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**Date:** 9 January 2018

**Sources:** Medline, Embase.

## Ultrasound of Uterine Scars

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### 1. Cesarean scar hysterotomy: Assessment by three-dimensional transvaginal ultrasound scan

**Author(s):** Troyano J.M.; Clavijo M.T.; Martinez-Wallin I.; Alvarez de la Rosa M.; Padilla A.I.; Molina Betancor A.; Bajo-Arenas J.

**Source:** Donald School Journal of Ultrasound in Obstetrics and Gynecology; 2017; vol. 11 (no. 1); p. 82-87

**Publication Date:** 2017

**Publication Type(s):** Review

**Abstract:**Objective: The combined study of two-dimensional (2D) and three-dimensional (3D) sonographic records may be useful to diagnose wound dehiscence from hysterotomy and forecast the well-being of future gestations. In that respect, irregular cicatrization patterns can be identified from the early puerperium over the whole postparturition recovery period, and may encourage the need for further cesarean in new pregnancies to come. Subjects and Methods: A random sample of 42 female patients were subjected to transvaginal sonographic exploration at three sampling times, namely 4 days, 4 months, and 1 year following hysterotomy. All of these women recovered successfully from their cesarean and were discharged from hospital 5 days after parturition. The 2D and 3D surveys were subsequently undertaken at each of the three study times. Four days after surgery, the 2D ultrasound scan aimed at evaluating the early evolution of the uterine scar. On the contrary, 3D echographies were implemented frame-to-frame, in a transverse direction, from the right to left sides of the uterus. Results: The 3D sonographic records from those dehiscence wounds displayed at this time a wide, irregular hypoechoic area crossed over by linear structures representing the suture material (Vycril). Such a record was called a "shark bite" pattern. The latter puerperal dehiscence pattern persisted in the isthmus region for 4 months and 1 year after delivery. It consistently featured a notch between the scar borders that run perpendicular to the complete extent of the internal myometrium layer and bordered the anterior uterine wall. By considering the length of the hysterotomy-derived notch over the whole study period, two types of scars could be differentiated through 2D sonographic surveys, scar notches  $>2/3$  ( $n=9$ ) or  $\leq 1/3$  ( $n=4$ ) of the total scar length. Six of the 13 wound-dehiscence women monitored in this study became pregnant within 2 years after their former cesarean. All were subjected to a second hysterotomy, before which an in situ examination of the previous uterine scar could be made. Early puerperal ultrasound scan focusing on hypoechoic areas across the borders of hysterotomy-derived scars under suturing pressure must be undertaken by means of 2D transvaginal ultrasound scan, with the bonus that such exploration can be extended through several months to a 1 year period after surgery. The extent of dehiscence myometrium areas and the depth of the notch remaining between the serosa and the cervical channel of the stigma can be used as reliable indicators for defective cicatrization processes

and should be used as background information aiding in future gestations. The 3D transvaginal ultrasound scan provides the practitioner with thorough records of myometrial failure and enhances the morphological study of iatrogenic pathologies originating from cesarean surgery. The state and extent of healed vs failing cicatrization areas can be easily assessed by means of 3D transvaginal ultrasound scan. Copyright © 2017, Jaypee Brothers Medical Publishers (P) Ltd. All rights reserved.

**Database:** EMBASE

## **2. Changes in the Uterine Scar during the First Year after a Caesarean Section: A Prospective Longitudinal Study.**

**Author(s):** van der Voet, Lucy F; Jordans, Inge P M; Brölmann, Hans A M; Veersema, Sebastiaan; Huirne, Judith A F

**Source:** Gynecologic and obstetric investigation; Sep 2017

**Publication Date:** Sep 2017

**Publication Type(s):** Journal Article

**PubMedID:** 28957798

**Abstract:**AIM To study changes in a cesarean section (CS) scar during the first year after a CS using gel installation sonography (GIS).METHODS Proof-of-concept study, prospective cohort study. Twenty women who delivered by their first CS were evaluated by both transvaginal sonography and GIS 2 months and 1 year after CS. A niche was defined as an anechogenic space at the uterine caesarean scar with a depth >2 mm. The primary outcome was any change in the thickness of the residual myometrium (RMT) as evaluated by GIS.RESULTS Mean RMT changed in time from 11.9 mm at 2 months to 6.5 mm at 12 months after the CS ( $p < 0.001$ ). Niche prevalence did not change. The adjacent myometrium (AM) reduced from 15 to 12.4 mm ( $p = 0.04$ ). The ratio between RMT and AM with GIS decreased from 0.80 at 2 months to 0.54 at 12 months ( $p = 0.002$ ).CONCLUSION RMT thickness, the adjacent myometrium and the ratio between the RMT and AM reduces from 2 to 12 months after a CS. The prevalence did not change. This needs to be taken into account when deciding on the timing of niche measurement and the interpretation of the RMT.

**Database:** Medline

### **3. Utility of multiparametric MRI in Caesarean section scar characterization and preoperative prediction of scar dehiscence: a prospective study.**

**Author(s):** Kumar, Ishan; Verma, Ashish; Matah, Manjari; Satpathy, Gayatri

**Source:** Acta radiologica (Stockholm, Sweden : 1987); Jul 2017; vol. 58 (no. 7); p. 890-896

**Publication Date:** Jul 2017

**Publication Type(s):** Journal Article

**PubMedID:** 27799572

**Abstract:**Background Post-Caesarean uterine scar rupture during vaginal birth after Caesarean section (VBAC) is a potentially life-threatening complication. Prediction of scar dehiscence and scar rupture is vital in treatment planning and selecting candidates of trial of labor after a Caesarean section (CS). Purpose To assess the accuracy of magnetic resonance imaging (MRI) for evaluation of post-Caesarean uterine scar and to predict scar dehiscence during repeat CS. Material and Methods Thirty patients with a history of at least one previous CS underwent pelvic MRI for assessment of uterine scar during a subsequent gestation, all of whom underwent lower segment Caesarean section (LSCS) subsequently due to one of the established indications of CSs. Thickness, T1, T2 signal intensity ratio (SER), and apparent diffusion coefficient (ADC) value of scar site were charted. The lower uterine segment was assessed and graded intraoperatively and findings were correlated with MRI findings. Results A total of 30 participants were included in this study, of which nine were classified as having an abnormal scar (of various grades) based on surgical observations. T2 SER with a cutoff value of 0.935 showed the highest sensitivity of 100% and scar thickness value of 3.45 mm showed highest specificity of 91% in prediction of abnormal scar. On drawing a receiver operating characteristic (ROC) curve, T2 signal intensity ratio showed the highest area under the curve (AUC) closely followed by scar thickness values. Conclusion MRI derived parameters may be utilized for differentiation of an abnormal post-Caesarean uterine scar from a normal one. Both scar thickness and T2 SER measured on MRI can be used to predict scar dehiscence. However, T2 SER can serve as a more standardized and objective criterion.

**Database:** Medline

#### **4. Assessment of Cesarean hysterotomy scar before pregnancy and at 11-14 weeks of gestation: a prospective cohort study.**

**Author(s):** Baranov, A; Salvesen, K Å; Vikhareva, O

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; Jul 2017; vol. 50 (no. 1); p. 105-109

**Publication Date:** Jul 2017

**Publication Type(s):** Journal Article

**PubMedID:** 27419374

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVETo compare the appearance and measurement of Cesarean hysterotomy scar before pregnancy and at 11-14 weeks in a subsequent pregnancy.METHODSThis was a prospective cohort study of women aged 18-35 years who had one previous Cesarean delivery (CD) at  $\geq 37$  weeks. Women were examined with saline contrast sonohysterography 6-9 months after CD. A scar defect was defined as large if scar thickness was  $\leq 2.5$  mm. Women were followed up and those who became pregnant were examined by transvaginal ultrasound at 11-14 weeks. Scar thickness was measured and scars were classified subjectively as a scar with or without a large defect. A receiver-operating characteristics curve was constructed to determine the best cut-off value for scar thickness to define a large scar defect at the 11-14-week scan.RESULTSA total of 111 women with a previous CD were scanned in the non-pregnant state and at 11-14 weeks in a subsequent pregnancy. The best cut-off value for scar thickness to define a large scar defect at 11-14 weeks was 2.85 mm, which had 90% sensitivity (18/20), 97% specificity (88/91) and 95% accuracy (106/111). In the non-pregnant state, large scar defects were found in 18 (16%) women and all were confirmed at the 11-14-week scan. In addition, a large defect was found in three women at 11-14 weeks that was not identified in the non-pregnant state.CONCLUSIONThe appearance of the Cesarean hysterotomy scar was similar in the non-pregnant state and at 11-14 weeks in a subsequent pregnancy. Copyright © 2016 ISUOG. Published by John Wiley & Sons Ltd.

