Sonographic Measurement of the Lower Uterine Segment Thickness in Women with Previous OneCesarean Section

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Abstract

Vaginal birth after cesarean section (VBAC) has become an integral part ofmodern obstetrics with more than 100,000VBACs achieved each year nationwide. Despite this, it remains a controversial issue. Although it has been reported as safe and has contributed to a reduced cesarean delivery (CS) rate, BAC is associated with a risk of uterine rupture. 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.

Method and Material: This prospective study was conducted at department of obstetrics and gynecology in Tripoli University Hospital for 6 months. **Results:** A among 60 patient included in our study the mean age was 30.7, mean gestational age was 38 weeks, and parity ranged from 2-5, and the mean of Lower uterine segment thickness was 4.047, and 40% of the patient's had successful trial of labour and delivered vaginally, and the appearance of the lower uterine segment at time of caesarean section was normal 50%, the cut of value of lower uterine segment that predict uterine rupture 3mm. **Conclusion:** Lower uterine segment measurement by Ultra sound can predictsuccessful dehiscence.

Key words: ultrasound, previous cesarean section, uterine segment

Introduction:-

Today the overall caesarean section is the most common major surgical procedure all over the world. Today the overall caesarean section rate has escalated to 25% and in the United States, had increased from 4.5% in 1965 to 27.6% in 2003.

Recently the indication for scheduled caesarean have been expanded with recommendations for HIV infected women, also a growing number of twin pregnancies increasing as more mature women have delayed pregnancy andare using assisted reproductive technologies, and there is growing demand for elective caesarean.(Limmattal 2004, PP17-24).

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These trends contribute to a rise in the current caesarean rate, as the number of primary caesarean increases the number of repeated caesareans will increase.

Patient with previous caesarean section now represent a relatively large proportion of the obstetric population.

Concern persists that a trial of labour in previous scar may increase the risk of maternal complications as compared with elective cesarean delivery. (Cowan et al 1994, pp933-936).

Uterine rupture is the most serious complication of VBAC (Vaginal birth after caesarean delivery) is often life threatening for both the mother and the baby, it occurs in approximately 0.3- 2.3 percent in patient with previous caesarean delivery (Miller DA 1994, pp255-258).

Incomplete of partial rupture refers to an opening of the previous scar but not the overlying peritoneum this includes extrusion of intrauterine contents into the broad ligament, It is called also scar dehiscence. A complete rupture is a separation of the previous scar and overlying Peritoneum with extrusion of intrauterine content into the abdominal cavity.

Uterine rupture requires immediate surgical intervention and outcomes for

infants and mother are often disastrous and associated with medico legal liability. For the mother it may results in hysterectomy, urological injury, maternal deaths and needs for blood transfusion as will complication associated with failed VBAC.(Rageth JC et al 1999, pp332-337)

Like hemorrhage, uterine atony or extension to uterine angles or to the cervix, broad ligament hematoma, bowel injury and long term adverse effects on the pelvic floor. (Wen SW et al 2004, pp1263-1269)

For the baby it is associated with antepartum stillbirth and intracranial hemorrhage. (Smith GC 2004, pp956-960).

Contributing factors for uterine rupture include. induction with oxytocin or prostaglandin preparation, dysfunctional labour, high parity, more than one prior caesarean delivery, previous perforation of the non-pregnant uterus bycurettage, hysteroscopy, metroplasty and myomectomy.

Also previous classical or previous vertical lower uterine segment caesarean delivery, single layer closure of lower transverse incision. And increase birth weight. (Flamm BL 2002, pp81-92)

The signs and the symptoms of uterine rupture may be surprising subtle however the diagnosis soon becomes apparent as the maternal or fetal condition or both deteriorate.

Fetal heart rate pattern abnormalities are identified with uterine rupture most consistently. Although none is specific, commonly involve variable deceleration that evolve rapidly into late deceleration, bradycardia andundetectable fetal heart tones. Other clinical finding of uterine rupture, include abdominal pain which usually in the area of previous incision, bleeding which is associated with anxiety, restlessness, dizziness, gross hematuria, shoulder pain and shock, loss of station of the presenting part is diagnostic.

Delivery of the fetus needs to be accomplished within 10 minutes so it is advisable that VBAC should be attempted only in units where there is immediate access to facilities for the management of uterine rupture and this usually require anesthetic and neonatology services.

Concerns that the symptom of uterine rupture might be masked by epidural anesthesia have not been sustained and the use of epidural analgesia it is appropriate when attempting VBAC.

