS}
Gestational age delivery (weeks)	39(36-40)	39(37-40)	39(36-40)	0.824^{NS}
Parity	1(1-7)	0	3(1-6)	0.00
Birth weight(gm)	3100(2750-4000)	3075(2700-3700)	3225(3000-4000)	0.322^{NS}

NS=Not statistical significant difference.

*= Statistical significant difference (p≤0.05). **= Statistical highly significant difference (p≤0.001).

Table 2: The lower uterine segment thickness (mm) in pregnant women with previous cesarean and control group.

LUS thickness (mm)	Study group	Control group		
	Previous one cesarean (n=53)	Nullipara (n=32) P=0.024	Multipara (n=24) P=0.04	Total (n=56) P<0.015
Mean	3.66	3.82	4.06	3.92
SD	0.93	0.86	1.33	1.08
Median	3.60	3.60	4.10	3.90
Minimum	0.05	2.70	1.60	1.60
Maximum	5.50	6.13	8.00	8.00

Table 3: The percentage of successful VBAC vaginal birth after cesarean section and repeat C/S

Parity	Delivery status			
	C/S		Vaginal birth after cesarean section	
	No	Percentage	No	Percentage
1(33)	17	70.8	16	59.3
2(6)	2	8.3	4	14.8
3(7)	2	8.3	5	18.5
≥4(5)	3	12.5	2	7.4
Total	24	100	27	100
P=0.570				

Table 4: The comparison of C/S percentage and vaginal birth after c/s percentage by a cut-off.

Delivery status	Thickness of lower uterine segment				Total
	<3.5mm		>=3.5mm		
	No	Percentage	No	Percentage	
C/S	5	20.8	19	79.2	24
VBAC	2	7.4	25	92.6	27
Total	7	13.7	44	86.3	51

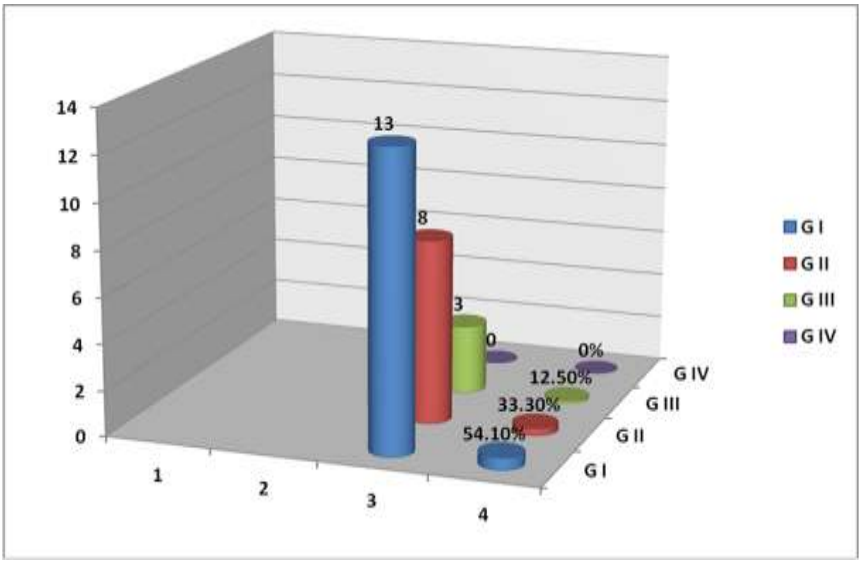

Figure 1: The degree of lower uterine segment thinning assessed intra-operatively for those repeat cesarean section after failure of vaginal birth.