**Database:** Medline

## **5. Validation of a prediction model for successful vaginal birth after Cesarean delivery based on sonographic assessment of a hysterotomy scar.**

**Author(s):** Baranov, A; Salvesen, K Å; Vikhareva, O

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; Feb 2017

**Publication Date:** Feb 2017

**Publication Type(s):** Journal Article

**PubMedID:** 28233347

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVE To validate a prediction model for successful vaginal birth after Cesarean delivery (VBAC) based on sonographic assessment of a hysterotomy scar, in a Swedish population. METHODS Data were collected from a prospective cohort study. Women aged 18-35 years who had one previous low-transverse Cesarean delivery performed at  $\geq 37$  gestational weeks and no other uterine surgery were recruited. Participants underwent transvaginal ultrasound examinations of the Cesarean hysterotomy scar at 11 + 0-13 + 6 and 19 + 0-21 + 6 gestational weeks. Thickness of the myometrium in the thinnest part of the scar area was measured. After delivery information about pregnancy outcomes was retrieved from hospital records. Individual probabilities of successful VBAC were calculated using a previously published model. Predicted individual probabilities were distributed into deciles. For every decile, observed VBAC rates were calculated. To assess the accuracy of the prediction model, receiver-operating characteristic curves were constructed, and the areas under the curves (AUC) were calculated. RESULTS In total, 120 women had complete sonographic data. Eighty (67%) women underwent trial of labor after Cesarean delivery (TOLAC) with VBAC in 70 (88%) cases. The scar was visible in all 80 women at the first trimester scan and in 54 (68%) women at the second trimester scan. AUC was 0.44 (95% CI 0.28-0.60) among all women who underwent TOLAC and 0.51 (95% CI 0.32-0.71) among those with sonographically visible scar at both scans. CONCLUSION The prediction model demonstrated poor accuracy for prediction of successful VBAC.

**Database:** Medline

## **6. Can third-trimester assessment of uterine scar in women with prior Cesarean section predict uterine rupture?**

**Author(s):** Jastrow, N; Vikhareva, O; Gauthier, R J; Irion, O; Boulvain, M; Bujold, E

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; Apr 2016; vol. 47 (no. 4); p. 410-414

**Publication Date:** Apr 2016

**Publication Type(s):** Editorial Review

**PubMedID:** 26483275

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Database:** Medline

## **7. Comparative study on course features of early pregnancy for patients with previous Cesarean uterine scar**

**Author(s):** Ouyntsetseg J.; Gantugs B.; Battsetseg K.H.; Erdenechimeg E.; Bayasgalan N.

**Source:** Journal of Obstetrics and Gynaecology Research; Oct 2015; vol. 41 ; p. 121

**Publication Date:** Oct 2015

**Publication Type(s):** Conference Abstract

Available at [Journal of Obstetrics and Gynaecology Research](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**Background: Many different complications encounter in obstetric practice that related to increased number of cesarean delivery and obstetricians pay mainly more attention on problems those could occur during next pregnancy and delivery. Among complications that occur during early pregnancy of uterus with scar miscarriages and missed abortions are becoming more common in relation to site of placental attachment. Goal: We aimed to study features of early pregnancy of uterus with scar in correlation with placental attachment and uterine scar condition. Study Objectives: 1. Features of early pregnancy course and pregnancy outcome of women with uterine scar. 2. To determine site of placentation and uterine scar thickness by ultrasound and study if they influence on pregnancy outcome. Material and Methodology: 60 pregnant women with early in uterus with scar. Prospective study was conducted with vaginal ultrasound examination, previous history, clinical symptoms and signs, provided treatment and pregnancy outcome. Statistical processing was performed using DESCRIPTIVE, FREQUENCIES K command, parametric method of variables correlations, Pirson's correlation method to determine median of variables, standard deviation, maximum and minimum values. Study Results: Course of early pregnancy in uterus with scar had strong linear correlation to site of placentation and Pirson's correlation was 4.23/ $P < 0.01$ /. High risk of missed abortion and miscarriage were observed with less thickness of scar. Average risky period was 61-70 days. Two variables such as miscarriage and anemia had weak correlation and they were statistically significant/ $r = 0.52$ /. Conclusions: Bleeding had led to complications women attending hospital. Occurrence of missed abortion at 61-70th days or 9-10 weeks of gestation showed that this period was the most vulnerable period for this pathology. Being incidence of missed abortion among mothers with uterine scar of 80% may be related to scarce blood supply in area of scar. Risk of missed abortion and miscarriage/75%/increased with thinning down of the scar. Simple linear regress analyses showed that course of early pregnancy had 2% linear correlation to placentation at anterior uterine wall, at scar and around scar. Pirson's correlation was 0.423,  $P < 0,01$ . Two variables such as miscarriage and anemia had weak correlation and they were statistically significant/ $r = 0.52$ /.

**Database:** EMBASE

**8. Scar thickness measurement by transvaginal sonography in late second trimester and third trimester in pregnant patients with previous cesarean section: does sequential change in scar thickness with gestational age correlate with mode of delivery?**

**Author(s):** Singh N.; Tripathi R.; Mala Y.M.; Dixit R.

**Source:** Journal of Ultrasound; Jun 2015; vol. 18 (no. 2); p. 173-178

**Publication Date:** Jun 2015

**Publication Type(s):** Article

Available at [Journal of Ultrasound](#) - from SpringerLink

Available at [Journal of Ultrasound](#) - from Europe PubMed Central - Open Access

**Abstract:** Purpose: The objective of this study was to evaluate whether scar thickness measured by transvaginal sonography and the sequential change in scar thickness from second to third trimester has any association with mode of delivery in patients with previous cesarean. Methods: Pregnant women with previous one cesarean section underwent transvaginal sonography between 24 and 28 weeks of gestation and then a repeat scan beyond 36 weeks of gestation to measure scar thickness. These scar thickness measurements were then correlated with the mode of delivery. The scar was measured at multiple sites (3-4) of the lower uterine segment and its thinnest portion was considered to be the scar. Result: Scar thickness was thinner in those patients having cesarean delivery than those having vaginal delivery and this difference was statistically significant at both the gestational ages. Mean scar thickness at 24-28 weeks of gestation in patients who delivered vaginally is  $4.8 \pm 1.1$  mm and in those who had repeat cesarean section is  $4.4 \pm 1.1$  mm (p value = 0.043). Mean scar thickness beyond 36 weeks of gestation in patients who delivered vaginally is  $3.3 \pm 0.7$  mm and in those who had repeat cesarean section is  $2.9 \pm 0.9$  mm (p value = 0.003). The mean decrease in scar thickness was not significantly different between those who delivered vaginally (mean decrease =  $1.73 \pm 0.95$  mm) and those who had a repeat cesarean (mean decrease =  $1.91 \pm 0.96$  mm). Conclusion: Our study concluded that thicker scars are associated with better chances of successful vaginal birth after cesarean. Measurement at both late second trimester and third trimester can be done but latter has better correlation with mode of delivery. This association may be explained by the fact that thinner scars have more chances of fetal bradycardia, meconium staining of liquor and previous cesarean for feto-pelvic disproportion. Copyright © 2014, Societa Italiana di Ultrasonologia in Medicina e Biologia (SIUMB).

**Database:** EMBASE

## **9. Feasibility of prediction of cesarean section scar dehiscence in the third trimester by three-dimensional ultrasound.**

**Author(s):** Mansour, Ghada M; El-Mekkawi, Sherif F; Khairy, Hassan T; Mossad, Asmaa E M

**Source:** The journal of maternal-fetal & neonatal medicine : the official journal of the European Association of Perinatal Medicine, the Federation of Asia and Oceania Perinatal Societies, the International Society of Perinatal Obstetricians; May 2015; vol. 28 (no. 8); p. 944-948

**Publication Date:** May 2015

**Publication Type(s):** Journal Article Observational Study

**PubMedID:** 24962499

**Abstract:****PURPOSE**To assess the role of three-dimensional (3D) ultrasound multiplanar view in prediction of cesarean section (CS) scars dehiscence.**SUBJECTS AND METHODS**One hundred pregnant women with previous CS scars were investigated by ultrasound to measure the scar thickness by 2D ultrasound and to depict the uterine wall by 3D coronal plane, using 3D multiplanar view. Straight line cut section by 3D multiplanar view was used and prediction of dehiscence was by detecting fenestration of the wall.**RESULTS**Operative findings revealed that 95 cases (95%) of the studied group had intact uterine scar, while dehiscence was detected among five ladies (5%). Validity of 3D U/S versus operative findings revealed a sensitivity of 83.3%, specificity 100%, positive predictive value 100%, negative predictive value 99% and accuracy 99%. C technique was superior to straight line technique in multiplanar view for assessment of the scars.**CONCLUSION**Three-dimensional ultrasound is useful in prediction of dehiscent scars during pregnancy with perfect sensitivity. Machines with the availability of C dissection in the multiplanar view are more useful in this field.

