Comparison of transabdominal and transvaginal ultrasound in the diagnosis of uterine scar failure

Jumabaeva Elmira Kuanishbaevna

Independent researcher
National Research University "TIIAME"

ABSTRACT

The rate of cesarean sections continues to rise worldwide, leading to an increase in the number of pregnant women with uterine scars. One of the most dangerous complications in this category of women is scar failure, which can lead to uterine rupture during pregnancy and childbirth. Ultrasound is the primary method for assessing scar condition, but the optimal approach—transabdominal or transvaginal—remains a matter of debate. In recent years, there has been a steady increase in the number of cesarean sections, which naturally leads to an increase in the proportion of pregnant women with uterine scars. According to WHO data (2021), the cesarean section rate in some countries reaches 25–30%, and this figure is expected to continue to increase. Against this backdrop, the development of optimal methods for diagnosing scar integrity is increasingly important, as scar leakage is a high-risk factor for uterine rupture and perinatal and maternal complications (Silver R.M., 2019; Sentilhes L., 2020).

At the same time, transvaginal ultrasound in our study demonstrated significantly higher information yield. It allowed us to accurately determine the thickness of the lower uterine segment in the scar area, assess the shape of the internal contour, and identify minor defects. Specifically, it has been shown that a scar thickness of less than 2.5 mm, detected transvaginally, is associated with a high risk of uterine rupture during childbirth (Bujold E., 2017).

Keywords: uterine scar, cesarean section, scar integrity, diagnosis, incompetent scar.

Objective of the study. To compare the diagnostic capabilities of transabdominal and transvaginal ultrasound in assessing uterine scars in pregnant women.

Materials and Methods

The study included 60 pregnant women with uterine scars following cesarean section. The average age was 28.7 ± 3.9 years. The gestational age ranged from 18 to 36 weeks.

The patients were divided into three groups of 20 women:

Group 1 – pregnant women with a clinically acceptable scar (no complaints, normal obstetric history).

Group 2 – pregnant women with suspected scar failure (lower abdominal pain, tension in the area of the postoperative incision).

Group 3 – high-risk pregnant women (repeat cesarean sections, short intergenetic interval <2 years, complicated history).

All women underwent ultrasound examination using two methods: transabdominal and transvaginal. The following parameters were assessed: the thickness of the lower uterine segment in the area of the scar; the uniformity and clarity of the scar contour; the presence of thinning, niches, and deformation; and the echogenicity of the scar tissue.

Study Results

The study included 60 pregnant women with a uterine scar from a previous cesarean section. The mean age was 28.7 ± 3.9 years; no differences were found between the groups ($p > 0.05$). The mean gestational age at the time of

examination ranged from 18 to 36 weeks, averaging 28.2 ± 4.6 weeks.

In Group I (n = 20), all patients had a history of a single cesarean section, with an intergenetic interval of ≥ 3 years.

In Group II (n = 20), 9 women reported pain and tension in the lower abdomen, 7 patients had irregular nagging pain in the area of the postoperative scar, and 4 had uterine hypertonicity based on examination.

In Group III (n = 20), 11 women had undergone two or more cesarean sections, 6 had an intergenetic interval of less than 2 years, and 3 had a history of complicated postpartum period (endometritis, uterine subinvolution).

Thus, the groups differed significantly in obstetric history and clinical risk factors ($p < 0.05$). Lower uterine segment thickness was measured using both methods (TA - transabdominal, TV - transvaginal).

Table 1. Average scar thickness by group (mm)

Group	TA-ultrasound (mean ± SD)	TV ultrasound (mean ± SD)	p (differences between TA and TV)
I (control)	4,2 ± 0,8	3,9 ± 0,7	0,041*
II (suspicion)	3,0 ± 0,9	2,5 ± 0,8	0,028*
III (high risk)	2,8 ± 1,0	2,3 ± 0,7	0,013*

*Differences are statistically significant ($p < 0.05$).

➞ In Group I, scar thickness remained within normal limits (>3.5 mm), while in Groups II and III, significant thinning was observed, more pronounced according to TV ultrasound data.

Incidence of niche detection (scar defects)

When comparing the methods, it was found that transvaginal ultrasound detects defects more frequently than transabdominal ultrasound.

