Original Article

Assessment of Transvaginal Ultrasound Predictive Features for Placenta Accreta Spectrum in Women with Previous Cesarean Scar

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ABSTRACT

Objective: To assess the transvaginal ultrasound examination to diagnose placenta accreta spectrum based on clear sonographic signs

Study Design: Descriptive study

Place and Duration of Study: This study was conducted at the Department of Radiology, College of Medicine, Al-Mustansiriyah University, Baghdad, Iraq, from 15th January 2026 to 30th May 2026.

Methodology: The study was conducted on 50 female patients who had previously undergone a cesarean section using ultrasound and color Doppler imaging.

Results: Ultrasound signs for diagnosing placenta accreta include: a reduced distance between the placenta and the uterus, disruption of the interface between the bladder and the uterus, the presence of placental lacunae (spaces), and increased blood flow surrounding the placenta.

Conclusion: Transvaginal ultrasound is a method for the early detection of placenta accreta.

Key Words: Placenta accreta spectrum, Transvaginal ultrasound, Cesarean scars, subplacental.

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INTRODUCTION

Placenta Accreta Spectrum (PAS) involves the attachment of the placenta to the uterine wall or the bladder, it occurs in pregnant women with a history of Cesarean sections and poses a serious risk if left undiagnosed or untreated.[1]

Recently, rates of cesarean section deliveries have increased. Current studies indicate that one in every 500 pregnancies among high-risk women is affected by this disorder. If the placental condition is not diagnosed prior to delivery, it can lead to serious complications—such as life-threatening hemorrhage and hysterectomy and may even result in maternal death.[2]

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Placenta accreta is diagnosed early by transvaginal ultrasound, and the earlier it is detected, the better the health outcomes for the mother.[3]

The incidence of placenta accreta spectrum increases in direct proportion to the number of prior uterine surgeries particularly previous Cesarean sections.[2]

Placenta previa is considered a major risk factor for placenta accreta spectrum, particularly in the presence of a prior cesarean scar. Additional risk factors include as advanced maternal age, multiparity, prior uterine surgeries, and assisted reproductive technologies.[4]

Placenta accreta spectrum is classified into three types; placenta accrete occurs when there is superficial attachment to the uterine muscle, placenta increta involves penetration or invasion of the uterine muscle and placenta percreta, where the placenta penetrates the uterine serosa and affects adjacent organs. The location of the placenta is significant for the health of both the mother and the fetus.[5]

This condition arises when a pre-existing scar from a previous cesarean section leads to a deficiency in the decidua, if implantation occurs at the site of the scar often associated with fibrosis, the likelihood of abnormal placental attachment increases and this risk rises with each subsequent procedure.[1]

Although ultrasound is the primary imaging modality but magnetic resonance imaging (MRI) is used in cases where ultrasound findings are inconclusive or when placental implantation in the posterior part of the uterus is suspected. In early pregnancy the transvaginal ultrasound is considered more accurate.[6]

Clear MRI signs for diagnosing placenta accreta include reduction of the hypoechoic clear zone, the presence of multiple placental lacunae, and thinning of the uterine muscle. The greater the number of radiological signs present, the higher the diagnostic accuracy. Color Doppler imaging used alongside transvaginal ultrasound, is significant as it reveals bridging blood vessels, increased sub-placental vascularity and turbulent flow within vascular lacunae.[5]

The purpose of this study is to focuses on diagnosing placenta accreta spectrum in pregnant women with scars from previous cesarean sections using transvaginal ultrasound.

METHODOLOGY

This descriptive study was carried out at the Ultrasound unit of the Department of Radiology from a private medical center during the period from 15th January 2026 to 30th May 2026 reference number 18 dated 1st January 2026 and 50 pregnant women who visited the ultrasound unit were enrolled. Cases were selected based on pregnant women with a history of prior surgeries, they underwent prenatal ultrasound examinations to determine the location and position of the placenta, as these patients face an increased risk of placenta accreta due to the presence of a uterine scar.

All pregnant woman with a history of previous cesarean sections, gestational age of 12 weeks or more, placenta located in the lower part of the uterus and single fetus pregnancy were included. Multiple pregnancies, congenital uterine anomalies, unclear imaging data were excluded.