**Database:** Medline



## **10. Sonographic prediction of scar dehiscence in women with previous cesarean section.**

**Author(s):** Sharma, Chanderdeep; Surya, Mukesh; Soni, Anjali; Soni, Pawan Kumar; Verma, Ashok; Verma, Suresh

**Source:** Journal of obstetrics and gynaecology of India; Apr 2015; vol. 65 (no. 2); p. 97-103

**Publication Date:** Apr 2015

**Publication Type(s):** Journal Article

**PubMedID:** 25883440

Available at [Journal of obstetrics and gynaecology of India](#) - from SpringerLink

Available at [Journal of obstetrics and gynaecology of India](#) - from Europe PubMed Central - Open Access

**Abstract:****PURPOSE**To estimate the risk of uterine dehiscence/rupture in women with previous cesarean section (CS) by comparing the thickness of lower uterine segment (LUS) and myometrium with trans-abdominal (TAS) and trans-vaginal sonography (TVS).**METHOD**In this case-control study, in 100 pregnant women posted for elective CS (with or without previous CS; group 1 and group 2 respectively), the thickness of LUS and myometrium was measured sonographically (TAS and TVS). Intra-operatively, LUS was graded (grades I-IV), and its thickness was measured with calipers. The primary outcome of the study was correlation between echographic measurements (TAS and TVS) and features of LUS (grades I-IV) at the time of CS. Secondary outcomes were correlation between myometrial thickness, number of previous CS, and inter-delivery interval with LUS (grades I-IV).**RESULT**Sonographic measurements of LUS and myometrium were significantly different between the two groups (both TAS and TVS p value = 0.000 each). However, the number of previous CS (p = 0.440) and inter-delivery interval (p = 0.062) had no statistically significant correlation with thickness of LUS.**CONCLUSION**Sonographic evaluation of LUS scar and myometrial thickness (both with TAS and TVS) is a safe, reliable, and non-invasive method for predicting the risk of scar dehiscence/rupture. Specific guidelines for TOLAC, after sonographic assessment of women with previous CS, are need of the hour.

**Database:** Medline

**11. Prediction of uterine dehiscence using ultrasonographic parameters of cesarean section scar in the nonpregnant uterus: a prospective observational study.**

**Author(s):** Pomorski, Michal; Fuchs, Tomasz; Zimmer, Mariusz

**Source:** BMC pregnancy and childbirth; Oct 2014; vol. 14 ; p. 365

**Publication Date:** Oct 2014

**Publication Type(s):** Journal Article Observational Study

**PubMedID:** 25733122

Available at [BMC pregnancy and childbirth](#) - from BioMed Central

Available at [BMC pregnancy and childbirth](#) - from Europe PubMed Central - Open Access

**Abstract:**BACKGROUND Every year 1.5 million cesarean section procedures are performed worldwide. As many women decide to get pregnant again, the population of pregnant women with a history of cesarean section is growing rapidly. For these women prediction of cesarean section scar performance is still a serious clinical problem. METHODS Starting in 2005, the study included 308 nonpregnant women with a history of low transverse cesarean section. The following ultrasonographic parameters of the cesarean section scar in the nonpregnant uterus were assessed: the residual myometrial thickness (RMT) and the width (W) and the depth (D) of the triangular hypoechoic scar niche. During 8 years of follow-up, 41 of these women were referred to our department for delivery. In all cases, a repeat cesarean section was performed and the lower uterine segment was assessed. Two independent statistical methods namely the logit model and Decision Tree analysis were used to determine the relation between the appearance of the cesarean section scar in the nonpregnant state and the performance of the scar in the next pregnancy. RESULTS The logit model revealed that the D/RMT ratio showed significant correlation with cesarean section scar dehiscence (P-value of 0.007). Specifically, a D/RMT ratio value greater than 1.3035 indicated that the likelihood of dehiscence was greater than 50%. The Decision Tree analysis revealed that a diagnosis of dehiscence versus non-dehiscence could be based solely on one criterion, a D/RMT ratio of at least 0.785. The sensitivity of this method was 71%, and the specificity was 94%. CONCLUSIONS Assessment of the cesarean section scar in the nonpregnant uterus can be used to predict the occurrence of scar dehiscence in the next pregnancy.

**Database:** Medline

## **12. Sonographic evaluation of the lower uterine segment thickness in women with a single previous Cesarean section.**

**Author(s):** Sanlorenzo, O; Farina, A; Pula, G; Zanello, M; Pedrazzi, A; Martina, T; Gabrielli, S; Simonazzi, G; Rizzo, N

**Source:** Minerva ginecologica; Oct 2013; vol. 65 (no. 5); p. 551-555

**Publication Date:** Oct 2013

**Publication Type(s):** Journal Article

**PubMedID:** 24096291

**Abstract:**AIMThe aim of this paper was to evaluate the lower uterine segment (LUS) thickness through transvaginal sonography in late preterm and full term pregnancies with a single previous Cesarean section, to correlate the obtained LUS measurements with intraoperative observations, and to identify a predictive cut-off value in order to select the best candidates for a vaginal birth after Cesarean delivery (VBAC).METHODSTwo hundred and fourteen women with a single previous Cesarean section who had an ultrasound measurement of the LUS thickness (stratified in S1, S2 and S3) in pregnancy were enrolled. The outcome of interest was the visual finding of a thin uterine scar at the time of the iterative Cesarean section. Linear regression was used to correlate the LUS thickness with gestational age (GA). A ROC curve has been used to determine the detection rate (DR) and the risk of each actual value of LUS thickness versus a thin uterine scar (outcome of interest).RESULTSThe LUS thickness was correlated with the gestational age ( $R^2=0.034$ ,  $P\text{-value}=0.005$ ). The DR as estimated by ROC curves to detect a translucent lower uterine segment (S3) was 94.1% at a false positive rate (FPR) of 20%. The correspondent cut-off value was 1.8 mm. Finally a likelihood ratio (LR) of observing S3 was estimated. At the quoted cut-off of 1.8 mm the LR was 3. As demonstrated, for a segment of 1 mm the LR was instead about 13.CONCLUSIONThe obtained values lead us to the conclusion that a thickness less than 1.8 mm can be reasonably considered a valid cut-off value to identify patients with a higher risk of thin uterine scar.

**Database:** Medline

### **13. Predicting successful vaginal birth after Cesarean section using a model based on Cesarean scar features examined by transvaginal sonography**

**Author(s):** Naji O.; Wynants L.; Smith A.; Abdallah Y.; Stalder C.; Sayasneh A.; McIndoe A.; Ghaem-Maghani S.; Van Huffel S.; Van Calster B.; Timmerman D.; Bourne T.

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; Jun 2013; vol. 41 (no. 6); p. 672-678

**Publication Date:** Jun 2013

**Publication Type(s):** Article

**PubMedID:** 23371440

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVE: To develop a model to predict the success of a trial of vaginal birth after Cesarean section (VBAC) based on sonographic measurements of Cesarean section (CS) scar features, demographic variables and previous obstetric history.METHODS: We used transvaginal sonography (TVS) to examine the CS scar of 320 consecutive pregnant women. TVS was carried out at 11-13, 19-21 and 34-36weeks' gestation and prospective measurements of the scar were recorded at each visit according to a defined protocol. A logistic regression model to predict success of VBAC was developed for those patients with a visible scar on ultrasound and only one previous CS. The model was evaluated using bootstrap validation.RESULTS: There were 131 women with one previous CS and a visible scar, of whom 10 underwent CS prior to labor and were excluded from analysis. Successful VBAC was achieved in 74/121 (61%) of the remaining cases. The prediction model developed was based on patient age, previous history of VBAC, residual myometrial thickness (RMT) and the change in RMT from the first to the second trimester (DELTARMT). The internally validated area under the receiver-operating characteristics curve was 0.62 when measurements of RMT and DELTARMT were excluded, but 0.94 when scar information was incorporated into the model.CONCLUSION: Ultrasound measurements of CS scar, namely RMT and the change in RMT from the first to the second trimester of pregnancy, when incorporated into a mathematical model, can predict accurately a successful trial of labor in patients with one previous CS.Copyright © 2013 ISUOG. Published by John Wiley & Sons Ltd.

