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Accuracy of Ultrasound in the Diagnosis of Lateral and Posterior Invasion in Patients with Placenta Accreta Spectrum Disorders

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Abstract

Background: A placenta's improper attachment to the uterine wall is known as placenta accreta (PA). Ultrasound and MRI are used to make the diagnosis. Skilled ultrasound operators with placenta accreta spectrum experience produce accurate images.

Aim: To prospectively evaluate a cohort of patients at high risk of PAS using specific ultrasound signs derived from the criteria proposed by the EW-AIP.

Patients and methods: The present study is an observational cross-sectional analytic study, which was conducted at Al-Hussein and Sayed Galal Hospitals, Faculty of Medicine, Al-Azhar University on 100 women who were recruited from Obstetrics and Gynecology Department and outpatient clinics.

Results: Most patients had placenta accreta. According to US findings, the majority of patients had lateral PAS, and there was a noticeable disparity between US findings and surgical findings. For diagnosing placental accreta, ultrasound's sensitivity and specificity are adequate.

Conclusion: For diagnosing placental accretas, ultrasound's sensitivity and specificity are adequate. Due to its accuracy, low cost, and noninvasive nature, The most accurate and popular scanning technique for determining the presence of the placental accreta is still ultrasound. This treatment method is extremely popular because it is widely available, patient-friendly, and reasonably priced.

Keywords: Lateral invasion, Placenta accreta spectrum, Posterior invasion, Ultrasound

1. Introduction

A disruption in the decidualized endometrium causes the placenta to attach abnormally to the uterine wall, which is known as placenta accreta (PA). Increta refers to a deeper invasion into the myometrium, while percreta refers to a full invasion through the uterine wall. These are referred to as aberrant placentation as a whole. A history of uterine surgery and contemporaneous placenta previa are present in the majority of women with abnormal

placentation (such as caesarean delivery, myomectomy, etc.).¹

Placenta accreta is more likely to occur in women who have myometrial damage from a past CD and either an anterior or posterior placenta previa covering the uterine scar.²

Over the past few decades, the incidence of placenta accreta spectrum disorders has increased from around 1/2500 to 1/500; this increase has been linked to an increase in the frequency of caesarean sections. If the uterine lining was affected, additional factors could be at work, such as manual

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placental delivery, uterine curettage, hysteroscopic endometrial resection, prior hysteroscopic surgery, and uterine artery embolization. There have even been cases of uterine adenomyosis and submucous myomata, and bicornuate uterus reported without any prior surgical history.³

When carried out by a trained professional with experience in the placenta accreta spectrum, ultrasound imaging is quite accurate.⁴

It has been demonstrated that both MRI and ultrasonography have a high overall diagnostic performance in identifying PAS. These statistics, however, only apply to women who have anterior placenta previa. Furthermore, when placental invasion develops in the posterior wall of the uterus, it is uncertain whether prenatal imaging will still be reliable in identifying these problems. Additionally, it has not yet been established how the most common risk factors for anterior PAS relate to posterior invasion. This is essential because it would make it possible to identify a group of women who would need to have a full imaging examination to rule out these defects.⁵

If the surgeon is ignorant of the existence of accreta placental tissue as a result of faulty preparation, the combination of placenta previa with accreta placentation causes severe maternal morbidity and occasionally fatality due to massive obstetric haemorrhage upon birth.⁴

The aim of this study was to prospectively evaluate a cohort of patients at high risk of PAS using specific ultrasound signs derived from the criteria proposed by the EW-AIP. And assess the efficiency of these signs in the diagnosis of posterior and lateral adhesion/invasion independently, through correlation with the results of the guided histopathologic examination.

2. Patients and methods

The present study was an observational cross-sectional analytic study, which was conducted at Al-Hussein and Sayed Galal Hospitals, Faculty of Medicine, Al-Azhar University on 100 women who was recruited from Obstetrics and Gynecology Department and outpatient clinics during the period from March 2022 to September 2022.

The study was included 100 pregnant women diagnosed with PAS disorders by prenatal ultrasound examination that was candidate for either cesarean hysterectomy or conservative management.