Antenatal counseling and future reproductive choice when advising onmanagement as much information about the previous caesarean section as possible should be sought. one should ask for a copy of case notes for possible extension of incision or other

complication and to document the discussion of risks and benefits of both vaginal delivery and caesarean Section with the mother carefully although success of VBAC associated with lower rates of non-life threatening complication, the potential for catastrophic uterine rupture raise the possibility that planned repeated caesarean deliveries (PRCD) may be associated with lower risk of sever maternal morbidity and mortality while women who elect for PRCD and are planning future pregnancies must consider the additional future risks associated with multiple previous caesarean Section, the major complication of placenta Previa with accrete and percreta.(Makoha FWetal 2004, pp 227-232) The development of a screening test may provide additional informationfor patient counseling and help to enhance the opportunities for women to attempt a trial of labour.

Some authors have used ultrasound both trans abdominal and transvaginal to assess the scar of women with previous caesarean. (Sen et al 2004, pp215-219). Therefore if the uterine rupture can be predicted the trials of labour in VBAC candidates may be managed more safely. Transvaginal ultrasonography, with its higher frequency and proximity to the pelvic structure has offered us a powerful tool for observing the uterine scare of previous caesarean section. While in Tran abdominal approach bladder must be full which in turn may stretch the lower uterine segment affecting true measurement and further the descent of fetal vertex may interfere with the measurement. (Qureshis 1997, pp 55-65)

Material and methods:-

This prospective study was conducted at department of obstetrics and gynecology in Tripoli University Hospital for 6 months. From August 2018 to January 2019. 60 pregnant women with one previous caesarean section underwent transvaginal ultrasound. The author calculate gestational age using the date of last normal menstrual period and measurement from first trimester sonography. none of the women were in labour at the time of scanning, all women underwent transvaginal sonographic examination using Aloca-SSD 1000 Probe 3.5 MHZ to allow better visualization of the LUS near the per cervical area and it carried out with full urinary bladder to allow good

imaging of the LUS. When observed with a vaginal probe three distinct layers can be distinguished in the lower uterine segment. The outer most layer is directly outside the muscular layer and adjacent to the bladder above, the second layer is the muscular layer, the third Layer is located directly inside and under the muscular layer and contains the decidual layer of the endometrium.

The patient's labour and delivery out comes were reviewed following a repeated caesarean section, the obstetrician who performed the surgery wasasked to assign the appearance of the lower uterine segment to one of the following categories:-

1- Normal thickness similar to that seen with primary caesarean section.

2- Paper- thin but not thin enough to visualize the uterine contents.

3- Evidence of rupture or dehiscence

Exclusion criteria:

Because the uterine thickness might be affected by abnormal intrauterine volume women with multiple gestation and abnormal amniotic fluid volumes were excluded from the study as were women with placenta Previa in whom the LUS might not be clearly identifiable, also breech, abnormal lie or who were in labour at the time of ultrasonographic examination were excluded from the study.

Results:

1- Age of Patients:

The age of the patients in our study ranged from 26-37 years (*Figure 1*) with a mean ± SD age of 30.7±3.17 (95% confidence interval 30.88 - 32.52).

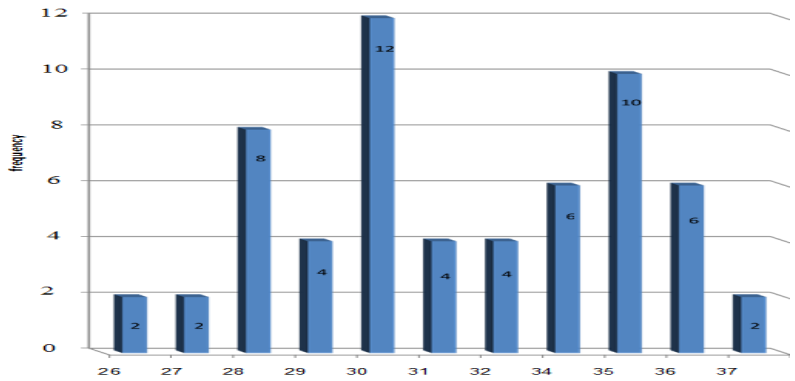

Figure (1) frequency of patient in different age group

2-The gestational age:

The gestational age of the patients in our study ranged from 36-42 years (*Figure 2*) with a mean± SD age of 38.93±1.56 (950 0 confidence interval 38.53 - 39.34).

