



MAGNETIC RESONANCE EVALUATION OF INVASIVE PLACENTA – OUR EXPERIENCE

Radiodiagnosis

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ABSTRACT

Introduction: Placenta accreta (PA) includes various types of abnormal placentation in which chorionic villi attach directly to or invade the myometrium. There is a rising trend of placenta accreta owing to increased number of primary and repeat Caesarean sections. Accurate and timely identification of affected pregnancies allows optimal obstetric management to reduce maternal morbidity and mortality. The availability of conservative treatment modalities for the management of post partum hemorrhage arising from the same mandates the use of magnetic resonance imaging (MRI) to precisely evaluate the degree of placental invasion so as to further guide the treatment options.

Materials and Methods: In two years observational cross sectional study, 18 pregnant females between age group 15-40 years were subjected to MRI pelvis and MRI findings were noted.

Result : Placenta accreta vera was the most common type found in our study. Patients with placenta previa and previous Caesarean section were at highest risk. Intraplacental bands, heterogenous placenta, lumpy placental contour were the most commonly observed findings.

Conclusion: MRI is very useful for accurate evaluation of placenta accreta particularly when USG findings are ambiguous or when there is a posterior placenta. There is increased incidence of placenta accreta with multiparity, placenta previa and history of previous Caesarean sections.

KEYWORDS

Placenta accreta; increta; percreta; MRI placenta.

INTRODUCTION

Placenta Accreta (PA) occurs due to abnormal invasion of the chorionic villi (CV) into the myometrium due to defect in the decidua basalis. PA is classified on the basis of the degree of myometrial invasion as 1) placenta accreta vera- chorionic villi are in contact with the myometrium without myometrial invasion (incidence 75-78%) ; 2) placenta increta- placenta partially invades the myometrium (incidence 15- 17%); 3) placenta percreta- CV penetrate through entire myometrial thickness or beyond serosa (5% incidence)^[1]. PA can lead to severe post partum hemorrhage and maternal mortality. History of lower segment Caesarean section (LSCS) and placenta previa are the commonest predisposing factors whereas uterine curettage and multiparity are less common risk factors^[2,3]. High-resolution grey-scale ultrasound (USG) with colour Doppler is widely used for antenatal diagnosis of invasive placenta. Irregularly shaped placental lacunae with turbulent flow and abnormal areas of hypervascularity with dilated blood vessels at the placenta-myometrial interphase are the most useful USG markers for PA^[4,5].

Magnetic resonance imaging (MRI) is indicated in the diagnostic workup when the ultrasound evaluation is equivocal or for patients with high clinical risk factors for placenta accreta. MRI achieves better soft tissue contrast than ultrasonography in posteriorly situated placenta accreta where the foetal head impedes the ultrasound beam and in prior myomectomy cases because it is blocked by scar tissue^[6].

The purpose of this article is to prime radiologists performing MRI for suspected placenta accreta, illustrating abnormal findings and diagnostic pitfalls so that they are familiar with the recommended MRI protocols and implications of examination findings for planning appropriate management strategy and thus contribute towards an improved maternal and fetal outcome.

In this study, all women who were antenatally diagnosed by ultrasound to have invasive placenta underwent MRI and observations were noted.

AIMS AND OBJECTIVES:

- To study the MRI findings of invasive placenta.
- To formulate an optimum reporting template for accurate MRI diagnosis of invasive placenta.

MATERIALS AND METHODS:

This cross sectional observational study was conducted in our institute between January 2019 to January 2020. Eighteen patients referred From Department Of Obstetrics and Gynaecology with antenatal sonographic diagnosis of invasive placenta were evaluated with MRI pelvis. Post partum patients with retained placenta were excluded from the study. All patients underwent non contrast MRI pelvis on 1.5-T Philips Achieva machine using a multi channel phased-array surface coil without respiratory gating as per the MRI protocol mentioned (Table 1). Scan was done with patient in supine position with moderately distended urinary bladder for better assessment of potential bladder invasion.

Table 1 – MRI scanning Protocol

Sequence	Planes
T2 HASTE	coronal
T2 SPAIR	axial
T2 TSE	Axial , coronal , sagittal
BTfE	Volume sequence
T1 gradient	Axial
T1 TSE	Axial
FOV	320- 400 mm
Flip angle	150
Matrix	axial 256*256 cor/sag 384*256

Fast sequences like T2-weighted HASTE and BTfE are needed to minimize fetal motion artefact. T1-weighted gradient-echo sequence in any one plane helps to look for subchorionic hemorrhage.