Inclusion criteria: Low lying/placenta previa totally or partially covering the internal os with lateral \pm posterior walls extension diagnosed as PAS disorders by

ultrasound, previous cesarean deliveries, gestational age (GA) \geq 28 weeks and singleton pregnancies.

Exclusion criteria: Patient's refusal to participate, multifetal pregnancies and GA < 28 weeks.

2.1. Methodology

All patients were required to provide written informed permission after being informed of the study's purpose, the procedure, and any potential risks. Complete obstetric history, medical and surgical history, and pertinent physical examination are all part of the history taking process.

In all cases, detailed TAS and TVS examinations of the placenta, uterus and pelvis was performed within 48 h before surgery (GE Voluson \rightarrow E10, GE Medical System, Zipf, Austria or Samsung Elite).

During the ultrasound examination the following criteria was studied: Placental localization and determining placental extension posteriorly: The placenta was categorised as "low lying" when its edge was 0.5–2 cm or less from the internal os of the uterine cervix. Placenta previa was defined as the placenta covering the internal os completely or being less than 0.5 cm away from it (marginal or complete respectively).⁴

The following are standards put forth by the European Working Group on Abnormally Invasive Placenta (EW-AIP)²⁵: Grayscale photography Myometrial thinning to less than 1 mm, big, irregular intra-placental lacunae, breakdown or removal of the bladder wall, and a placental bulge or localised exophytic mass that extends past the uterine serosa are all signs of preterm labour.

Color Doppler images: uterovesical hypervascularity between the placenta and the bladder's back wall, Subplacental hypervascularity, including fast-moving feeder arteries that cross the myometrium and extend beyond the uterine serosa. All patients with lateral \pm posterior walls extension was studied for lateral and posterior uterine walls adhesion/invasion by the suggested criteria:

For lateral PAS: In the present evaluation of the patients for the presence of lateral adhesion/invasion, we was identified the main placental bulk laterally whether right or left, then investigating this area for the following signs: Lateral myometrial thinning \gggg myometrial thinning to less than 1 mm. Localized lacunae \gggg the presence of multiple lacunae in a specific area thus raising the suspicion of abnormal placental attachment in this specific part. Lateral placental bulge: we evaluated the presence of localized bulge of the placenta into the lateral compartment. Sub-placental hypervascularity: we evaluated the presence of increased

vascularity at the placental myometrial interface laterally and in the placental bed. Lateral bridging vessels: the presence of vessels bridging across the myometrium and continuous with the broad ligament vascularity.

Lateral lacunae feeder vessels: we evaluated the presence of lateral lacunae with feeder vessels related to the lateral uterine compartment.

2.2. Statistical analysis

All data were collected, tabulated, and statistically analysed using MedCalc 13 for Windows and SPSS 22.0 for Windows (SPSS Inc., Chicago, IL, USA) (MedCalc Software bvba, Ostend, Belgium). The Shapiro Walk test was used to check for normality in the data distribution. To represent qualitative data, frequencies and relative percentages were used. The chi-square test (2) and Fisher exact were used to determine the difference between the qualitative variables, as illustrated. Data was presented quantitatively as mean SD (Standard deviation).

Table 1. Demographic characteristics of the studied patients.

	Patients (n = 100)
Age (years)	
Mean ± SD	32.31 ± 4.62
BMI (kg/m ²)	
Mean ± SD	27.84 ± 3.65
No. of previous CS	
Mean ± SD	2.92 ± 0.845
GA (weeks)	
Mean ± SD	34.21 ± 2.67

3. Results

Table 2. Placenta accreta distribution among the patients, We found that 60% of the patients had placenta accrete.

	Patients (n = 100) N (%)
Lateral PAS	60 (60)
Posterior	40 (40)

Table 3. Comparison of US findings according to surgical findings 63 lateral PAS in US findings, 58 patients were accurate by surgical observation with false positive was 12.5%.

US	Surgical findings		Total	P
	Lateral N (%)	Posterior N (%)		
Lateral PAS	58 (96.7%)	5 (12.5%)	63 (63%)	<0.001
Posterior PAS	2 (3.3%)	35 (87.5%)	37 (37%)	
Total	60 (100%)	40 (100%)		

Table 4. Diagnostic value of US.