Information collected from the pregnant women included: maternal age, number of pregnancies and deliveries, number of previous Caesarean sections and any history of placenta previa. Pregnant women underwent transabdominal ultrasound to assess fetal viability, determine gestational age, evaluate placental location, and measure amniotic fluid volume. Transvaginal ultrasound was performed to determine the site of placental implantation with greater precision.

The transvaginal probe operates at a high frequency ranging from 5 to 9 MHz. The examination is performed after the bladder has been emptied, with the pregnant woman positioned in the lithotomy position (lying on her back with her legs raised). The gray-scale imaging signs indicative of placenta accreta include thinning of the retroplacental clear zone (appearing hypoechoic), presence of multiple, irregular placental lacunae, thinning of the myometrium at the placental implantation site (thickness <5 mm), abnormalities of the uterine contour and disruption of the interface between the uterus and the bladder

Notable signs observed via Color Doppler imaging include: the presence of blood vessels extending from the placenta to the uterine serosa; a marked increase in blood flow in the area where the placenta attaches to the uterus; and increased blood flow at the site of placental implantation over the Cesarean section scar. These signs serve as indicators for diagnosing placenta accreta spectrum.

Diagnostic criteria: The presence of two ultrasound signs is considered an indicator of placenta accreta spectrum, even if color Doppler imaging results are normal. The definitive diagnosis is established through intraoperative observations during delivery and/or via hysterectomy and histological examination.

The pregnant woman for the third time with a history of two previous cesarean sections, was diagnosed with placenta accreta following a transvaginal ultrasound that revealed a low-lying placenta and a reduced distance between the placenta and the uterus (Fig. 1). The data was entered and analyzed through SPSS-26.

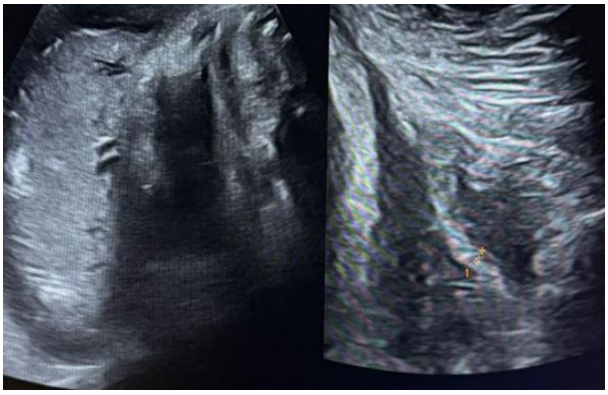


Figure No. 1: Pregnant woman for the third time with a history of two previous cesarean sections

RESULTS

Table 1 illustrates the necessity of using color Doppler with intracranial ultrasound, as it increases the sensitivity to 90%. Table 2 showed that diagnosis via transvaginal ultrasound is more valuable than magnetic resonance imaging. The ultrasound signs for diagnosing placenta accreta are a reduced distance between the placenta and the uterus, accompanied by the presence of placental lacunae (Table 3).

Ultrasound imaging reveals the specific type of placental adhesion. Among these types":placenta accreta" is diagnosed by the disappearance of the clear interface zone. "Placenta increta" appears as marked thinning of the uterine muscle, accompanied by blood vessels extending through it. "placenta percreta" presents various ultrasound signs, such as placental protrusion and extension toward the bladder, so transvaginal ultrasound examination is essential (Table 4).

Table No. 1: Predictive TVU features of PAS

Feature	Descriptive	Diagnostic value
Loss of clear zone	Disappearance of the hypoechoic line between placenta and myometrium	High sensitivity
Myometrial thinning	Myometrium <1 mm under the placental bed	Moderate sensitivity
Placental lacunae	Irregular vascular spaces within placenta	High specificity
Bladder-uterine interface disruption	Loss of hyperechoic bladder wall line	High specificity
Bridging vessels	Vessels crossing from placenta to bladder	Specific for invasive PAS
Subplacental hypervascularity	Turbulent color Dopper flow	Good sensitivity
Placental bulge	Outward contour deformity of uterus	Suggestive of percreta

