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Comparative Diagnostic Accuracy of Ultrasonography and Magnetic Resonance Imaging in Placenta Accreta Spectrum

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Abstract

Introduction: Placenta accreta spectrum (PAS) is a serious obstetric condition associated with significant maternal morbidity and mortality, particularly in resource-limited settings such as India. Early and accurate antenatal diagnosis is crucial for optimal management and significant reduction of obstetric complications. **Aim:** The aim of the study was to compare the diagnostic accuracy of ultrasonography (USG) and magnetic resonance imaging (MRI) in detecting PAS using histopathology as the gold standard. **Materials and Methods:** This prospective observational study included 30 pregnant women with suspected PAS. All patients underwent USG followed by MRI, and findings were correlated with histopathological examination results. Diagnostic performance parameters were calculated. **Results:** Out of 30 patients, PAS was confirmed in 26 cases. USG demonstrated a sensitivity of 73.08% and specificity of 25%, with an overall diagnostic accuracy of 66.67%. MRI showed higher sensitivity (92.31%) and specificity (75%), with superior diagnostic accuracy of 90%. MRI also showed better delineation of placental invasion, particularly in cases with posterior placenta and inconclusive USG findings. **Conclusion:** MRI demonstrates superior diagnostic performance compared to USG in the evaluation of PAS. While USG remains an effective first-line screening tool in resource limited setting such as India, MRI serves as a valuable adjunct in high-risk or equivocal cases, improving diagnostic confidence and aiding in preoperative planning.

Keywords: Cesarean section, Magnetic resonance imaging, Placenta accreta spectrum, Placenta previa, Ultrasonography

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Introduction

Placenta accreta spectrum (PAS) refers to the spectrum of abnormal placental adherence from accreta to percreta, which is associated with significant maternal morbidity and mortality due to massive postpartum hemorrhage.[1] The incidence of PAS has increased in recent decades, largely attributed to rising cesarean section rates and maternal age.[2] Early antenatal diagnosis plays a crucial role in reducing maternal morbidity and mortality by enabling appropriate surgical planning and early multidisciplinary management.[2] Ultrasonography (USG) is widely used as the primary screening modality; however, its diagnostic accuracy may be limited in certain cases, necessitating adjunctive imaging techniques such as magnetic resonance imaging (MRI).[3]

Aim and Objectives

The aim of the study was to compare the diagnostic accuracy of USG and MRI in detecting PAS using histopathological examination (HPE) as the gold standard.

Materials and Methods

This prospective observational study was conducted after obtaining approval from the Institutional Ethics Committee (IEC No. 27/IEC-GRMC/2024) from April 2024 to September 2025 at Gajra Raja Medical College and J.A. Group of Hospitals, Gwalior, Madhya Pradesh, India. The study included 30 pregnant women with clinically suspected PAS, with inclusion criteria: Pregnant women with suspected PAS willing to undergo both USG and MRI and exclusion criteria: Patients with incomplete imaging or contraindications to MRI or refusing to consent. All 30 patients were made to sign consent forms in Hindi (native language), following which all of them underwent USG and MRI, and the imaging findings were correlated with HPE. Out of 30 patients, PAS was confirmed in 26 cases.

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Gray-scale USG imaging demonstrated loss of retroplacental hypoechoic clear zone with the presence of multiple irregular placental lacunae and focal thinning of myometrium at the placental attachment site and bridging vessels extending across the uterine–myometrium interface on USG color Doppler study.[3] MRI (1.5 Tesla) T2-weighted sequences showed a heterogenous placenta with multiple T2 hypointense intra-placental bands with focal thinning and interruption of the myometrium at the placental attachment site with outward uterine bulging[3] [Figures 1 and 2].

Statistical analysis was done with Statistical Package for the Social Sciences version 20 (IBM, USA). Risk factor analysis was done for 26 patients [Table 1]. The diagnostic performance parameters, including sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), were calculated [Table 2], and receiver operating characteristic (ROC) curves were drawn for both imaging modalities [Figure 3].