Optimum knowledge about the normal changes in placental morphology throughout pregnancy is essential for differentiating them with changes seen in PA. Normal placental morphology and abnormal changes in PA are tabulated in Table 2.

Table2- Normal placental imaging characteristics versus abnormal features in PA

Criteria	Normal	Abnormal
Placental signal	Homogenous	Heterogenous (due to bands, hemorrhage, vascularity)

Placental edges	Tapering, angular	Round
Placental contour	Uniform thickness	Lumpy
Intraplacental bands	Uniformly distributed thin septae	Irregularly placed thick dark bands.
Utero- placental interface	Smooth	Interrupted
Placenta-myometrial interface	Mild vascularity	Abnormally increased vascularity
Myometrium	Intact, continuous	Thinning with disruption of outer myometrial contour
Uterine contour	Smooth	Lobulated due to transmural placental protrusion.

Prominent intraplacental vascularization, protrusion of placenta within the cervix, irregularity or disruption of the normal T2 hypointense bladder wall, vessels from placenta extending into the vesical wall and within the parametrium are other features in placenta percreta. Methodical image evaluation and interpretation is crucial as, occasionally, presentation can be quite subtle, with placenta accreta exhibiting only one or two of the aforementioned features.

OBSERVATIONS AND RESULTS

Our study included 18 patients of which 13 were less than 30 years old and 5 were more than 30 years old. Nine out of 18 patients were second gravida while 6 out of 18 patients were third gravida. Fourteen of 18 patients had history of previous LSCS, 2 patients had history of abortions with curettage, 1 patient had history of hysterotomy while 1 patient had no operative history.

Twelve out of 18 patients had placenta previa.

There were 10 patients with placenta accreta vera, 5 with placenta increta and 3 patients with placenta percreta. Succenturiate lobe was present in one patient. MRI features were documented as seen in Table 3

Table 3- MRI features of invasive placenta

No.	MRI feature	Number/ Percentage of patients with the mentioned feature
1	Heterogenous signal of placenta	18 100%
2	Dark intraplacental bands	18 100%
3	Round placental edges, lumpy placental contour	18 100%
4	Interrupted utero- placental interface	18 100%
5	Increased vascularity at the placenta-myometrial interface	10 55%
6	Myometrial thinning	10 55%
7	Disruption of the normal T2 hypointense bladder wall	5 27%
8	Vessels from placenta extending into the parametrium	1 5.5%
9	Lobulated outer uterine contour	1 5.5%
10	Protrusion of placenta within the cervix	0 0%

DISCUSSION:

In this study, 72.2% patients were aged between 20-29 years, median age being 27.5 years, 27% aged more than 30 years, 95.45% patients were second gravida or higher. In a similar study by Umezurike C et al, median age was 30 years and 82% patients were second gravida or more with a median parity of 3^[7].

History of at least one LSCS was present in 77.7%, and 70.58% patients had an associated placenta previa. In the 2008 study by Dwyer et al, 81% of patients with PA had history of previous LSCS and 66% patients had placenta previa.^[8]

The most consistently observed features were heterogenous placental intensity with lumpy contour, rounded edges and irregularly distributed thick intraplacental bands (100%) (Fig.1). These result due to tethering of placental tissue and are more pronounced in placenta percreta as compared with placenta accreta or placenta increta. These are consistent with the study conducted by Lax A et al^[9].

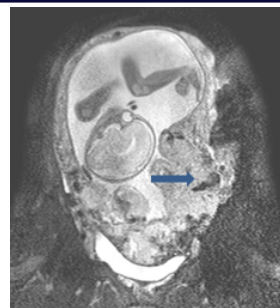


Figure1- T2 Spair coronal image- showing heterogenous lumpy placenta, dark intraplacental bands(blue arrow), lobulated external uterine contour along its left lateral wall, left parametrial extension.

Less frequently documented findings included myometrial thinning (Fig. 2 and 3) /increased vascularity at utero- placental interface (55.5%) (Fig.4).

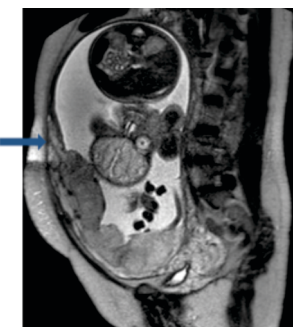


Figure 2: Sagittal T2 W MR image shows complete placenta previa with focal interruption of myometrium and extension of placenta upto the serosa at the level of umbilicus(blue arrow).