**Database:** EMBASE

#### **14. Changes in Cesarean section scar dimensions during pregnancy: a prospective longitudinal study.**

**Author(s):** Naji, O; Daemen, A; Smith, A; Abdallah, Y; Saso, S; Stalder, C; Sayasneh, A; McIndoe, A; Ghaem-Maghami, S; Timmerman, D; Bourne, T

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; May 2013; vol. 41 (no. 5); p. 556-562

**Publication Date:** May 2013

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 23108803

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVE To describe changes in Cesarean section (CS) scars longitudinally throughout pregnancy, and to relate initial scar measurements, demographic variables and obstetric variables to subsequent changes in scar features and to final pregnancy outcome. METHODS In this prospective observational study we used transvaginal sonography (TVS) to examine the CS scar of 320 consecutive pregnant women at 11-13, 19-21 and 32-34 weeks' gestation. For scars visible on TVS, the hypoechoic part was measured in three dimensions and the residual myometrial thickness (RMT) was also measured. Analyses were carried out using one-way repeated measures ANOVA and mixed modeling. The incidence of subsequent scar rupture was recorded. RESULTS The CS scar was visible in 284/320 cases (89%). Concerning length and depth of the hypoechoic part of the scar and RMT, the larger the initial scar measurement, the larger the decrease observed during pregnancy. For the hypoechoic part of the scar, the width increased on average by 1.8 mm per trimester, while the depth and length decreased by 1.8 and 1.9 mm, respectively (false discovery rate  $P < 0.0001$ ). Mean RMT in the first trimester was 5.2 mm and on average decreased by 1.1 mm per trimester. Two cases (0.62%) of uterine scar rupture were confirmed following a trial of vaginal delivery; these had a mean RMT of 0.5 mm at second scan and an average decrease of 2.6 mm over the course of pregnancy. CONCLUSION This study establishes reference data and confirms that the dimensions of CS scars change throughout pregnancy. Scar rupture was associated with a smaller RMT and greater decrease in RMT during pregnancy. There is the potential to test absolute values and observed changes in CS scar measurements as predictors of uterine scar rupture and outcome in trials of vaginal birth after Cesarean section.

**Database:** Medline

### **15. Prediction of scar integrity and vaginal birth after caesarean delivery.**

**Author(s):** Valentin, Lil

**Source:** Best practice & research. Clinical obstetrics & gynaecology; Apr 2013; vol. 27 (no. 2); p. 285-295

**Publication Date:** Apr 2013

**Publication Type(s):** Journal Article Review

**PubMedID:** 23103207

**Abstract:** A statistically significant association with uterine rupture during a trial of labour after caesarean delivery was found in at least two studies for the following variables: inter-delivery interval (higher risk with short interval), birth weight (higher risk if 4000 g or over), induction of labour (higher risk), oxytocin dose (higher risk with higher doses), and previous vaginal delivery (lower risk). However, no clinically useful risk estimation model that includes clinical variables has been published. A thin lower uterine segment at 35-40 weeks, as measured by ultrasound in women with a caesarean hysterotomy scar, increases the risk of uterine rupture or dehiscence. No cut-off for lower uterine segment thickness, however, can be suggested because of study heterogeneity, and because prospective validation is lacking. Large caesarean hysterotomy scar defects in non-pregnant women seen at ultrasound examination increase the risk of uterine rupture or dehiscence in subsequent pregnancy, but the strength of the association is unknown. To sum up, we currently lack a method that can provide a reliable estimate of the risk of uterine rupture or dehiscence during a trial of labour in women with caesarean hysterotomy scar(s).

**Database:** Medline

**16. Effective anatomical and functional status of the lower uterine segment at term: estimating the risk of uterine dehiscence by ultrasound.**

**Author(s):** Gizzo, Salvatore; Zambon, Alessandra; Saccardi, Carlo; Patrelli, Tito Silvio; Di Gangi, Stefania; Carrozzini, Monica; Bertocco, Anna; Capobianco, Giampiero; D'Antona, Donato; Nardelli, Giovanni Battista

**Source:** Fertility and sterility; Feb 2013; vol. 99 (no. 2); p. 496-501

**Publication Date:** Feb 2013

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 23127591

**Abstract:**OBJECTIVETo define the role of lower uterine segment (LUS) evaluation at term.DESIGNObservational case-control study.SETTINGUniversity hospital.PATIENT(S)Ninety-four patients were divided into two groups. Group A consisted of 45 multiparous single fetus pregnant women with up to two previous cesarean sections (CS). Group B consisted of 49 multiparous pregnant women with up to three vaginal deliveries and no uterine scars.INTERVENTION(S)Total LUS and myometrial thickness were measured by sonogram in all patients before undergoing a CS.MAIN OUTCOME MEASURE(S)The primary outcome is a correlation between echographic measurements and features of the LUS at the time of CS. The secondary outcome is a definition of a correlation between the number of previous CS, interdelivery interval time, and features of the LUS (grades I-IV).RESULT(S)Sonographic measurements revealed significant differences in LUS size and myometrial thickness between the two groups. Grades III and IV of LUS were only observed in group A. An interdelivery interval <18 months, LUS thickness  $\leq 3.0$  mm, and myometrial thickness < 1.5 mm were statistically significant predictors of LUS grades III and IV. Number of previous CS showed no correlation with surgical LUS status.CONCLUSION(S)Sonographic evaluation of the LUS may be a noninvasive, reproducible, and safe technique for defining the risk of uterine dehiscence, with a sensitivity of 100% and specificity of 85% (positive predictive value, 45%; negative predictive value, 100%).

**Database:** Medline

**17. Cesarean scar imaging and prediction of subsequent obstetric complications.**

**Author(s):** Varner, Michael

**Source:** Clinical obstetrics and gynecology; Dec 2012; vol. 55 (no. 4); p. 988-996

**Publication Date:** Dec 2012

**Publication Type(s):** Journal Article Review

**PubMedID:** 23090468

Available at [Clinical obstetrics and gynecology](#) - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Abstract:**It has long been hoped that cesarean hysterotomy scar imaging data could predict obstetric complications in subsequent pregnancies with sufficient precision to be used for clinical decision-making. Although large visualized defects in nonpregnant uteri, and thinning of the lower uterine segment late in subsequent pregnancies, may be associated with increased risk of uterine rupture, the paucity of available clinical correlation data still preclude any clinical utility. There is an ongoing need for prospective adequately powered registries that include clinical factors related to the previous cesarean deliveries that can inform subsequent practice decisions.

**Database:** Medline

**18. Systematic review of cesarean scar assessment in the nonpregnant state: imaging techniques and uterine scar defect.**

**Author(s):** Roberge, Stéphanie; Boutin, Amélie; Chaillet, Nils; Moore, Lynne; Jastrow, Nicole; Demers, Suzanne; Bujold, Emmanuel

**Source:** American journal of perinatology; Jun 2012; vol. 29 (no. 6); p. 465-471

**Publication Date:** Jun 2012

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article Review

**PubMedID:** 22399223

**Abstract:**OBJECTIVETo review the ability of imaging techniques to predict incomplete healing of uterine cesarean scars before the next pregnancy.STUDY DESIGNA systematic literature review searched for studies on women who underwent previous low-transverse cesarean, evaluated by hysteroGRAPHY, sonohysteroGRAPHY (SHG), or transvaginal ultrasound (TVU). The median prevalence of scar defects was computed with 95% confidence intervals (95% CIs). Odds ratio (OR, 95% CI) identified risk factors of incomplete healing.RESULTSThe analysis included 21 studies. The proportions of suspected scar defects detected by hysteroGRAPHY, SGH, and TVU were 58% (33 to 70), 59% (58 to 85), and 37% (20 to 65), respectively. Two studies found that women with a large uterine scar defect had a higher risk of uterine rupture or uterine scar dehiscence than those with no scar defect or small scar defect (OR: 26.05 [2.36 to 287.61],  $p < 0.001$ ). The only reported risk factor for scar defect was the occurrence of more than one previous cesarean (OR: 2.24 [1.13, 4.45],  $p = 0.02$ ).CONCLUSIONHysteroGRAPHY, SGH, and TVU can detect uterine scar defects in ~50% of women with previous cesarean.