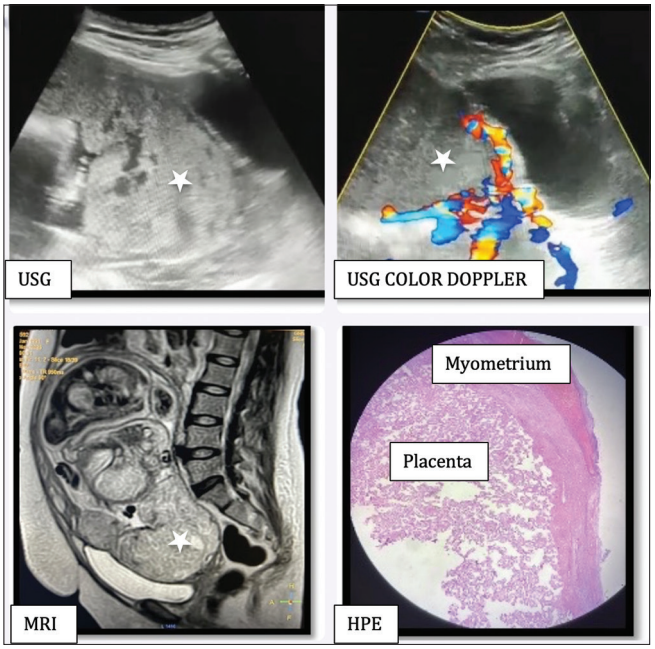

Figure 1: Ultrasonography (USG), magnetic resonance imaging (MRI) and histopathological examination (HPE) findings in 34-year-old multigravida with placenta accreta spectrum (PAS): 34-year-old multigravida (G4 P3 L3) with 37 weeks of gestation and history of previous 2 lower segment cesarean section (LSCS) had with posterior placenta previa with PAS (*) and underwent elective LSCS and hysterectomy followed by HPE of the placenta

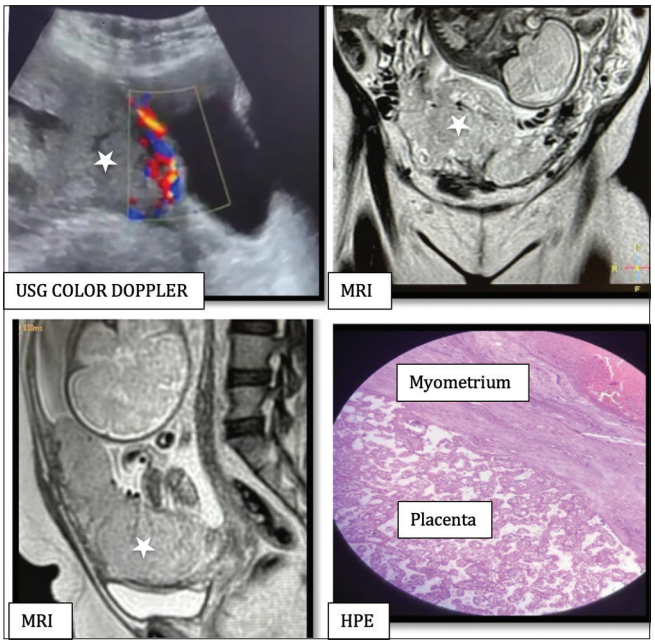

Figure 2: Case 2 – Ultrasonography (USG), magnetic resonance imaging (MRI) and histopathological examination (HPE) findings in 32-year-old multigravida with placenta accreta spectrum (PAS): 32-year-old multigravida (G3 P2 L2) with 32 weeks gestation, history of previous 2 lower segment cesarean section (LSCS) with anterior placenta previa with PAS (*) underwent elective LSCS and hysterectomy and HPE of the placenta

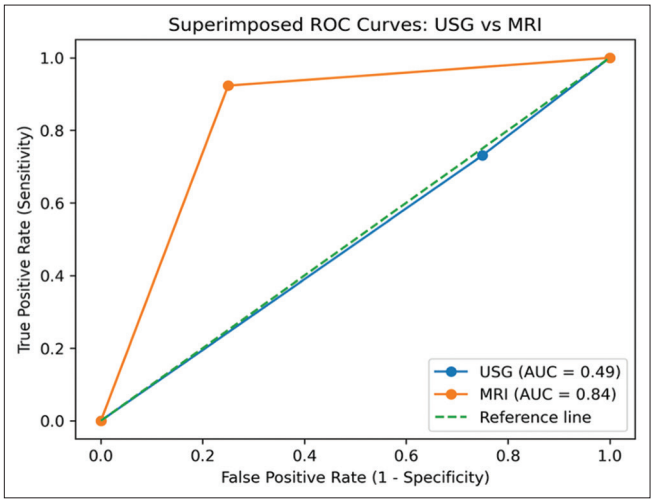

Figure 3: Receiver operating characteristic (ROC) curves of ultrasonography (USG) and magnetic resonance imaging (MRI) for placenta accreta spectrum (PAS): Superimposed ROC curves of USG and MRI in diagnosis of PAS