Statistic	Value	95% CI
Sensitivity	96.7%	88.47%–99.59%
Specificity	87.5%	73.2%–95.81%
Positive Predictive Value (PPV)	92.1%	83.61%–96.35%
Negative Predictive Value (NPV)	94.6%	81.68%–98.57%
Accuracy	93%	86.11%–97.14%

Table 1.

Patients mean age of 32.31 ± 5.44 years, meanwhile mean BMI is 26.92 ± 3.65 kg/m². Number of previous CS 2.92 ± 0.845 Fig. 1.

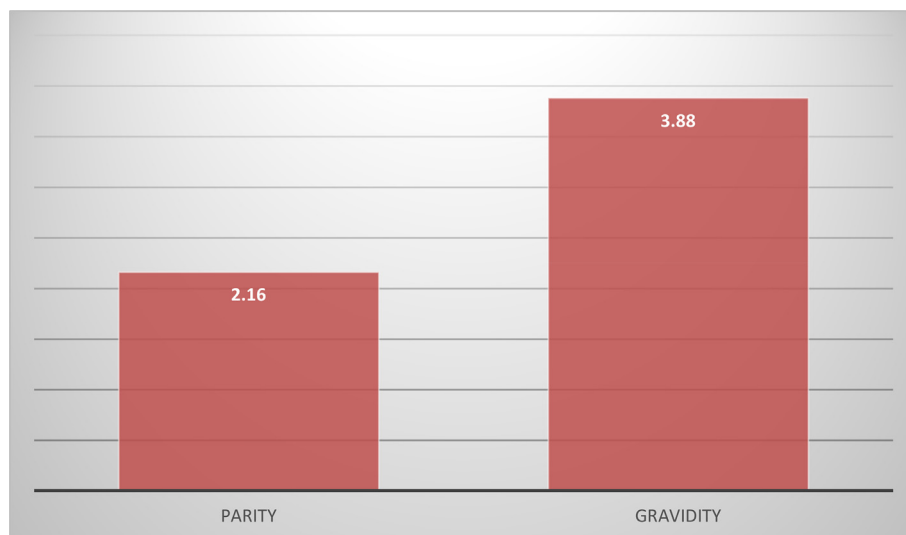


Fig. 1. Parity and Gravidity distributions among the patients.

The mean parity of patients was 2.16 ± 1.24 , and mean gravidity was 3.88 ± 1.96 Tables 2–4.

The US sensitivity was 96.7%, specificity was 87.5%, NPV was 94.6% and PPV was 92.1% with accuracy of 93% in the diagnosis of placenta lateral and posterior PAS.

4. Discussion

The present observational cross-sectional analytic study was conducted at Al-Hussein and Sayed Galal Hospitals, Faculty of Medicine, Al-Azhar University on 100 women recruited from Obstetrics and Gynecology Department and outpatient clinics during the period from March 2022 to September 2022. The current investigation revealed that the average age and BMI of the patients under study were both 32.31 5.44 years and 26.92 3.65 kg/m², respectively. The previous CS number was 2.92 0.845. Our findings were close to those of Hamada et al.⁶ who enrolled 100 cases in their study and found that the mean age was 33.42 9.21 years and the mean BMI was 26.86 3.75 kg/m². They were diagnosed with placenta accreta in the US. Previous CS numbers ranged from 2 to 4, with a mean of 2.93 0.873.