**Database:** Medline



**19. Clinical importance of appearance of cesarean hysterotomy scar at transvaginal ultrasonography in nonpregnant women.**

**Author(s):** Vikhareva Osser, Olga; Valentin, Lil

**Source:** Obstetrics and gynecology; Mar 2011; vol. 117 (no. 3); p. 525-532

**Publication Date:** Mar 2011

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 21343754

Available at [Obstetrics and gynecology](#) - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Abstract:**OBJECTIVETo estimate the association between the appearance of cesarean hysterotomy scars at transvaginal ultrasound examination of nonpregnant women and the outcome of subsequent pregnancies and deliveries.METHODSA total of 162 women who had ever given birth by cesarean underwent transvaginal ultrasound examination of the hysterotomy scar 6 to 9 months after the latest cesarean delivery. Published ultrasound definitions of large scar defects were used. The appearance of the hysterotomy scar at ultrasound examination was compared with the outcome of subsequent pregnancies and deliveries. Clinical information on subsequent pregnancies was obtained from medical records.RESULTSSix women were lost to follow-up, leaving 156 for analysis. Of these 156 women, 69 became pregnant after the ultrasound examination (99 pregnancies, 65 deliveries). There were no placental complications or scar pregnancies. At the first repeat cesarean delivery after the ultrasound examination, 5.3% (1/19) of the women with an intact scar or a small scar defect had uterine dehiscence or rupture compared with 42.9% (3/7) of those with a large defect ( $P=.047$ ), odds ratio 11.8 (95% confidence interval 0.7-746).CONCLUSIONOur results point toward a likely association between large defects in the hysterotomy scar after cesarean delivery detected by transvaginal ultrasonography in nonpregnant women and uterine rupture or dehiscence in subsequent pregnancy.

**Database:** Medline

**20. Sonographic assessment of lower uterine segment at term in women with previous cesarean delivery.**

**Author(s):** Kushtagi, Pralhad; Garepalli, Suneeta

**Source:** Archives of gynecology and obstetrics; Mar 2011; vol. 283 (no. 3); p. 455-459

**Publication Date:** Mar 2011

**Publication Type(s):** Journal Article

**PubMedID:** 20145938

Available at [Archives of gynecology and obstetrics](#) - from SpringerLink

**Abstract:**OBJECTIVETo correlate lower uterine segment (LUS) thickness measured by abdominal sonography at term pregnancy with that measured manually using caliper at cesarean delivery and to find out minimum LUS thickness indicative of its integrity in women with previous cesarean.METHODSIn 106 women with previous cesarean delivery and 68 with unscarred uterus, abdominal sonographic assessment of LUS was carried out within a week of delivery. Sonographic measurements were correlated with manual measurement of lower flap of LUS using Vernier calipers in 96 of these women (64 with previous cesarean and 32 of unscarred uterus) who had elective cesarean delivery.RESULTSSonographically determined LUS was thinner among women with previous cesarean delivery than in those without (4.58 SD 1.05 vs. 4.8 SD 0.8;  $t = 1.986$ ;  $p = 0.04$ ). Women with vaginal birth after cesarean had thicker LUS than women with repeat cesarean delivery (4.4 SD 0.97 vs. 4.48 SD 1.0). The findings were not influenced by engaged fetal head status or

amount of bladder fullness. Directly measured LUS thickness using Vernier calipers before delivery of the baby confirmed ultrasound measurements, but showed smaller differences between them. There were eight cases with defective uterine scar at cesarean. LUS thickness at term of 3 mm provided 87.5% sensitivity and specificity, and was found to have negative predictive value of 98%. But in two of seven cases the actual LUS was not measurable despite sonographic measurement of 3 mm, and there were two records of scar dehiscence in those with 3 and 4 mm of LUS thickness. CONCLUSION LUS thickness of 3 mm measured by abdominal ultrasonography prior to delivery at term in women with previous cesarean is suggestive of stronger LUS but is not a reliable safeguard for trial of labor.

**Database:** Medline

## **21. Uterine scar assessment: How should it be done before trial of labor after cesarean delivery?**

**Author(s):** Spong C.Y.; Queenan J.T.

**Source:** Obstetrics and Gynecology; Mar 2011; vol. 117 (no. 3); p. 521-522

**Publication Date:** Mar 2011

**Publication Type(s):** Editorial

**PubMedID:** 21343752

Available at [Obstetrics and Gynecology](#) - from Ovid (Journals @ Ovid)

Available at [Obstetrics and Gynecology](#) - from Ovid (LWW Total Access Collection 2015 - Q1 with Neurology)

**Database:** EMBASE

## **22. Sonographic lower uterine segment thickness and risk of uterine scar defect: a systematic review.**

**Author(s):** Jastrow, Nicole; Chaillet, Nils; Roberge, Stéphanie; Morency, Anne-Maude; Lacasse, Yves; Bujold, Emmanuel

**Source:** Journal of obstetrics and gynaecology Canada : JOGC = Journal d'obstetrique et gynecologie du Canada : JOGC; Apr 2010; vol. 32 (no. 4); p. 321-327

**Publication Date:** Apr 2010

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article Review

**PubMedID:** 20500938

**Abstract:**OBJECTIVETo study the diagnostic accuracy of sonographic measurements of the lower uterine segment (LUS) thickness near term in predicting uterine scar defects in women with prior Caesarean section (CS).DATA SOURCESPubMed, Embase, and Cochrane Library (1965-2009).METHODS OF STUDY SELECTIONStudies of populations of women with previous low transverse CS who underwent third-trimester evaluation of LUS thickness were selected. We retrieved articles in which number of patients, sensitivity, and specificity to predict a uterine scar defect were available.DATA SYNTHESISTwelve eligible studies including 1834 women were identified. Uterine scar defect was reported in a total of 121 cases (6.6%). Seven studies examined the full LUS thickness only, four examined the myometrial layer specifically, and one examined both measurements. Weighted mean differences in LUS thickness and associated 95% confidence intervals between women with and without uterine scar defect were calculated. Summary receiver operating characteristic (SROC) analysis and summary diagnostic odds ratios (DOR) were used to evaluate and compare the area under the curve (AUC) and the association between LUS thickness and uterine scar defect. Women with a uterine scar defect had thinner full LUS and thinner myometrial layer (weighted mean difference of 0.98 mm; 95% CI 0.37 to 1.59,  $P = 0.002$ ; and 1.13 mm; 95% CI 0.32 to 1.94 mm,  $P = 0.006$ , respectively). SROC analysis showed a stronger association between full LUS thickness and uterine scar defect (AUC: 0.84 +/- 0.03,  $P < 0.001$ ) than between myometrial layer and scar defect (AUC: 0.75 +/- 0.05,  $P < 0.01$ ). The optimal cut-off value varied from 2.0 to 3.5 mm for full LUS thickness and from 1.4 to 2.0 for myometrial layer.CONCLUSIONSonographic 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.

**Database:** Medline

### **23. Ultrasonographic evaluation of lower uterine segment thickness in pregnant women with previous cesarean section**

**Author(s):** Elmoghazy D.

**Source:** International Journal of Gynecology and Obstetrics; Oct 2009; vol. 107

**Publication Date:** Oct 2009

**Publication Type(s):** Conference Abstract

Available at [International Journal of Gynecology and Obstetrics](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**Objective: To evaluate the lower uterine segment thickness in pregnant women with previous cesarean section by ultrasonography in comparison to those with previous normal vaginal delivery, and to determine a critical thickness above which safe vaginal delivery is predictable. Methods: A prospective observational study of 100 antenatal women with previous cesarean delivery and 50 controls was carried out. Transabdominal and transvaginal ultrasonography were used in both groups to evaluate lower uterine segment thickness. The obstetric outcome in patients with successful vaginal birth and intraoperative findings in women undergoing cesarean delivery were correlated with lower segment thickness. Results: The overall vaginal birth after cesarean section (VBAC) was 68%, the incidence of dehiscence was 28%, and there were no uterine ruptures. There was an 86% correlation between transabdominal ultrasonography with magnification and transvaginal ultrasonography. The critical cutoff value for safe lower segment thickness, derived from the receiver operator characteristic curve, was 2.5mm. Conclusion: Ultrasonographic evaluation permits better assessment of the risk of scar complication intrapartum, and could allow for safer management of delivery.