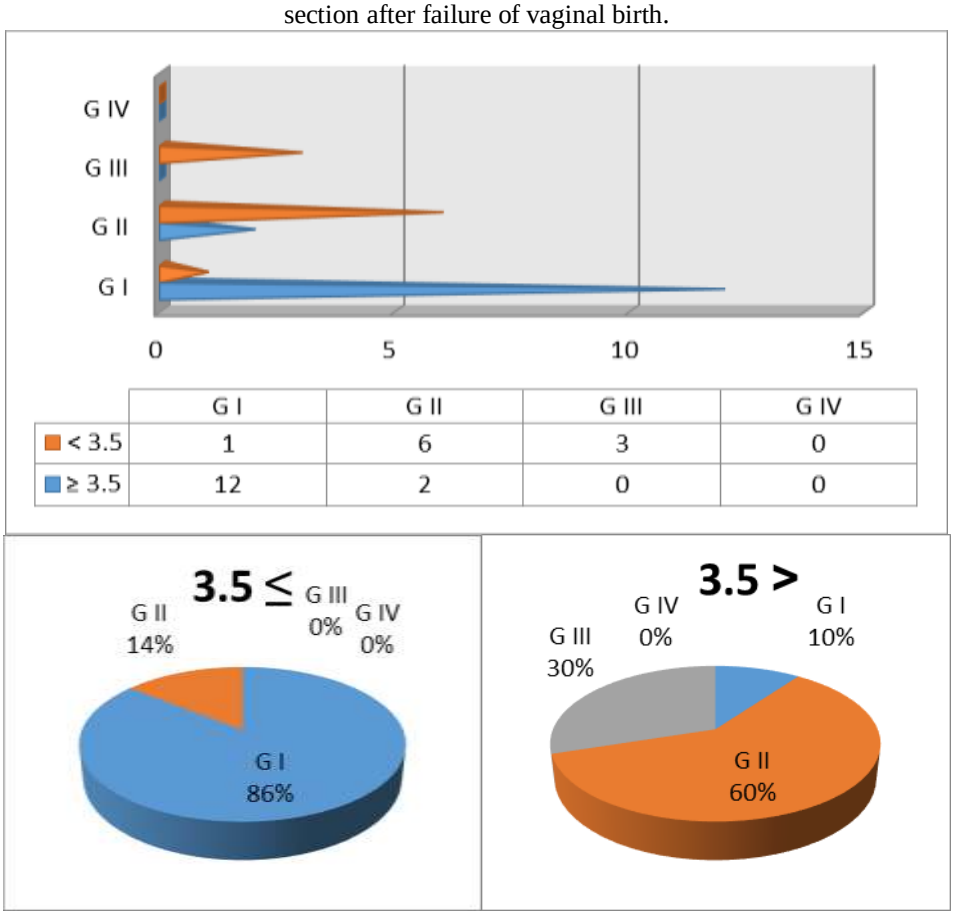

Figure 2: The correlation of LUS thickness with the risk of uterine defect as cut-off point 3.5 mm with a sensitivity of 100% and specificity of 52%.

Discussion:

One of the challenging concerns in modern obstetric practice is to offer trial of labour to women with previous cesarean delivery. Although attempted vaginal birth after previous Cesarean delivery has been reported as safe and has contributed

to a reduced cesarean delivery rate, it associated with a risk of uterine rupture estimated frequency of uterine scar rupture in trial of labour is reported to be varying between 0.5 and 3.8% mainly due to lack of awareness of the integrity of scarred LUS [10]. Because the maternal and fetal consequences of uterine rupture can be serious and potentially life threatening, the proper selection of patients would be an important prerequisite [10,11,12]. With the advanced cervical dilatation there is a danger to incise the cervical tissue itself, techniques of closure and postoperative infection; all this influence the healing process and the quality of the scar. Lower uterine segment thickness depends on the formed scar quality [9]. Bad scar interrupts the regeneration of the isthmic part of the uterus, which makes it thinner.

In this study the maternal age, gestational age at examination and at delivery with neonatal birth weight are comparable in the study group and the control group.

This study shows the cesarean group had a thinner lower uterine segment than unscarred uterus. In the following pregnancy additional thinning of the lower uterine segment can be followed by a defect which is supported by the results of Sen *et al.* (2004)[13], Cheung *et al.* (2005)[10] and Bujold *et al.* (2009)[14] all found that the lower uterine segment thickness in pregnant women with previous Caesarean section was significantly lower than in pregnant women without scars.

All our patients go on trial of labour after previous C/S, 53% have successful vaginal birth without complications to the mother and their babies; some of them had thin lower uterine segment thickness but their scar was strong enough to complete their labour without incidence of rupture uterus, the rest repeat C/S for obstetrical reasons (failure of progress or fetal distress) and this rate goes with the studies that report a successful rate of (VBAC) vaginal birth after cesarean section from 29% to 68%.[11, 13, 14]

Poorly healed uterine scar might affect the regeneration of isthmus of uterus and make it thinner [14], resulting in much thinner lower uterine segment in subsequent pregnancies. Thin lower uterine segment with scar is likely to rupture during labour. Assessment of the lower uterine segment integrity thus becomes important and it has become possible with the availability of ultrasonography.

Several studies examined full Lower uterine segment thickness with different cut-off points,[9] four studies assessed the myometrial layer of the Lower uterine segment with a lower cut-off points,[11,14,15] and one evaluated both measurements. Rozenberg *et al.*[9] found that Lower uterine segment thickness correlated inversely with the risk of rupture and concluded that full Lower uterine segment thickness more than 3.5 mm is protective against rupture.

Although the sensitivity and positive predictive value of a thin segment for a defective scar were low, the negative predictive value of a thick lower uterine segment was high for potentially safe vaginal birth after cesarean.