Also, Hussein et al.,⁷ who enrolled 150 patients revealed that the mean age was 28.91 ± 5.26 (18.0–42.0), and the mean BMI was 28.08 ± 4.87 (19.0–37.0) kg/m². Furthermore, According to this study, placenta accreta incidence was highly correlated with the number of prior caesarean sections. Iacovelli et al.'s recent systematic review and meta-analysis,⁸ A review of 46 studies found that maternal obesity and advanced maternal age were related with a higher incidence of placenta accreta, but not smoking (odd ratio, OR, 95% CI, 1.0–1.8; and OR, 3.1, 1.4–7.0). In comparison to controls, placenta previa was associated with a higher risk of placenta accreta in women who had at least one prior CS, with an OR of 12.0, 95% CI 1.6–88.0. There was also a link between the number of prior CS and a higher risk of placenta accreta (OR of 2.6, 95% CI 1.6–4.4 and 5.4, 95% CI 1.7–17.4 for two and three prior CS, respectively). According to the current study, the mean parity and gravidity of the patients were 3.88 and 1.96, respectively. The mean parity and mean gravidity of the patients, according to Hamada et al.,⁶ were 3.16 1.204 and 4.08 1.46, respectively.

In addition, 100 patients with suspected placenta accreta were discovered by Borg et al. to have parities ranging from 1 to 4 and gravidities ranging from 2 to 11 with a mean of 4.0 2.06 (Borg et al., 2009). In addition, Hussein et al.⁷ found a significant correlation between the occurrence of placenta

accreta and the increase in gravidity and parity. Comparing US findings according to surgical findings in the current study revealed that, out of 63 lateral PAS in US findings, 58 patients had their diagnoses confirmed by surgical observation, with a false positive rate of 12.5%. Additionally, 35 cases were verified by surgical observation out of 37 Posterior PAS findings in the US, with a false positive rate of 3.3%.

Our results suggested that US can be more accurately diagnosing posterior PAS than lateral PAS. However, no studies in the literature have compared the ability of US in detecting posterior and lateral PAS, these results need to be confirmed by larger multi-observer studies.

Our results can be supported by Hamada et al.,⁶ They reported that 60 patients were accreta by surgical observation out of 66 accreta in US results, with a false positive rate of 15%. Furthermore, Borg et al.⁹ (stated) found that 64 patients out of 76 with accreta in Doppler US findings had accreta by surgical observation, with a false positive rate of 33.3% and no false negative instances found.

The false positive rate for 2D US was 22.2%, with 60 patients having accreta by intraoperative observation. As a result, they came to the conclusion that colour Doppler ultrasound is a more reliable method of identifying placenta accreta. Additionally, in keeping with our findings, Lin et al.¹⁰ reported that there was a significant degree of agreement (Kappa = 0.85) between ultrasonography and clinical data. They also said that 55 individuals were found to be accreta by surgical observation, with a false positive rate of 9.8%, out of 61 accreta in US results.

As well, El Wakeel et al.,¹¹ revealed that according to the operative findings and/or pathological studies, One patient (12.5%) was confirmed to be a false positive, whereas seven of the eight (87.5%) patients had actual positive results. Eight (66.7%) of the 12 patients had true negative results, while four (33.3%) had false negative results. To assess the diagnostic effectiveness of US in detecting PA, a ROC curve analysis was performed. The results showed that US had a sensitivity of 96.7%, specificity of 87.5%, NPV of 94.6%, PPV of 92.1%, and accuracy of 93% in identifying placenta lateral and posterior PAS.

In keeping with our findings, Hamada et al.⁶ discovered that the US had a sensitivity of 100%, specificity of 85%, NPV of 100%, PPV of 90.9%, and accuracy of 94% for the diagnosis of placental accretas. However, according to studies by El Wakeel et al.,¹¹ the overall sensitivity and specificity of sonography for identifying an accreta placenta

were 63.6 and 91.6%, respectively. In addition, Hussein et al.⁷ found that 2D-US had higher sensitivity (86.96%) for the diagnosis of placenta accreta than 2D colour Doppler (84.06%) and 3D-PD (79.71%). However, 3D-PD demonstrated somewhat higher specificity (83.95%) for the diagnosis of placenta accreta when compared to colour Doppler (82.72%) and 2D-US (77.78%). The eradication of the retroplacental sonolucent zone (86.96%) was the most sensitive 2D-US metric. Ayati et al.¹²; ($P = 0.37$) found that MRI sensitivity was 76% and Doppler sonography sensitivity was 87%. Doppler sonography had a 63% specificity compared to an MRI's 83% ($P = 0.01$). Overall, there was little difference in sensitivity between the two methods, but MRI was substantially more accurate at identifying PAD than Doppler sonography.