Table 1: Risk factor association in PAS patients

S. No.	*Risk factor*	*Category*	*Number*	*Percentage*	*P-value*
1.	Maternal age	>30 years	17	65.38	0.0028
		≤30 years	9	34.62	
2.	Placenta previa	Present	16	61.53	0.0996
		Absent	10	38.47	
3.	Previous LSCS	≥1 LSCS	12	46.15	0.5824
		None	14	53.85	
4.	Gravidity	Multigravida	22	84.62	<0.0001
		Primigravida	4	15.38	

PAS: Placenta accreta spectrum, LSCS: Lower segment cesarean section

Results

A total of 26 patients diagnosed with PAS were evaluated for associated risk factors. The distribution of risk factors among the PAS patients is tabulated in Table 1.

The most prevalent risk factor identified was multigravidity in 84.62% (n = 22/26) of the cases, which was statistically significant (P < 0.0001). Regarding maternal age, a majority of the patients (65.38%, n = 17) were aged over 30 years, which was statistically significant (P = 0.0028). Placenta previa was co-existent in 61.53% (n = 16/26) of the cases (P = 0.0996). The distribution between patients with a history of at least one previous lower segment cesarean section (LSCS) (46.15%) and those with no prior surgery (53.85%) was nearly equal (P = 0.5824).

The diagnostic performance of USG and MRI is compared and tabulated in Table 2. USG demonstrated a sensitivity of 73.08% and specificity of 25%, with an overall diagnostic accuracy of 66.67%. In contrast, MRI showed higher sensitivity (92.31%) and specificity (75%), resulting in superior diagnostic accuracy of 90%. MRI also demonstrated higher PPV and NPVs compared to USG, indicating better overall diagnostic reliability in detecting PAS. MRI demonstrated higher sensitivity (92.31%) and specificity (75%) compared to USG (73.08% and 25%, respectively). MRI also showed superior diagnostic accuracy compared to USG (90% and 66.67%, respectively). These findings suggest that while USG

Table 2: Diagnostic performance parameters of USG and MRI in the study population of 30 patients (PAS positive=26 and PAS negative=4 patients)

Modality	*TP*	*FP*	*FN*	*TN*	*Sensitivity (%)*	*Specificity (%)*	*PPV (%)*	*NPV (%)*	*Accuracy (%)*
USG	19	3	7	1	73.08	25.0	86.36	12.5	66.67
MRI	24	1	2	3	92.31	75.0	96.0	60.0	90.0

TP: True positive, FP: False positive, FN: False negative, TN: True negative, PPV: Positive predictive value, NPV: Negative predictive value

is useful as a screening modality for PAS, MRI provides superior diagnostic confidence, particularly in high-risk or equivocal cases.

ROC curves were drawn for USG and MRI. MRI demonstrated a higher area under the curve (AUC = 0.84) indicating excellent diagnostic performance whereas USG demonstrated a smaller AUC = 0.49 indicating poor diagnostic performance.

Discussion

The results of this prospective study demonstrate that MRI offers significantly higher diagnostic accuracy for PAS compared to USG in a high-risk cohort study done in a single institute. The poor discriminative ability of USG in this study, as evidenced by AUC of 0.49 suggests that while USG is an essential primary screening tool, its reliability can be limited in advanced clinical settings. In concordance with the study done by D'Antonio *et al*.,[1] which highlighted that USG accuracy is highly dependent on operator experience and placental location, our findings indicate that USG alone may not be sufficient for definitive surgical planning in high-risk patients. Consistent with the findings of Patel-Lippmann *et al*.,[2] our data confirms that MRI serves as a vital complementary modality, providing critical diagnostic value when USG findings are equivocal or inconclusive.