**Database:** EMBASE

### **24. Prediction of complete uterine rupture by sonographic evaluation of the lower uterine segment.**

**Author(s):** Bujold, Emmanuel; Jastrow, Nicole; Simoneau, Jessica; Brunet, Suzanne; Gauthier, Robert J

**Source:** American journal of obstetrics and gynecology; Sep 2009; vol. 201 (no. 3); p. 320

**Publication Date:** Sep 2009

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 19733288

**Abstract:**OBJECTIVEThe purpose of this study was to establish the validity of sonographic evaluation of lower uterine segment (LUS) thickness for complete uterine rupture.STUDY DESIGNA prospective cohort study of women with previous cesarean delivery was conducted. LUS thickness (full thickness and myometrial thickness only) was measured between 35 and 38 weeks gestation, and the thinnest measurement was considered to be the dependent variable. Receiver operating curve analyses and logistic regression were used.RESULTSTwo hundred thirty-six women were included in the study. Nine uterine scar defects (3 cases of complete rupture during a trial of labor and 6 cases of dehiscence) were reported. Receiver operating curve analyses showed that full thickness of <2.3 mm was the optimal cutoff for the prediction of uterine rupture (3/33 vs 0/92; P = .02). Full thickness was also identified as an independent predictor of uterine scar defect (odds ratio, 4.66; 95% confidence interval, 1.04-20.91)CONCLUSIONFull LUS thickness of <2.3 mm is associated with a higher risk of complete uterine rupture.

**Database:** Medline

**25. Cesarean scar defect: correlation between Cesarean section number, defect size, clinical symptoms and uterine position.**

**Author(s):** Wang, C-B; Chiu, W-W-C; Lee, C-Y; Sun, Y-L; Lin, Y-H; Tseng, C-J

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; Jul 2009; vol. 34 (no. 1); p. 85-89

**Publication Date:** Jul 2009

**Publication Type(s):** Research Support, Non-u.s. Gov't Journal Article

**PubMedID:** 19565535

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVETo determine the prevalence of clinical symptoms associated with Cesarean scar defects, and to determine the association between the size of these defects, clinical complaints, uterine position, and a history of multiple Cesarean sections.METHODSIn this cross-sectional study, Cesarean scar defects in women with a history of transverse lower-segment Cesarean section were measured by transvaginal ultrasound while being assessed for other gynecological conditions. The relationships between the size of the Cesarean scar defect and the clinical symptoms, uterine position and number of previous Cesarean sections were evaluated. Patients with other uterine pathologies, including endometrial hyperplasia, polyps, malignancy and submucosal myomas, were excluded from the study.RESULTSDuring a 3-year period, 4250 women were assessed by transvaginal sonography, of whom 293 (6.9%) were diagnosed with Cesarean scar defects. Eighty-six patients were excluded due to other uterine pathologies. Altogether, 207 patients with Cesarean scar defects were included in this study. Women who had undergone multiple Cesarean sections tended to have larger scar defects (in width and depth) than did those who had undergone a single Cesarean section. Women with retroflexed uteri also tended to have wider defects than those with anteflexed uteri. Defect width was significantly greater in women with postmenstrual spotting, dysmenorrhea and chronic pelvic pain.CONCLUSIONSMultiple Cesarean sections and retroflexed uteri are risk factors for larger Cesarean scar defects. The size of the Cesarean scar defect is associated with clinical symptoms such as postmenstrual spotting, dysmenorrhea and chronic pelvic pain.

**Database:** Medline

## **26. Ultrasonographic evaluation of lower uterine segment thickness in patients of previous cesarean section.**

**Author(s):** Sen, S; Malik, S; Salhan, S

**Source:** International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics; Dec 2004; vol. 87 (no. 3); p. 215-219

**Publication Date:** Dec 2004

**Publication Type(s):** Controlled Clinical Trial Clinical Trial Journal Article

**PubMedID:** 15548392

Available at [International journal of gynaecology and obstetrics: the official organ of the International Federation of Gynaecology and Obstetrics](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVETo evaluate by ultrasonography, the lower uterine segment thickness of women with a previous cesarean delivery and determine a critical thickness above which safe vaginal delivery is predictable.METHODSA prospective observational study of 71 antenatal women with previous cesarean delivery and 50 controls was carried out. Transabdominal and transvaginal ultrasonography were used in both groups to evaluate lower uterine segment thickness. The obstetric outcome in patients with successful vaginal birth and intraoperative findings in women undergoing cesarean delivery were correlated with lower segment thickness.RESULTSThe overall vaginal birth after cesarean section (VBAC) was 46.5% and VBAC success rate was 63.5%, the incidence of dehiscence was 2.82%, and there were no uterine ruptures. There was a 96% correlation between transabdominal ultrasonography with magnification and transvaginal ultrasonography. The critical cutoff value for safe lower segment thickness, derived from the receiver operator characteristic curve, was 2.5 mm.CONCLUSIONUltrasonographic evaluation permits better assessment of the risk of scar complication intrapartum, and could allow for safer management of delivery.

**Database:** Medline

## **27. Sonographic evaluation of the lower uterine segment in patients with previous cesarean delivery**

**Author(s):** Cheung V.Y.T.; Constantinescu O.C.; Ahluwalia B.S.

**Source:** Journal of Ultrasound in Medicine; Nov 2004; vol. 23 (no. 11); p. 1441-1447

**Publication Date:** Nov 2004

**Publication Type(s):** Article

**PubMedID:** 15498908

Available at [Journal of Ultrasound in Medicine](#) - from HighWire - Free Full Text

**Abstract:**Objective. To evaluate the appearance of the lower uterine segment (LUS) in pregnant women with previous cesarean delivery and to compare the LUS thickness with that in women with unscarred uteri. Methods. In a prospective study, sonographic examination was performed on 53 pregnant women with previous cesarean delivery (cesarean group), 40 nulliparas (nullip-control), and 40 women who had 1 or more childbirths with unscarred uteri (multip-control) between 36 and 38 weeks' gestation to assess the appearance and compare the thickness of the LUS. In the cesarean group, the sonographic findings were correlated with the delivery outcome and the intraoperative LUS appearance. Results. In the cesarean group, 44 patients (83.0%) had a normal-appearing LUS indistinguishable from that of control groups; 2 patients (3.8%) had an LUS defect suggestive of dehiscence; and 7 patients (13.2%) had thickened areas of increased echogenicity with or without myometrial thinning. Although the cesarean group had a thinner LUS (1.9 +/- 1.4 mm) when

compared with both the nullip-control group (2.3 +/- 1.1 mm; P > .05) and the multip-control group (3.4 +/- 2.2 mm; P < .001), only the latter difference achieved statistical significance. One of the 2 patients who had a sonographically suspected LUS defect had confirmed uterine dehiscence during surgery. An intraoperatively diagnosed paper-thin LUS, when compared with an LUS of normal thickness, had significantly smaller sonographic LUS measurements (1.1 +/- 0.6 versus 2.0 +/- 0.8 mm, respectively; P = .004). Conclusions. Prior cesarean delivery is associated with a sonographically thinner LUS when compared with those with prior vaginal delivery. Prenatal sonographic examination is potentially capable of diagnosing a uterine defect and determining the degree of LUS thinning in patients with previous cesarean delivery.

**Database:** EMBASE

## **28. Sonographic imaging of cervical scars after Cesarean section.**

**Author(s):** Zimmer, E Z; Bardin, R; Tamir, A; Bronshtein, M

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; Jun 2004; vol. 23 (no. 6); p. 594-598

**Publication Date:** Jun 2004

**Publication Type(s):** Journal Article

**PubMedID:** 15170802

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVETo investigate whether uterine contractions at the time of a Cesarean section have an impact on future presence and location of a cervical Cesarean scar.METHODSA targeted transvaginal ultrasound examination of the fetus, uterus and cervix was done in 2973 consecutive women at 14-16 weeks' gestation. The sonographer was blinded to the women's previous obstetric histories. The presence and location of a sonographic cervical hypoechogenic line, which probably represented a Cesarean scar, was recorded.RESULTSThere were 180 women with a previous Cesarean section performed before the start of uterine contractions and 173 with a Cesarean section performed during contractions in labor. The cervical hypoechogenic line was more common in sections performed during contractions (75.7% vs. 52.7%; P < 0.001) and was more distally located from the internal os (17.9 +/- 9.4 vs. 14.6 +/- 9.1 mm; P = 0.01). A hypoechogenic line was observed in 21/2620 women without a previous Cesarean section, representing a false-positive rate of 0.8%.CONCLUSIONCesarean sections, especially those done during uterine contractions, are actually performed through cervical tissue. This finding is in agreement with the physiological process of cervical effacement during contractions.