While, Nawab *et al.*,¹³ reported that the USG's accuracy, sensitivity, specificity, positive predictive value, and negative predictive value were, in order, 85.7%, 83.3%, 66.7%, 93.8%, and 84%. The MRI's accuracy, sensitivity, specificity, positive predictive value, and negative predictive value, on the other hand, were, in that order, 71.4%, 72.2%, 50%, 86.7%, and 72%. According to the study, antenatal placenta accreta diagnosis, USG has higher diagnostic accuracy than MRI.

4.1. Conclusion

Due to its accuracy, low cost, and noninvasive nature, The most accurate and popular scanning technique for determining the presence of the placental accreta is still ultrasound. This treatment method is extremely popular because it is widely available, patient-friendly, and reasonably priced.

Disclosure

The authors have no financial interest to declare in relation to the content of this article.

Authorship

All authors have a substantial contribution to the article.

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Conflicts of interest

The authors declared that there were NO conflicts of Interest.

References

- Belfort MA. Placenta accreta. *Am J Obstet Gynecol.* 2010;203:430–439. <https://doi.org/10.1016/j.ajog.2010.09.013>.
- ACCETA P. Committee opinion placenta accreta the American college of obstetricians and gynecologists. *Obstet Gynecol.* 2011;118(501):405–410.
- Jauniaux E, Collins SL, Jurkovic D, Burton GJ. Accreta placentation: a systematic review of prenatal ultrasound imaging and grading of villous invasiveness. *Am J Obstet Gynecol.* 2016;215:712–721.
- Jauniaux E, Hussein AM, Fox KA, Collins SL. New evidence-based diagnostic and management strategies for placenta accreta spectrum disorders. *Best Pract Res Clin Obstet Gynaecol.* 2019;61(xxxx):75–88. <https://doi.org/10.1016/j.bpobgyn.2019.04.006>.
- Tinari S, Buca D, Cali G, et al. Systematic review and meta-analysis of posterior placenta accreta spectrum disorders: risk factors, histopathology and diagnostic accuracy. *Ultrasound Obstet Gynecol.* 2021;57:903–909. <https://doi.org/10.1002/uog.22183>. Published online.
- Hamada AM, Mohammad MF, El Sadek AM. Sonographic detection of placenta accreta in the second and third trimesters of pregnancy. *Al-Azhar Int Med J.* 2021;2(9):75–80.
- Hussein M, Abd MFR, Abu-Elhassan AM, Abbas AM, Youssef AEA. Evaluation of different ultrasonographic modalities in the diagnosis of morbidly adherent placenta: a cross-sectional study. *Open J Obstet Gynecol.* 2019;9:405.
- Iacovelli A, Liberati M, Khalil A, et al. Risk factors for abnormally invasive placenta: a systematic review and meta-analysis. *J Matern Fetal Neonatal Med.* 2020;33:471–481.
- Borg HM, Ossman AM, Salem HA, El-Hemedi M, El-Shafie K, Alarabawya RA. Color Doppler ultrasound in diagnosis of placenta accreta. *Evid Based Wom Health J.* 2018;8:215–222.
- Lin R, Li J, Ren Y, Cheng H. Ultrasound and MRI accordance and features in the prenatal diagnosis of placenta accreta. *Int J Clin Exp Med.* 2017;10:8917–8925.
- El Wakeel A, Azab S, Rahman HMA. Role of ultrasound, Doppler, and MRI in the diagnosis of placenta accreta. *Menouf Med J.* 2018;31:1023.
- Ayati S, Leila L, Pezeshkird M, et al. Accuracy of color Doppler ultrasonography and magnetic resonance imaging in diagnosis of placenta accreta: a survey of 82 cases. *Int J Reprod Biomed.* 2017;15:225–230.
- Nawab K, Naveed S, Khan M. Diagnostic accuracy of ultrasound (USG) and magnetic resonance imaging (MRI) in prenatal diagnosis of placenta accreta taking operative findings as gold standard. *PJR.* 2017;27:4.