

Uterine rupture risk assessment with third trimester transvaginal ultrasonography in women with previous cesarean section

Abstract

A lot of methods have been used to evaluate the lower uterine segment after cesarean section: hystero-graphy of the uterine scar, pelvic examination, amniography, x-ray pelvimetry and ultrasonography. The present study consisted of 275 secondiparous with the gestational age between 36 and 38 weeks. All recruited patient were evaluated by transvaginal ultrasound in order to characterize the lower uterine segment (LUS). LUS thickness was measured as the distance between the two calipers placed at the urinary bladder - myometrium interface and at the myometrium - chorioamniotic membrane interface. The appearance of the LUS where classified into three categories, where class I and II are considered non-dehiscent and class III was considered dehiscent. Therefore, the intraoperative assessment results included 19.6% patients in class III (dehiscent LUS, uterine content visible) and 80.4% patients in class I and II (non-dehiscent LUS). In the intraoperative non-dehiscent group 25.8% patients were included in class I (normal, well-developed LUS) and 54.6% were included in class II (thin LUS, uterine content not visible). The results showed that at a LUS thickness less than 2 mm carries a higher risk for dehiscence (incomplete uterine rupture) than those with a thickness more than 2 mm.

Keywords: cesarean section, transvaginal ultrasound, uterine rupture

Introduction

Cesarean section is the most common surgical intervention on the uterus in fertile women. The number of cesareans is on a global upward trend over the last three decades. Cesarean section incidence in developed countries varies between 6.2% and 36%, with an average of 21.1%⁽¹⁾. In Romania the incidence of the cesarean section increased constantly, from 4.72% in 1988 to 12.39% in 1998⁽²⁾ and 35% in 2011.

Uterine rupture is a rare complication associated with severe maternal and fetal morbidity and mortality⁽³⁾. Previous cesarean section is the most important risk factor for uterine rupture⁽³⁾. Uterine rupture is anatomically clasified as complete (i.e. when all layers of the uterine wall are separated) or incomplete (i.e. when the myometrium is separated but the visceral peritoneum is intact). Incomplete uterine rupture is also known as dehiscence. The risk of uterine rupture in women who attempted labour after cesarean section is 0.3-4%⁽⁴⁾. Uterine scar defect includes a wide spectrum of abnormalities that vary from asymptomatic scar dehiscence to uterine rupture with complete fetal extrusion from the uterus into maternal peritoneal cavity⁽⁵⁾.

Different methods have been used to evaluate the lower uterine segment after cesarean section: hystero-graphy of the uterine scar⁽⁶⁾, pelvic examination⁽⁷⁾, amniography⁽⁸⁾, x-ray pelvimetry⁽⁹⁾ and ultrasonography^(10,11). Previous studies showed that the risk of uterine rupture on scarred uterus is related directly to the lower uterine segment

thickness^(10,11). The ultrasound was used to determine the degree of lower uterine segment thinning in patients with previous cesarean section and showed that the risk of uterine rupture is directly related to the lower uterine segment thickness^(10,11,12,13). Although there is no general consensus, ultrasound proved to be a reliable method to predict the risk of uterine rupture. Sonographically the lower uterine segment appears as a structure with 2 layers that consists of the echogenic muscularis and mucosa of the bladder wall and the relatively hypoechoic myometrium⁽¹²⁾.

We conducted a prospective study that aims to assess the risk of uterine rupture with third trimester transvaginal ultrasound in women with previous cesarean section.

Methods

This prospective study was conducted in the Obstetrics and Gynecology Department of the "Sf. Pantelimon" Clinical Emergency Hospital Bucharest between January 2015 and December 2016. The study population consisted of 275 secondiparous pregnant women with a history of one previous cesarean delivery. All patients had uncomplicated singleton pregnancies, with the gestational age between 36 and 38 weeks. Gestational age was calculated using the measurements of the first or second trimester ultrasound. The exclusion criteria were represented by a history of two ore more previous cesarean deliveries, placenta praevia, premature rupture of fetal membranes, polyhydramnios, multiple pregnancies and other uterine scars.

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All recruited patient were evaluated by transvaginal ultrasound (TVUS) in order to characterize the lower uterine segment (LUS). All ultrasound exams were performed with a Voluson E8 Expert (GE Healthcare) machine with a 7,5 MHz vaginal probe. Examination was done with a full bladder and in the absence of uterine contractions that can alter the LUS appearance. In each examination we obtained a sagittal section that contained the cervical canal, LUS, urinary bladder and the amniotic cavity. LUS was ultrasonographic characterized by its thickness and appearance. LUS thickness was measured as the distance between the two calipers placed at the urinary bladder-myometrium interface and at the myometrium-chorio-amniotic membrane interface. LUS appearance result was intact or dehiscence, depending on the interruption of the myometrial continuity. Measurement of the LUS thickness was repeated at least three times and the minimal value was noted.