We assessed the Lower uterine segment from 36-39 weeks of pregnancy, measuring the full Lower uterine segment by transabdominal U/S, we chose a cut-off of 3.5 mm, according to the results of Rozenberg *et al.* and Cheung et al (as they had large prospective studies demonstrated that a full Lower uterine segment thickness of under 3.5 mm had a strong negative predictive value) [9,10]. Our study was in agreement with them as most patient who had Lower uterine segment thickness more than 3.5 mm had a safe labour without complications while for patients of repeated C/S, G II thinning Lower uterine segment and dehiscence were found with thickness <3.5mm.

In our study, the presence of certain Lower uterine segment grading intra-operatively, and its relationship to the Lower uterine segment thickness with cut-off point 3.5 mm shows the lower thickness associated with higher grade of defects which is in accordance with the results obtained by studies mentioned earlier. Therefore, measurement of full Lower uterine segment thickness near term could lead to a reduction of uterine rupture in women who are contemplating vaginal birth after cesarean delivery. The decision to undergo(TOLAC) trial of labour after cesarean section is an individual one that should be based on careful, thorough counseling maternal characteristics & obstetric history can provide a rough estimate of her chances of successful trial of labour[16].

Conclusion:

Prenatal sonographic examination is potentially capable of diagnosing a uterine defect and determining the degree of Lower uterine segment thinning in patient with previous cesarean delivery.

So we suggest that sonography permits an assessment of the lower uterine segment thickness in women with previous cesarean section and therefore can be used to encourage a trial of labour and to predict the risk of uterine rupture for a safe vaginal birth.

References:

1. Cunningham GFC, Leveno KJ, Bloom SL, Spong CY. Prior cesarean delivery, William Obstetric 24th edition, McGraw-Hill, 2014: 2-54
2. Kean L. Management of previous cesarean section. Obstetrics and Gynecology: An

evidence-based text for MRCOG, 2nd edition, 2010; 355-63.
3. High infant mortality rate seen with elective C-section. Reuters Health. Available from: http://www.medicineonline.com/news/12/6008/High-infant-mortality-seen-with-elective-c-section.html. September, 2006.
4. Guise JM, Berlin M, McDonagh M *et al*. Safety of vaginal birth after cesarean: A systematic review. Obstet Gynecol, 2004; 103(3): 420-29.
5. Bujold E, Bujold C, Hamilton EF, Harel F, Gauthier RJ. The impact of a single-layer or double-layer closure on uterine rupture. Am J Obstet Gynecol, 2002; 186(6): 1326-30.
6. Cheung VYT, Contrantinescu OC, Ahluwalia BS. J Ultrasound Med, 2004; 23: 1441-47.
7. Sarsam SD. CABOG, KCMJ, 2013; 9(2): 9-13.
8. Durnwold CP, Mercer BM. Myometrial thickness according to uterine site, gestational age & prior cesarean delivery. J Metern Fetal Neonatal Med, 2008; 21(4): 247-50
9. Rosenberg P, Goyent F, Philippe HJ, Nisand I. Thickness of the lower uterine segment: its influence in the management of patient with previous cesarean section. Eur J Obstet Gyneccol Report Boil, 1999; 87: 39-45
10. Cheung VY. Sonographic measurement of the lower uterine segment thickness in women with previous caesarean section. J Obstet Gynaecol Can, 2005; 27: 674-81
11. Zimmer EZ, Bardin R, Tamir A, Bronshtein M. Sonographic imaging of cervical scars after cesarean section. Ultrasound Obestet Gynecol, 2004; 23:594-98.
12. Lippincott Williams & Wilkins; The American Institute of Ultrasound in Medicine. J Ultrasound Med, 2004; 23: 1441-47. 0278-4297/04/$3.50
13. Sen S, Malik S, Salhan S, Ultrasound evaluation of lower uterine segment thickness in patients of previous cesarean section. Int J Gynaecol Obestet, 2004; 87: 215-19.
14. Bujold E, Jastrow N, Simoneau J, Brunet S, Gauthier RJ. Prediction of complete uterine rupture by sonographic evaluation of the lower uterine segment. Am J Obstet Gynecol, 2009; 201: 320. e1-6.
15. Asakura H, Nakai A, Ishikawa G, Suzuki S, Araki T Prediction of uterine dehiscence by measuring lower uterine segment thickness prior to the onset of labor: evaluation by transvaginal ultrasonography. J Nippon Med Sch, 2000; 67: 352-56.
16. Studsgaard A, Skorstengaard M, Glavind J, Hvidman l, Uldbjerg N. Trial of labour compared to repeat cesarean section in women with no risk factor than prior cesarean delivery. Acta Obstet Ggynecol Scand, 2013; 92(11): 1256-63.

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