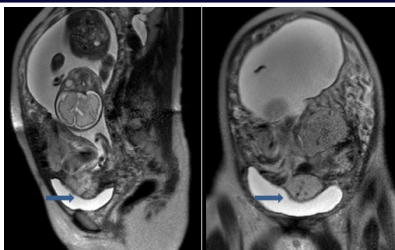
Figure 3- BTFE axial image showing thinning and interruption of the normal triple layered myometrium (blue arrow)



Figure 4- T2 sagittal image- complete placenta previa with rounded placental edges, increased flow voids at at the placenta- myometrial interface just overlying the cervical os.

Focal discontinuity in the vesical wall was observed in 27% cases (Fig4). Lobulated external contour of uterus with increased parametrial vascularity was present in 5.5% patients(Fig1).

Figure 5- T2 weighted sagittal and coronal sections show heterogenous lumpy placenta with trans serosal extension of placenta with loss of fat planes with the superior vesical wall with irregular bladder wall (blue arrow).



In general, no attempt is made to distinguish placenta accreta from placenta increta, because the treatment plan does not differ between the two. However, with placenta percreta, invasion of bladder, rectum, or abdominopelvic wall muscles, does affect the surgical management, and an attempt should be made to identify involved structures on MRI. In cases of placenta percreta, all adjacent involved structures should be identified so that, if necessary, the relevant surgical expertise (e.g., urology, vascular, colorectal, or plastic surgery) can be recruited before the procedure.^[10,11,12to16]

Limitations:

Before week 24, the placenta is immature and vascularity at the placental-myometrial interface cannot be differentiated from signs of invasion. After 30 weeks, the aging placenta appears more heterogeneous and can be mistaken for an invasive placenta. Thus, to minimize false positive results, MRI placenta needs to be performed at 24–30 weeks when normal placenta exhibits homogeneous intermediate signal and is distinct from the more heterogeneous and hyperintense myometrium^[17].

Dark intraplacental bands are also seen in placental infarction and intervillous thrombus. Even though abnormal intraplacental vascularity denotes placental invasion, the increased pelvic vascularity is not a reliable indicator of invasive placentation. Additional imaging perpendicular to the suspicious interphase and localization of abnormality in at least two orthogonal planes are suggested to avoid pseudo – impressions regarding signs due to obliquity of imaging planes.^[18] Rapid imaging is available with both gradient-echo which better delineates the placental contour and placenta- myometrial interface and spin-echo sequences reliably depicts placental signal heterogeneity and intraplacental bands. Fast spin-echo sequences yield greater tissue contrast and signal-to-noise ratios than does single-shot imaging^[18].

We recommend the use of a reporting template (Table 4) for the MRI diagnosis of PA so as to follow a detailed check list for comprehensive evaluation of each patient and reduce inter- observer variation in standard of reporting.

Table 4 – MR Reporting template for placental accreta

Patients details- name/ age/ sex/ gravida/parity status	
Present gestational age	
Short relevant history	
Usg findings	
MRI findings	
Fetal lie	
Internal os status	
Placental localisation	
Accessory findings- intra/ retroplacental clot, fibroid, succenturiate lobe, vasa previa, ovarian cysts.	
Features of invasive placenta	Present/ absent
Heterogenous signal of placenta	
Dark intraplacental bands	
Round placental edges, lumpy placental contour	
Interrupted utero- placental interface	
Increased vascularity at the placenta- myometrial interface	
Myometrial thinning	
Disruption of the normal T2 hypointense bladder wall	
Vessels from placenta extending into the parametrium	
Lobulated outer uterine contour	
Protrusion of placenta within the cervix	

SUMMARY AND CONCLUSION

Invasive placenta is one of the most feared complications in obstetrics. The diagnosis of invasive placenta is usually made based on clinical history, imaging findings and histological features. Antenatal imaging assessment using ultrasonography or MRI in high risk patients is the main stay for antenatal diagnosis. Early diagnosis is important so that the patient can be prepared and adequately counselled with regard to treatment options and their possible consequences. Increased placental lacunae and increased vascularity at the placenta- myometrial interface are the most common USG features.

MRI examination is needed not only to diagnose or confirm PA when USG is inconclusive or incomplete but also to guide operative management. The most consistently observed features are heterogenous placental intensity with lumpy contour, rounded edges and irregularly distributed thick intraplacental bands. Less frequent findings are interrupted vesical wall, trans serosal extension of placenta into the parametrium. Familiarity with MRI technique to assess the placenta and experience with imaging appearances of normal and invasive placentation will help the radiologist in contributing to an optimal outcome. MRI increases the accuracy of the workup of high-risk patients and aids in multidisciplinary delivery planning to improve maternal outcome.

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