**Database:** Medline

## **29. Cesarean section scar evaluation by saline contrast sonohysterography.**

**Author(s):** Regnard, C; Nosbusch, M; Felleman, C; Benali, N; van Rysselberghe, M; Barlow, P; Rozenberg, S

**Source:** Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology; Mar 2004; vol. 23 (no. 3); p. 289-292

**Publication Date:** Mar 2004

**Publication Type(s):** Journal Article

**PubMedID:** 15027020

Available at [Ultrasound in obstetrics & gynecology : the official journal of the International Society of Ultrasound in Obstetrics and Gynecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**OBJECTIVETo investigate the frequency of images suggesting the existence of a dehiscence at the site of the uterine scar after Cesarean section.METHODSThirty-three women with a past history of Cesarean section who were planning a further pregnancy were involved in the study. Saline contrast sonohysterography (SCSH) was performed a minimum of 3 months following Cesarean section. The thickness of the residual myometrium, the thickness of the myometrium bordering the scar and the depth of the filling defect in the scar (i.e. the 'niche', defined as a triangular, anechoic area at the presumed site of incision) were recorded in each case. A 'dehiscence' was defined as a niche whose depth was at least 80% of the anterior myometrium.RESULTSIn 19/33 (57.5%) patients a niche with a depth of 4.2 +/- 2.5 (range, 1.2-11.7) mm was identified. In these patients the residual myometrium measured 6.5 +/- 2.7 (range, 0-10.9) mm vs. 8.9 +/- 2.0 (range, 6.9-13.9) mm in the remaining 14 patients without a niche. Within the 19 niches, two dehiscences were identified.CONCLUSIONNiches can be identified by SCSH following a Cesarean section in about 60% of patients. The prevalence of scar dehiscence (in the present series 2/33 or 6%) is much higher than the reported risk of uterine rupture (0.4%).

**Database:** Medline



### **30. Preoperative diagnosis of dehiscence of the lower uterine segment in patients with a single previous Caesarean section.**

**Author(s):** Suzuki, S; Sawa, R; Yoneyama, Y; Asakura, H; Araki, T

**Source:** The Australian & New Zealand journal of obstetrics & gynaecology; Nov 2000; vol. 40 (no. 4); p. 402-404

**Publication Date:** Nov 2000

**Publication Type(s):** Journal Article Validation Studies

**PubMedID:** 11194423

Available at [The Australian & New Zealand journal of obstetrics & gynaecology](#) - from Wiley Online Library Science , Technology and Medicine Collection 2017

**Abstract:**Preoperative diagnoses were checked during surgery in 39 patients who underwent elective repeat Caesarean section with (n = 20) and without (as control, n = 19) a preoperative diagnosis of wall dehiscence (thinning) of the lower uterine segment (LUS). All patients were examined manually and by ultrasonography at 36 weeks gestation before labour. A preoperative diagnosis of wall dehiscence was made when the wall thickness was less than 2 mm and/or the patient felt pain and tenderness in the LUS. Surgical findings of dehiscence were defined as a subperitoneal separation of the uterine scar in the LUS. The sensitivity and specificity of our ultrasonographic evaluations were found to be 100% and 83% (p < 0.05), respectively. On the other hand, there were no surgical findings of dehiscence in patients who felt pain and tenderness in the LUS with a wall thickness greater than 2 mm, nor among those in the control group.

**Database:** Medline

### **31. Prediction of uterine dehiscence by measuring lower uterine segment thickness prior to the onset of labor: evaluation by transvaginal ultrasonography.**

**Author(s):** Asakura, H; Nakai, A; Ishikawa, G; Suzuki, S; Araki, T

**Source:** Journal of Nippon Medical School = Nippon Ika Daigaku zasshi; Oct 2000; vol. 67 (no. 5); p. 352-356

**Publication Date:** Oct 2000

**Publication Type(s):** Clinical Trial Journal Article

**PubMedID:** 11031364

**Abstract:**OBJECTIVE Lower uterine segment thickness was measured by transvaginal ultrasound examination and its correlations with the occurrence of uterine dehiscence and rupture was examined. METHOD The thickness of the muscular layer of the lower uterine segment was measured in 186 term gravidas with previous uterine scars and its correlation with uterine dehiscence/rupture was investigated. RESULTS Uterine dehiscence was found in 9 cases or 4.7%. There were no cases of the uterine rupture. The thickness of the lower uterine segment among the gravidas with dehiscence was significantly less than those without dehiscence (p < 0.01). The cut-off value for the thickness of the lower uterine segment was 1.6 mm as calculated by the receiver operating characteristic curve. The sensitivity was 77.8%; specificity 88.6%; positive predictive value 25.9%; negative predictive value 98.7%. CONCLUSION Measurement of the lower uterine segment is useful in predicting the absence of dehiscence among gravidas with previous cesarean section. If the thickness of the lower uterine segment is more than 1.6 mm, the possibility of dehiscence during the subsequent trials of labor is very small.

**Database:** Medline

### **32. Thickness of the lower uterine segment: its influence in the management of patients with previous cesarean sections.**

**Author(s):** Rozenberg, P; Goffinet, F; Philippe, H J; Nisand, I

**Source:** European journal of obstetrics, gynecology, and reproductive biology; Nov 1999; vol. 87 (no. 1); p. 39-45

**Publication Date:** Nov 1999

**Publication Type(s):** Journal Article

**PubMedID:** 10579615

**Abstract:**OBJECTIVETo determine how ultrasound measurement of the lower uterine segment affects the decision about delivery for patients with previous cesarean sections (CS) and what are the consequences on cesarean section rates and uterine rupture or dehiscence.DESIGNProspective open study.PATIENTS198 patients: all women with a previous CS who gave birth in our department during 1995 and 1996 to an infant with a gestational age of at least 36 weeks and who underwent ultrasound measurement of their lower uterine segment (95-96 study group), compared with a similar population from 1989 to 1994 whose measurements were not provided to the treating obstetrician.RESULTSAmong the patients with one previous CS, the vaginal delivery rate did not differ significantly during the two periods (70.3% for the 89-94 study period vs. 67.9% for the 95-96 study period,  $P=0.53$ ), but the 95-96 study group experienced a significant increase in the rate of elective CS, compensated by a reduction in the rate of emergency CS (6.3% and 23.4%, respectively, for the 89-94 study period vs. 11.9% and 20.1% for the 95-96 study period,  $P=0.01$ ). There was a very significant increase in the rate of vaginal delivery for the 95-96 study period among patients with two previous CS (26.7% vs. 8.0% for the 89-95 study period,  $P=0.01$ ). The lower uterine segment was significantly thicker among women with a trial of labor than among those with an elective CS ( $4.5 \pm 1.4$  mm compared with  $3.8 \pm 1.5$  mm;  $P=0.006$ ); and the trial of labor group contained significantly fewer women with a lower uterine segment measurement less than 3.5 mm than did the elective CS group (24.0% compared with 56.6%;  $P<0.001$ ). Two patients (0.8%) were found to have a defect of the uterine scar, a rate significantly lower than that observed in the early group (3.9%,  $P=0.03$ ).CONCLUSIONSUltrasound measurement of the lower uterine segment can increase the safe use of trial of labor, because it provides an additional element for assessing the risk of uterine rupture.

**Database:** Medline

### **33. Relationship of uterine scar strength to pre-labor ultrasound appearance**

**Author(s):** Mazurek-Kantor J.; Kietlinska Z.; Splewankiewicz B.; Sawicki W.; Stelmachow J.

**Source:** Medical Science Monitor; 1998; vol. 4 (no. 5); p. 797-802

**Publication Date:** 1998

**Publication Type(s):** Article

**Abstract:**Our study group comprised 587 who gave birth to children following a previous cesarean section. Out of this group, 309 women delivered by a second cesarean section, and 278 delivered vaginally. There was no correlation between the dehiscence ratio and the period of time following the previous cesarean section. Before delivery we measured the thickness of the uterine scar following the previous cesarean section in 482 patients. Out of this group 249 patients delivered by a second cesarean section and 233 underwent natural labor. Among these patients we compared the resistance of the uterine scar during the following labor dependent of its ultrasound thickness. We noted that in scars under 3 mm of thickness (49 patients) the dehiscence of the scar occurred in 90% of patients (44 cases), and in scars above 3 mm of thickness (200 patients) the dehiscence of the scars was noted only in 13% of patients (26 cases). Thickening of the uterine scar is correlated with a decreased incidence of dehiscence. Out of 380 patients who underwent vaginal delivery, 240 received oxytocin at a dose of 2.5 j in 500 ml 0.9% NaCl. This groups ratio of dehiscence with and without the use of oxytocin was comparable. In patients undergoing labor, oxytocin use insignificantly increased successful vaginal delivery. The highest rate of dehiscence and paper-lower segments (43%) occurred in patients (with a previous cesarean section) delivering abdominally following an unsuccessful attempt at vaginal delivery.

