

Ultrasound Versus MRI In The Antenatal Diagnosis Of Placenta Accreta Spectrum

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I. Introduction

Placenta accreta spectrum (PAS) comprises abnormal placental adherence disorders – placenta accreta, increta & percreta and is a leading cause of severe obstetric hemorrhage, peripartum hysterectomy & maternal morbidity. The incidence of PAS has increased substantially over recent decades, from approximately 1 in 2500 pregnancies to nearly 1 in 500 pregnancies, largely parallelling the rising rate of cesarean deliveries.

Timely antenatal diagnosis is crucial, as planned delivery in a tertiary care setting has been shown to reduce intraoperative blood loss by up to 40-50%, decrease transfusion requirements & improve overall maternal outcomes. Ultrasound & color Doppler assessment, is the recommended first line diagnostic modality with reported sensitivity of 80-90% & specificity of 90-95%. Key sonographic markers include placental lacunae, loss of retroplacental clear zone, myometrial thinning & bridging vessels.

Magnetic resonance imaging (MRI) is frequently used as an adjunct, particularly in cases with posterior placenta, equivocal ultrasound findings, or suspected deep placental invasion. Variable diagnostic accuracy of MRI, with sensitivity of 75-90% & specificity from 70-85% and studies suggest that MRI alters clinical management in only 8-15% of cases. Its routine use therefore remains controversial due to cost, limited availability & lack of consistent superiority over ultrasound.

In this context, the present study aims to compare the diagnostic accuracy of ultrasound & MRI in antenatal detection of PAS & evaluate the incremental value of MRI over ultrasound in high risk pregnancies.

II. Objectives

1. To assess the diagnostic accuracy of ultrasound in PAS.
2. To evaluate the role of MRI in suspected PAS.
3. To compare ultrasound and MRI findings with intraoperative diagnosis.
4. To determine the additional value of MRI over ultrasound.

III. Materials And Methods

Study design and setting – this was an observational diagnostic accuracy study conducted in the department of obstetrics & Gynaecology at Hitech medical College & Hospital, Bhubaneswar over a period of 1 year.

Study population – pregnant women with risk factors for placenta accreta spectrum (PAS) who presented for antenatal care were enrolled

Inclusion criteria – placenta previa or low-lying placenta

- History of one or more previous cesarean sections.
- Previous uterine surgery (myomectomy)

Exclusion criteria

- Multiple pregnancy
- Major fetal anomalies
- Contraindications to MRI
- Incomplete intraoperative & histopathological data

Imaging protocol

- Ultrasound with grayscale and color Doppler
- MRI in selected cases with posterior placenta, equivocal ultrasound findings or suspected deep placental invasion

Reference standard

Final diagnosis of PAS was confirmed based on

- Intraoperative findings at cesarean delivery
- Histopathological examination where hysterectomy was performed.

Statistical analysis

Data were analysed by using {SPSS/Version} diagnostic performance parameters including sensitivity, specificity, PPV, NPV were calculated using the reference standard.

IV. Results

Baseline clinical characteristics (n-50)

Mean maternal age (yrs)	35+-4
Placenta previa/ low lying placenta	38(76%)
>\= 1 previous cesarean section	40(80%)
>\= 2 previous cesarean sections	22(44%)
Previous uterine surgery	6(12%)

Majority had strong PAS risk factors, justifying targeted antenatal imaging.

Final diagnosis of Placenta Accreta Spectrum

Diagnosis	Number(%)
No PAS	30(64%)
Placenta accreta	10(20%)
Placenta increta	5(10%)
Placenta percreta	3(6%)
Total PAS	18(36%)

Increasing severity correlated with higher surgical complexity and blood loss.

Diagnostic accuracy: ultrasound vs MRI

Parameter	Ultrasound	MRI
True positives	16	14
False positives	3	4
False negatives	2	3
Sensitivity (%)	88.9	77.8
Specificity (%)	90.6	81.3
PPV(%)	84.2	77.8
NPV(%)	93.5	81.3

Ultrasound showed higher diagnostic accuracy, supporting it's role as the primary screening and diagnostic tool.

Key imaging findings and predictive value

Imaging sign	Frequency in PAS(%)	Modality
Placenta lacunae	83	Ultrasound
Bridging vessels	78	Color Doppler
Loss of clear zone	72	Ultrasound
Dark intraplacental T2 bands	70	MRI
Myometrial disruption	65	MRI

Ultrasound markers were more frequently detected and easier to identify during routine antenatal care.

Imaging modality vs clinical outcomes

Outcome	Ultrasound – diagnosed PAS	MRI- assisted PAS
Planned cesarean delivery	16(89%)	14(78%)
Cesarean hysterectomy	9(50%)	8(44%)
Massive blood transfusion > 4 units	7(39%)	6(33%)
Bladder involvement detected preoperatively	2	3
Improved surgical planning		5(10% of total cases)

- Antenatal Diagnosis , not imaging modality alone , improved preparedness.
- MRI added value mainly in defining depth of invasion and organ involvement, not in routine detection

V. Discussion

- Placenta accreta spectrum (PAS) poses a significant risk of severe maternal morbidity, making accurate antenatal diagnosis essential for optimal outcomes. In this study, ultrasound demonstrated high diagnostic accuracy as a first-line modality, with characteristic grayscale and Doppler features reliably identifying PAS in high-risk pregnancies. These findings align with current evidence and international guidelines supporting ultrasound as the primary diagnostic tool.
- The routine use of MRI did not significantly enhance diagnostic accuracy beyond ultrasound. Its utility was limited to selected cases with posterior placentation, equivocal sonographic findings, or suspected extrauterine invasion, suggesting an adjunctive rather than primary role. Given its higher cost and limited availability, indiscriminate MRI use may not be justified.
- Crucially, the clinical value of antenatal diagnosis lies in its ability to enable planned multidisciplinary management, which remains the most effective strategy for reducing hemorrhage-related morbidity and improving maternal outcomes.

VI. Conclusion

Ultrasound remains the cornerstone of antenatal diagnosis of placenta accreta spectrum, offering high diagnostic accuracy, wide availability, and cost-effectiveness. Routine MRI does not significantly enhance diagnostic performance and should be reserved for selected cases requiring further anatomical clarification. Early diagnosis coupled with multidisciplinary management is the most decisive factor in reducing maternal morbidity and optimizing outcomes in PAS.

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