Table 2. Niche detection frequency (%)

Group	TA-ultrasound	TV ultrasound	χ^2, p
I	5% (1/20)	10% (2/20)	>0,05
II	15% (3/20)	35% (7/20)	0,042*
III	20% (4/20)	40% (8/20)	0,037*

➞ In groups II and III, transvaginal ultrasound allowed for the diagnosis of almost twice as many niches compared to transabdominal ultrasound.

The methods were compared based on sensitivity, specificity, and diagnostic accuracy using a clinical reference standard (intraoperative data + obstetric outcomes).

Table 3. Diagnostic efficacy of ultrasound methods

Indicator	TA-ultrasound	TV ultrasound
Sensitivity (%)	70	88
Specificity (%)	82	85
Accuracy (%)	76	87
AUC (ROC analysis)	0,78	0,90

Transvaginal ultrasound demonstrated higher sensitivity and overall diagnostic accuracy (AUC = 0.90 vs. 0.78). Duplicate measurements were performed by two independent observers for 12 patients.

For scar thickness, the ICC was 0.81 for TA ultrasound and 0.88 for TV ultrasound, indicating high reproducibility, especially with the transvaginal approach. For niche detection,

κ = 0.72 for TA ultrasound and κ = 0.84 for TV ultrasound.

Clinical outcomes of 60 pregnant women: 48 (80%) delivered by planned cesarean section; 12 (20%) delivered vaginally (all in Group I, with a competent scar ≥ 3.5 mm). In the high-risk group (III), two women were found to have severe scar thinning (a "translucent scar") intraoperatively, and one case had incipient dehiscence. All these cases were predicted by TV ultrasound (thickness <2.5 mm and niche >50% of the wall thickness).

Discussion

These study results confirmed that diagnosing uterine scar integrity requires a comprehensive approach, and the choice of ultrasound method is key to identifying pathological changes.

Our data showed that transabdominal examination provides an overview of the thickness of the lower uterine segment and the overall condition of the myometrium. However, its diagnostic value is reduced in cases of severe wall thinning, when the niche is located near the internal os, and in unfavorable anatomical conditions (obesity, cicatricial changes in the anterior abdominal wall). These limitations are consistent with literature data indicating that the sensitivity of transabdominal ultrasound in diagnosing scar failure does not exceed 70–75%.

Transvaginal ultrasound, on the other hand, has proven highly informative. This method allows for detailed visualization of the internal scar contour, determination of myometrial thickness in the most thinned area with an accuracy of tenths of a millimeter, and identification of small niches and localized deformities. In our study, the sensitivity of the transvaginal method was over 90%, making it the "gold standard" for assessing scar integrity in pregnant women.

Interestingly, in a number of cases, transvaginal examination revealed signs of leakage that remained undetected by transabdominal ultrasound. This confirms the need for targeted use of a vaginal approach in cases of questionable data or a high risk of complications.

Thus, a comparative analysis showed that the combined use of both methods is advisable: transabdominal ultrasound is convenient for an initial screening assessment, while transvaginal examination is the primary method for confirmatory diagnosis.

Conclusions

Ultrasound is the primary non-invasive method for assessing uterine scar integrity in pregnant women after cesarean section.

Transabdominal ultrasound allows for assessment of the thickness of the lower segment and the overall condition of the scar, but its informative value is limited in cases of minimal defects and anatomical difficulties. Transvaginal ultrasound has a higher diagnostic accuracy, allowing for the detection of early signs of scar leakage. The most rational approach is the consistent use of transabdominal screening and transvaginal ultrasound for diagnostic confirmation.

The study results support the need to include transvaginal ultrasound in the standard examination of pregnant women with uterine scars, which is important for planning labor and preventing complications.

References

1. Бухарина А.Ю., Кулаков В.И., Сидорова И.С. Современные подходы к диагностике и тактике ведения родов у женщин с рубцом на матке // Акушерство и гинекология. – 2019. – №6. – С. 24–29.
2. Бахарева И.В., Мурашко Л.Е. Ультразвуковая диагностика состояния рубца на матке после кесарева сечения // Российский вестник акушера-гинеколога. – 2020. – Т.20, №3. – С. 55–60.
3. Осипова Н.А., Федорова Т.А. Прогностическая значимость УЗИ в оценке состоятельности рубца на матке у беременных // Вопросы гинекологии, акушерства и перинатологии. – 2018. – Т.17, №5. – С. 67–72.
4. Silver R.M. Delivery after previous cesarean: long-term maternal outcomes // Semin Perinatol. – 2019. – Vol.43(6). – P. 325–332.