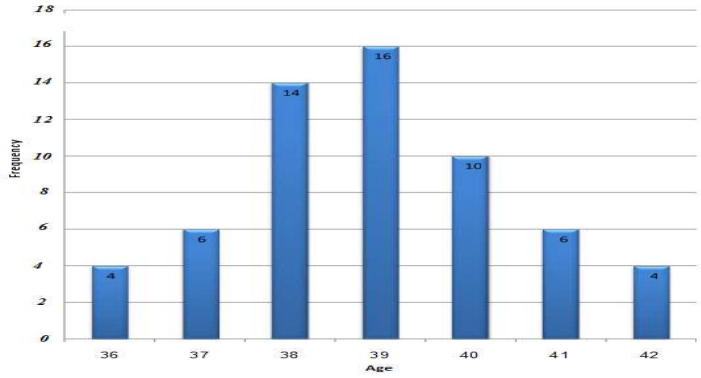

Figure (2) distribution of frequency of patient at different gestational age

3-Parity:

Parity ranged from 2-5, 46.7% and 40% of the study group were para 2 and 3 respectively *(fig. 3)*.

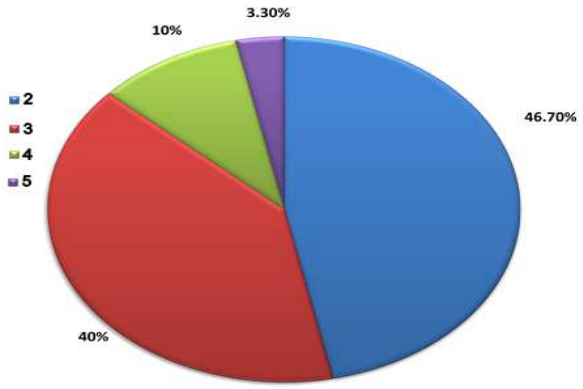

Figure (3) distribution of parity for the patient

4- Lower uterine segment thickness:

The mean of Lower uterine segment thickness was 4.047 (*Table* 1). Lower uterine segment thickness in our study ranged from 2-7 mm with amean ±SD of 4.047±1.59 (95% confidence interval (3.63-4.45).

Table (1) Lower uterine segment Thickness

Thickness / MM	*Frequency*	*Percent*
1.1-1.5	4	6.7
1.6-2.0	6	10.0
2.1-2.5	2	3.3
2.6-3.0	12	20.0
3.6-4.0	12	20.0
More than 5	24	40.0
Total	60	100.0

5-Mode of delivery:

40% of the patient's had successful trial of labour and delivered vaginallywhile 23.30% had failed the trial. Elective caesarean was the mode of delivery in 36.7% of the patient's (*fig 4)*.

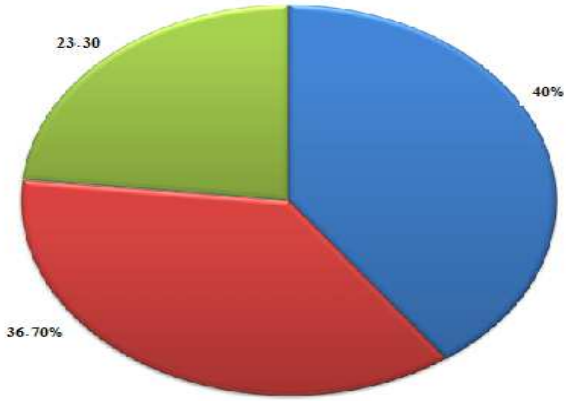

Figure (4) distribution of different mode of delivery for patient under study

6- comparison between L.U.S thickness and mode of delivery:

In our study 22 women (36,7%) underwent elective repeated caesarean section, 14 women (23,3%) had an emergency caesarean section after trial of labour and 24 women (40%) had a successful VBAC with prenatal sonographic mean LUS thickness of 4.30, 4.1 and 3.7 respectively *(fig5)*