**Database:** EMBASE

### **34. Ultrasonographic evaluation of lower uterine segment to predict the integrity and quality of cesarean scar during pregnancy: a prospective study.**

**Author(s):** Qureshi, B; Inafuku, K; Oshima, K; Masamoto, H; Kanazawa, K

**Source:** The Tohoku journal of experimental medicine; Sep 1997; vol. 183 (no. 1); p. 55-65

**Publication Date:** Sep 1997

**Publication Type(s):** Randomized Controlled Trial Clinical Trial Journal Article

**PubMedID:** 9453117

**Abstract:**A prospective randomized study was conducted to measure the serial thickness of the lower uterine segment (LUS) by transvaginal ultrasonography in a control group of 80 women having no history of uterine surgery and in a study group of 43 women having a history of previous cesarean section (C/S). In the study group, more than 2 mm of thickness of the LUS was considered as good healing and less than 2 mm of thickness as poor healing. After serial sonographic examination, the women with good healing were given trial for labor unless an obstetrical indication for C/S existed. The appearance of the LUS during surgery was compared with antenatal ultrasonographic assessment by direct inspection. Twenty two (79%) of 28 women with a well healed scar had trial labor with the result that 46% had a successful vaginal birth without any uterine rupture of dehiscence. Eight women with poor healing all had elective C/S. Seven women with a 2 mm LUS thickness were individually categorized for delivery mode. Two of those women delivered vaginally. The LUS was found to be thin to translucent in these later two groups. Two mm or less as a criterion for poor healing had the sensitivity and specificity of 86.7% and 100% respectively. The positive predictive value was 100% and the negative predictive value was 86.7%. Ultrasonographic evaluation is effective in predicting the quality of a uterine scar and in differentiating the risk group of probable uterine rupture from the non risk group.

**Database:** Medline

**35. Ultrasonographic measurement of lower uterine segment to assess risk of defects of scarred uterus.**

**Author(s):** Rozenberg, P; Goffinet, F; Phillippe, H J; Nisand, I

**Source:** Lancet (London, England); Feb 1996; vol. 347 (no. 8997); p. 281-284

**Publication Date:** Feb 1996

**Publication Type(s):** Journal Article

**PubMedID:** 8569360

Available at [Lancet \(London, England\)](#) - from ProQuest (Hospital Premium Collection) - NHS Version

Available at [Lancet \(London, England\)](#) - from Patricia Bowen Library & Knowledge Service West Middlesex University Hospital NHS Trust (lib302631) Local Full Text Collection

**Abstract:**BACKGROUNDUltrasonography has been used to examine the scarred uterus in women who have had previous caesarean sections in an attempt to assess the risk of rupture of the scar during subsequent labour. The predictive value of such measurements has not been adequately assessed, however. We aimed to evaluate the usefulness of sonographic measurement of the lower uterine segment before labour in predicting the risk of intrapartum uterine rupture.METHODSIn this prospective observational study, the obstetricians were not told the ultrasonographic findings and did not use them to make decisions about type of delivery. Eligible patients were those with previous caesarean sections booked for delivery at our hospital. 642 patients underwent ultrasound examination at 36-38 weeks' gestation, and were allocated to four groups according to the thickness of the lower uterine segment. Ultrasonographic findings were compared with those of physical examination at delivery.FINDINGSThe overall frequency of defective scars was 4.0% (15 ruptures, 10 dehiscences). The frequency of defects rose as the thickness of the lower uterine segment decreased: there were no defects among 278 women with measurements greater than 4.5 mm, three (2%) among 177 women with values of 3.6-4.5 mm, 14 (10%) among 136 women with values of 2.6-3.5 mm, and eight (16%) among 51 women with values of 1.6-2.5 mm. With a cut-off value of 3.5 mm, the sensitivity of ultrasonographic measurement was 88.0%, the specificity 73.2%, positive predictive value 11.8%, and negative predictive value 99.3%.INTERPRETATIONOur results show that the risk of a defective scar is directly related to the degree of thinning of the lower uterine segment at around 37 weeks of pregnancy. The high negative predictive value of the method may encourage obstetricians in hospitals where routine repeat elective caesarean is the norm to offer a trial of labour to patients with a thickness value of 3.5 mm or greater.

**Database:** Medline

## Strategy 345687

#	Database	Search term	Results
1	Medline	(scar ADJ2 dehiscence).ti,ab	189
2	Medline	exp "SURGICAL WOUND DEHISCENCE"/	6962
3	Medline	(1 OR 2)	7091
4	Medline	(cesarean* OR caesarean* OR "c section").ti,ab	52134
5	Medline	exp "CESAREAN SECTION"/	40337
6	Medline	(4 OR 5)	64403
7	Medline	(3 AND 6)	396
8	Medline	(scar ADJ2 necrosis).ti,ab	102
9	Medline	(6 AND 8)	1
10	Medline	("uter* scar dehiscence").ti,ab	57
11	Medline	(6 AND 10)	54
12	EMBASE	(scar ADJ2 dehiscence).ti,ab	271
13	EMBASE	exp "WOUND DEHISCENCE"/	15000
14	EMBASE	(scar ADJ2 necrosis).ti,ab	99
15	EMBASE	(12 OR 13 OR 14)	15258
16	EMBASE	(cesarean* OR caesarean* OR "c section").ti,ab	74649
17	EMBASE	exp "CESAREAN SECTION"/	84535
18	EMBASE	(16 OR 17)	100354
19	EMBASE	(15 AND 18)	740

20	EMBASE	exp "LABOR COMPLICATION"/	173971
21	EMBASE	(19 AND 20)	332
22	EMBASE	*"WOUND DEHISCENCE"/	2060
23	EMBASE	(18 AND 22)	143
24	Medline	exp "UTERINE RUPTURE"/	4492
25	Medline	(3 AND 24)	117
26	Medline	(ultrasound* OR sonograp* OR ultrasonogra*).ti,ab	309054
27	Medline	exp ULTRASONOGRAPHY/	389142
28	Medline	(26 OR 27)	526397
29	Medline	(uter*).ti,ab	168571
30	Medline	exp UTERUS/	110584
31	Medline	(29 OR 30)	225028
32	Medline	(3 AND 6 AND 31)	225
33	Medline	exp CICATRIX/	35300
34	Medline	(scar).ti,ab	35766
35	Medline	(3 OR 33 OR 34)	67619
36	Medline	(6 AND 28 AND 35)	742
37	Medline	(outcome*).ti,ab	1343978
38	Medline	exp "PREGNANCY OUTCOME"/	48383
39	Medline	(37 OR 38)	1365292
40	Medline	(36 AND 39)	170

41	Medline	(28 AND 31 AND 35 AND 39)	157
42	Medline	(scar ADJ3 defect*).ti,ab	384
43	Medline	(6 AND 28 AND 42)	73
44	EMBASE	exp SCAR/	63521
45	EMBASE	exp ECHOGRAPHY/	653920
46	EMBASE	(18 AND 44 AND 45)	668
47	EMBASE	exp "PREGNANCY OUTCOME"/	46263
48	EMBASE	(46 AND 47)	30
49	EMBASE	*"TRANSVAGINAL ECHOGRAPHY"/	2962
50	EMBASE	(18 AND 44 AND 49)	51
51	EMBASE	(18 AND 22 AND 45)	26
52	EMBASE	exp "WOUND DEHISCENCE"/	14522
53	EMBASE	(18 AND 45 AND 52)	95
54	Medline	(predict*).ti,ab	1284952
55	Medline	(36 AND 54)	61
56	EMBASE	exp PREDICTION/	297573
57	EMBASE	(18 AND 44 AND 45 AND 56)	7
58	EMBASE	(predict*).ti,ab	1684009
59	EMBASE	(18 AND 44 AND 45 AND 58)	41
60	Medline	(28 AND 35 AND 38)	62
61	EMBASE	(44 AND 45 AND 47)	34

62 EMBASE

(13 AND 17 AND 45 AND 47) 7