Table No. 2: Comparison of TVU and MRI in PAS diagnosis

Parameter	TVU	MRI
Accessibility	Widely available, cost-effective	Limited availability, expensive
Resolution	High resolution for lower uterine segment	Excellent soft tissue delineation
Detection of PAS	High sensitivity and specificity	Comparable accuracy, useful adjunct
Operator dependence	High (requires skilled examiner)	Moderate
Use in 1st trimester	Possible for early PAS signs	Limited role
Use in bladder invasion	Less reliable	Superior assessment of percreta

Table No. 3: Summary of clinical cases (n=50)

Patient Group	No. of Cases	Main TVU Features	Final Diagnosis
Placenta accrete vera	20	Loss of clear zone, mild lacunae	Confirmed accreta
Placenta increta	15	Myometrial thinning, bridging vessels	Confirmed increta
Placenta percreta	10	Placental buldge, bladder wall invasion	Confirmed percreta
Normal cerarean scar placenta	5	Intact myometrium, no abnormal lacunae	Excluded PAS

Table No. 4: Sensitivity and specificity of key TVU features

TVU Feature	Sensitivity	Specificity
Loss of clear zone	77-85%	90-90%
Myometrial thinning <1mm	70-82%	75-88%
Placental lacunae	80-93%	85-93%
Bladder-uterine interface disruption	65-80%	90-95%
Bridging vessels	60-75%	88-95%
Subplacental hypervasculaity	78-90%	80-90%
Placental bulge	55-70%	90-96%

DISCUSSION

Placental adherence poses a risk to the health of both the mother and the fetus particularly in women who have undergone previous surgeries. Transvaginal ultrasound is the method for early detection of placental adherence; this aligns with the findings of a study by D'Antonio et al[3], which demonstrated that ultrasound imaging supplemented by color Doppler can detect placental adherence prior to delivery.

A link exists between placental lacunae and histologically confirmed placental adherence a finding corroborated by Cali et al[5] consistent with the current study's conclusion that placental lacunae serve as an indicator of placental adherence.

The reduced distance between the placenta and the uterus is associated with placental adhesion, consistent with the findings of the study by Jauniaux et al[7], which demonstrated a relationship between myometrial thickness and placental implantation.

Color Doppler imaging revealed specific patterns specifically, increased blood flow in the region beneath the placenta, observed in multiple cases that had previously been described by Collins et al[8] and Morel et al[9] in their studies of (placenta increta and placenta percreta). The presence of blood flow within placental lacunae, the proximity of the placenta to the uterus, and increased intraoperative blood loss were identified as signs of placental adherence consistent with the findings of a studies by Zhang et al[10] and Vahdani et al.[11]

The necessity of using color Doppler and transvaginal ultrasound for the early diagnosis of placenta accreta spectrum disorders is supported by the findings of D'Antonio et al.[3] A single ultrasound sign is insufficient for diagnosis; rather, the presence of two or more signs is required for an accurate diagnosis consistent with the work of Shih et al[12] and Zhang et al[13], who established criteria linking 2D ultrasound findings with Doppler examination results.

The small sample size and reliance on routine clinical data from a single medical center are among the limitations of this study. This aligns with the findings of Bowes et al[14] and Kirovakov et al[15], they highlighted the need to balance broad applicability with practical challenges. The importance of placental assessment using transvaginal ultrasound and color Doppler particularly in cases of prior cesarean section cannot be overstated, as it serves to protect the maternal uterus. Further large-scale studies are recommended to investigate placental adhesion.

CONCLUSION

Transvaginal ultrasound plays a crucial role in detecting placental adhesion and identifying its three types in women with a history of cesarean sections by visualizing specific imaging markers, thereby reducing risks and safeguarding maternal health.

Author's Contribution:

Concept & Design or acquisition of analysis or interpretation of data:	Rafal Hani Mustafa, Sulaf Saadi Hussein Al-Jailawi
Drafting or Revising Critically:	Rafal Hani Mustafa, Farah Akram Al Mahdawi
Final Approval of version:	All the above authors
Agreement to accountable for all aspects of work:	All the above authors

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