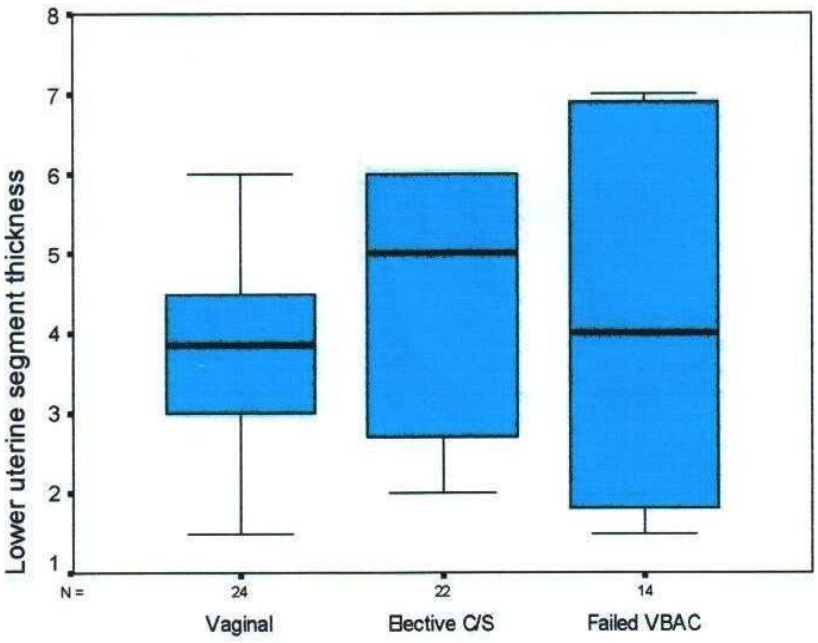

Figure (5) comparison between L.U.S thickness and mode of delivery

7-Lower uterine segment appearance:

The surgeon at time of caesarean section observe that the lower uterinesegment was normal in 50% of cases and defected in 11.1% of cases while 38.9 of cases was thin as illustrated in table (2).

Table (2) lower uterine segment appearance observed by surgeon at time ofcaesarean section

	frequency	***Percent***
Normal	18	50.0
Thin	14	38.9

Defect	4	11.1
Total	36	100.0

8-Birth weight:

The mean of the Birth Weight was 3273.33 grams, the Birth Weight in ourstudy ranged from 2500-4200 gram with a mean ± SD age of 3273.33 ± 425.4(95% confidence interval 3163.44 — 3383.23). *(fig. 6)*

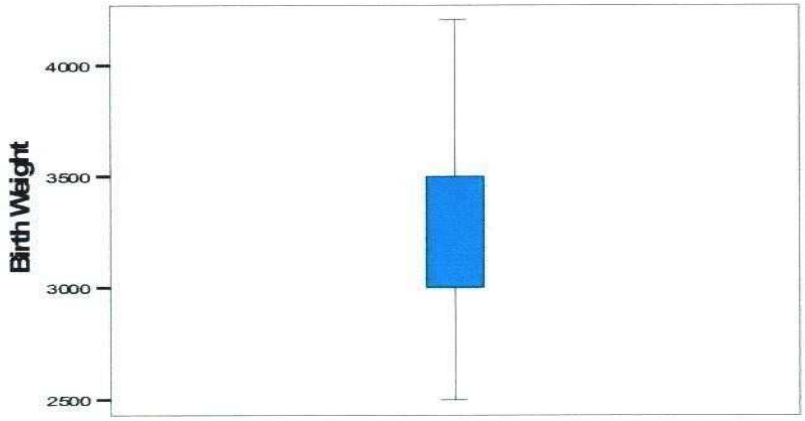

Figure (6) distribution of fetal birth weight

9- Comparison between mode of delivery and L.U.S appearance:

From table (3) and by using Chi-Square Tests p _value was

< 0.05 so there is relation between mode of delivery and lower uterinesegment appearance.

Table (3) comparison between mode of delivery and L.U.S appearance

		Mode of delivery		Total
		Elective C/S	Failed VBAC Total	
LUS Appearance	Normal	12	6	18
	Thin	10	4	14
	Defect		4	4
Total		22	14	36

10-Comparison between L.U.S thickness at caesarean section and L.U.S sonographic appearance:

All of women who had a caesarean section the intraoperative finding were compared with the sonographic LUS measurement, the comparison was nottotally blinded because some elective repeat caesarean section were performed by obstetrian who were aware of sonographic finding. Of 36 women who had a repeated caesarean section either elective or emergency 4 have defect in scar (dehiscence) and 14 have thin lower uterine segment and 18 have normal L.U.S thickness with preoperative sonographic mean LUS is 1.6 mm, 2.9mm and 5.8 mm respectively. None of cases with defect in scar can be identified sonographically *fig (7)*