All patients delivered by cesarean section at the onset of labour. During the cesarean section, the doctor was asked to describe the appearance of the LUS and to assign it in three categories, according to a modified system that was first figured by Qureshi et al.⁽¹⁴⁾: class I (normal, well-developed LUS), class II (thin LUS, uterine content not visible), class III (dehiscent LUS, uterine content visible). Class I and II are considered non-dehiscent and class III is considered dehiscent.

Antepartum ultrasonographic results were compared with direct intraoperative assessment during at the time of cesarean delivery. We also used the antepartum and intraoperative data to investigate whether incomplete uterine rupture could be predicted by ultrasound LUS measurement during third trimester of pregnancy.

Results

The mean age of the 275 patients included in the study group was 28.2 ± 4.2 years. The mean interdelivery interval was 3.05 ± 1.2 years. Regarding the hospital in which previous cesarean was performed, 70.9 % (195) were done in our hospital, while 29.1% (80) were performed into another hospital. The mean gestational age at the time of ultrasound was 37.2 ± 0.5 weeks. At the time of the ultrasound 94.1% (259) of fetuses were in cephalic presentation.

Ultrasound results showed a LUS dehiscent appearance (interrupted myometrial continuity) in 13.4% (37) of patients. The ultrasound intact appearance of the LUS was noticed in 86.6% (238) cases. The intact ultrasound aspect of the LUS was classified into three categories depending on thickness: <2 mm in 4.4% (12) of cases, between 2 and 3 mm in 54.6% (150) and >3 mm in 27.6% (76).

The intraoperative assessment results included 19.6% (54) patients in class III (dehiscent LUS, uterine content visible) and 80.4% (221) patients in class I and II (non-dehiscent LUS). In the intraoperative non-dehiscent group 25.8% (71) patients were included in class I (normal, well-developed LUS) and 54.6% (150) were included in class II (thin LUS, uterine content not visible). The ultrasound and intraoperative LUS characteristics are reported in Table 1.

The mean ultrasound thickness of the dehiscent LUS (class III) was 1.8 ± 0.7 mm and of the non-dehiscent LUS (class I and II) was 2.5 ± 0.8 mm, as shown in Table 2.

The presence of dehiscent LUS was not related to maternal age, gestational age at delivery or fetus birth weight. The study also shown that the risk of LUS dehiscence was higher with short period of interdelivery interval.

Table 1 LUS appearance (TVUS and intraoperative)

LUS appearance	Dehiscent (n=37)	Intact – thickness (n=238)		
		<2 mm	2 -3 mm	>3 mm
TVUS (n=275)	37 (13.4%)	12 (4.4%)	150 (54.6%)	76 (27.6%)
Intraoperative* (n=275)				
Class I (n=71) (25.8%)	0	0	5 (3.33%)	66 (86.8%)
Class II (n=150) (54.6%)	2 (5.4%)	3 (25%)	135 (90%)	10 (13.2%)
Class III (n=54) (19.6%)	35 (94.6%)	9 (75%)	10 (6.67%)	0

* Class I – normal LUS; Class II – thin LUS; Class III – dehiscent LUS (uterine content visible); Class I and II – non-dehiscent; Class III – dehiscent.

Table 2 The mean ultrasound thickness of the LUS

LUS	Mean thickness (TVUS)
Dehiscent (Class III)	1.8 mm \pm 0.7 mm
Non-dehiscent (Class I and II)	2.5 mm \pm 0.8 mm

The results showed that at a LUS thickness less than 2 mm carries a higher risk for dehiscence (incomplete uterine rupture) than those with a thickness more than 2 mm.

Discussion

Uterine dehiscence is a high risk condition for complete uterine rupture⁽¹⁵⁾. Ultrasound examination of the LUS prior to the onset of labour can evaluate the integrity of the uterine scar⁽¹⁶⁾.

Our study reported a positive correlation between the ultrasound thickness of the LUS and intraoperative staging of the LUS. In the present study, 2 mm was considered the critical cut-off value of the LUS thickness under which there is a high risk of dehiscence (e.g. incomplete uterine rupture). Our results were in agreement with that reported by Sen et al.⁽¹⁷⁾ and Cheung et al.⁽¹¹⁾ but in contradiction with the results published by Rozenberg et al.⁽¹⁸⁾, which

considered 3.5 mm as a critical cut-off value of the LUS thickness.

Conclusions

In conclusion, LUS integrity can be effectively evaluated by ultrasound measurement in the third trimester of pregnancy. The risk of the uterine scar dehiscence is inversely proportional to the thickness of the uterine scar. TVUS is the standard imaging exam that has the ability to evaluate the risk of incomplete uterine rupture in patients with scarred uterus. Our results showed that at a LUS thickness less than 2 mm carries a higher risk for dehiscence (incomplete uterine rupture) than those with a thickness more than 2 mm. Although controversial, TVUS assessing of the uterine scar integrity can select candidates for vaginal birth after cesarean section. ■

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