The identification of T2-hypointense placental bands and focal myometrial thinning on MRI was the most reliable markers. This is in concordance with the study done by Baughman *et al*.,[3] which established these signs as hallmarks of invasive placentation. Furthermore, the superior visualization of the uterine-bladder interface provided by MRI is consistent with the findings of Bourgioti *et al*.[4] which emphasized MRI's role in mapping the topography of invasion beyond the limits of USG.

A significant observation in our study was the high prevalence of multigravidity (84.62%), which was statistically significant ($P < 0.0001$). While a history of prior LSCS is the most recognized risk factor, our study noted a nearly equal distribution of PAS in patients with and without prior LSCS. This is consistent with the findings of Einerson *et al*.[5] and Jauniaux *et al*.,[6] who noted that advanced maternal age and high parity serve as critical independent contributors to the rising incidence of PAS.

The superior specificity (75%) of MRI in our study supports its use for detailed preoperative placental visualization. This is in concordance with the study done by Silver and Branch,[7] who observed that preoperative knowledge of invasion depth is the single most important factor in reducing intraoperative blood loss. Our reliance on MRI for high-risk cases is also consistent with the findings of Palacios-Jaraquemada and Bruno,[8] who advocated for a standardized MRI protocol to guide multidisciplinary management. Furthermore, our diagnostic approach remains in concordance with the study done by Hecht *et al*.[9] regarding FIGO consensus guidelines, while the potential for future predictive modeling remains consistent with the findings of Sun *et al*.[10] regarding radiomics.

From a clinical perspective, the findings of this study support a structured, stepwise imaging approach with USG remaining as the primary screening modality due to its accessibility, safety, and cost-effectiveness in primary as well as tertiary Indian tertiary health care center such as ours. However, given its limitations, MRI should be employed selectively in cases with inconclusive USG findings, posterior placentation, and/or suspected invasion. This combined approach enhances diagnostic accuracy and is particularly relevant in resource-limited settings, where optimal utilization of imaging resources is essential.

Limitations

The present study had a relatively small sample size and was conducted at a single tertiary care center, which may limit generalizability. Additionally, interobserver variability in imaging interpretation was not assessed.

Conclusion

USG remains as the primary screening tool in the diagnosis of PAS, and MRI serves as an important adjunct in equivocal cases. A risk-based, stepwise imaging approach is recommended to improve diagnostic accuracy and clinical outcomes in high-risk population in resource limited setting.

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References

1. D'Antonio F, Iacovella C, Bhide A. Prenatal identification of invasive placentation using ultrasound: Systematic review and meta-analysis. Ultrasound Obstet Gynecol 2013;42:509-17.
2. Patel-Lippmann KK, Planz VB, Phillips CH, Ohlendorf JM, Zuckerwise LC, Moshiri M. Placenta accreta spectrum disorders: Update and pictorial review of the SAR-ESUR joint consensus statement for MRI. Radiographics 2023;43:e220090.
3. Baughman WC, Corteville JE, Shah RR. Placenta accreta: Spectrum of US and MR imaging findings. Radiographics 2008;28: 1905-16.
4. Bourgioti C, Zafeiropoulou K, Fotopoulos S, Nikolaidou ME, Theotokas I, Damaskos C, *et al*. MRI in placenta accreta spectrum: Beyond the basics. Radiographics 2021;41:1541-58.
5. Einerson BD, Gilner JB, Zuckerwise LC. Placenta accreta spectrum. Obstet Gynecol 2023;142:31-50.

6. Jauniaux E, Bunce C, Grønbeck L, Langhoff-Roos J. Prevalence and main outcomes of placenta accreta spectrum: A systematic review and meta-analysis. Am J Obstet Gynecol 2019;221: 208-18.
7. Silver RM, Branch DW. Placenta accreta spectrum. N Engl J Med 2018;378:1529-36.
8. Palacios-Jaraquemada JM, Bruno CH. MRI for placenta accreta spectrum disorders: A practical guide. Abdom Radiol (NY) 2022;47:3245-59.
9. Hecht JL, Baergen R, Adibi JJ, Gundogan F, Costa MA, Knight M, *et al*. FIGO consensus guidelines on placenta accreta spectrum disorders: Prenatal diagnosis and screening. Int J Gynaecol Obstet 2018;140:281-98.
10. Sun H, Qu H, Lan L, Zhao S, Yuan M, Li W, *et al*. Radiomics based on T2-weighted MRI for preoperative prediction of placenta accreta spectrum. Eur J Radiol 2023;158:110624.