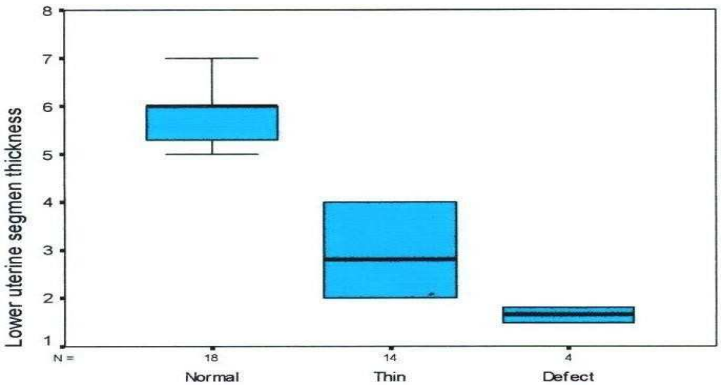

Figure (7) comparison between L.U.S thickness and L.U.S appearance

Receiver operating characteristic (ROC) curve showing the specificity and sensitivity are calculated at 0.2cm intervals of L.U.S thickness with Cutoff point = 0.31 cm. *Fig. (8)*

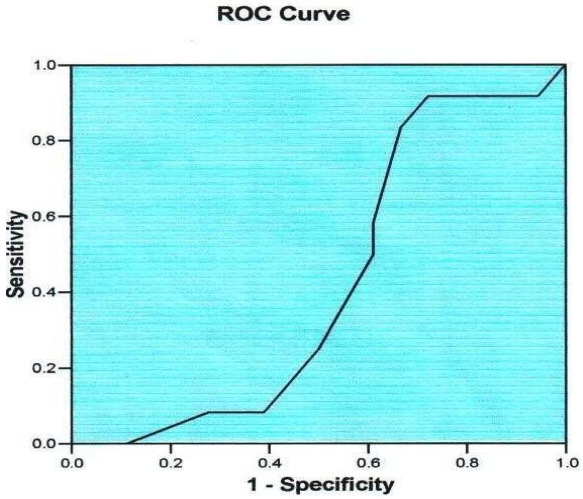

Figure (8) cut off point L.U.S thickness.

Discussion:

Uterine dehiscence occurs in 0.4–4.6% of VBAC cases. It is known to be asymptomatic and not life threatening. However, it may exists prior to the onset of labor.

In the present study, uterine dehiscence was found at the time of EmCS prior to the onset of labor. Other reports have shown that the uterinedehiscence is a high risk condition for uterine rupture. Therefore, measurement of the LUS thickness prior to the on-set of labor may have clinical significance if it can identify the uterine dehiscence. Thetissues adjacent to the uterine scar tend to be thinner in gravid as with previous CS than in those with-out CS.Thinning of the LUS is considered to be a result of stretching in a portion of the LUS caused by the gestation it-self, which does not occur in the scarred tissue. Scarred tissues rigid and does not stretch. Furthermore, during labor, the descent of the fetal head may stretch the LUS further and makes the LUS thinner possibly leading to uterine rupture. Several studies have shown that sonography can predict uterine rupture in women with previous caesarean section .Because uterine rupture is so rare, most of these studies used uterine dehiscence rather than just rupture as the outcome measure. In a uterus with disturbed healing. The LUS may become extremely thin during gestation. Thus, the quality and integrity of the LUS can be evaluated by the LUS thickness. The present study reported that the prior CS is associated with a sonographically thinner LUS when comparedwith those with prior vaginal delivery. This is in agreement with a study by Cheung et al 2004. However, Cheung reported that the clinical application of the LUS measurement in the management of VBAC re-mains controversial. Clinical experience with the use of the LUS measurement in predicting uterine rupture and managing VBAC is limited. Having a national registry to record data and review all cases of uterine rupture would accelerate the accumulation of experience on this subject. The present study suggests that son graphic LUS evaluation is potentially capable of identifying those patients with a thin or defective LUS, which could carry a higher risk of subsequent rupture when trial of VBAC is attempted. If the thickness of the LUS is more than 2.5 mm, the possibility of dehiscence during the subsequent trials of labor is very small and a safe vaginal delivery can be achieved in the present study, 3 mm was considered the critical cut-off value of the LUS thickness above which safe vaginal delivery can be achieved. This critical

cutoff value was derived from the ROC curve with sensitivity, specificity, PPV, and NPV90.9%, 84%, 71.4%, and 95.5%, respectively (using TA U/S), and 81.8%, 84%, 69.2%, and 91.3%, respectively (using TV U/S). Regarding the critical thickness in this study had high NPV, implying that a thick LUS is generally strong. The reported cutoff in the present study was not in agreement with that reported by Sen et al who suggested that an LUSthickness of 2.5 mm or above could allow for a safe vaginal delivery. However, in the study by Rozenberg et al 1996, the derived cutoff was 3.5 mm using U/S. They reported a sensitivity of 88%, NPV of 95.3%, a specificity of 73.2%, and a PPV of 11.8%. In both Vincent et al study and Asakura et al 2000 reported that a cutoff thickness of 1.5 mm had a sensitivity of88.9%, a specificity of 59.5%, a PPV of 32.0%, and a NPV of 96.2% in predicting a paper-thin or dehisced LUS. It is therefore obvious thatthe techniques used for measuring the LUS thickness and identifying uterine defects have not been inconsistent among different studies, although some studies seem to give good results with different measurement technique.

Until recently, the 3.5 mm cut-off value for full LUS thickness was the bestvalidated, with 937 cases analyzed in the literature. However, although this cut-off demonstrated a high sensitivity and a strong negative predictive value for uterine scar defect, it had weak specificity. To improve the positive predictive value, a thinner cut-off value was proposed by several authors. Recently suggested that 2.3 mm could be a better cut-off value for the prediction of complete uterine rupture during a TOL .On the other hand, measurement of the myometrial lay was expected to bemore representative of LUS thickness as the outer bladder wall is unlikely to contribute to the functional integrity of the LUS. This hypothesis was corroborated by a recent case report where uterine rupture occurred in the presence of a thick full LUS but a thin myometrial layer. However, only a few studies have evaluated this possibility, and these studies were limited by a small number of subjects. (Armstrong et al 2003pp-61-5.) In the largest study, the association between myometrial layer thickness and uterine rupture or uterine scar defect was not confirmed. Moreover, no study evaluated the reproducibility of myometrial layer measurement.

There was a positive correlation between intraoperative grading of the LUSand its thickness by US. This demonstrates that, the lower the LUS thickness, the higher the risk of scar dehiscence. The relative risk ofdehiscence at the LUS thickness below or equal to the critical cutoff value ''3mm'' using TAU/S was 92.9% and it was 71% for thicknesses more than3mm. Using TV U/S, the relative risk of dehiscence at the LUS thickness below or equal to the critical cutoff value 3 mm was 85.7% and itwas 14.2% for thicknesses more than 3mm. This implies the LUS thickness more than 3 mm as measured by US, the less likely isthe possibility of dehiscence of LUS as seen in the intraoperative, and this may encourage obstetricians to offer a trial of labor to women with a LUS thickness of 3 mm or greater. Most studies suggesting that a normal LUS thickness is a strong indicator that a safe VBAC may be anticipated. It was found in this study that the absolute risk of dehiscence was 14%. This is considered as a high percent but this may be due to the relatively small sample size, also the study was done at a tertiary medical Centre, so, most of our cases are at high risk with a higher possibility of complications.However, this study was small; larger studies on similar lines are needed to verify its findings.

Conclusion:

Sonography permits accurate assessment of the LUS thickness in women with previous caesarean section and therefore can potentially be used to predict the safety of VBAC.

Sonography evaluation of the LUS provides an additional tool to estimate the risk of uterine rupture and should be more widely used in the management of VBAC.

Recommendation:

Sonographic LUS thickness is a strong predictor for uterine scar defect in women with prior Caesarean section. ***However***, because of the heterogeneity of the studies we analyzed, no ideal cut-off value can yet be recommended, which underlines the need for more standardized measurement techniques in future studies.

الملخص بالعربي
الولادة الطبيعية بعد العملية القيصرية اصبحت من تطورات العلم الحديث. ألا انه علي الرغم من انه هذا الموضوع مبهم ولديه العديد من التساؤلات الا انه مكن ان يكون امن تحت ظروف معينة ومن تم يمكن انقاص عدد العمليات القيصرية لما تحمله من مخاطر عديدة وقد تم اجراء هذه الدراسة المستقبلية لمدة ستة اشهرفي مركز طرابلس الطبي علي ستون إمراءة، حيث كان متوسط أعمار المرضي 30 سنة ومعدل احمالهم يتراوح ما بين 2 الي 5 احمال ومتوسط عمر الجنين 38 اسبوع وكان نجاح الولادة الطبيعية بنسبة 40% في الحالات التي كان قياس الموجات الصوتية اكثر من4 ومن هنا يتبين ان قياس الموجات الصوتية له اثر إيجابيي في انقاص العمليات القيصرية.
الكلمات الدالة: الموجات فوق الصوتية, الولادات القيصرية

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