AIMS AND OBJECTIVES:

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

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. 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.

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 accrete 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. MRI 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. 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.

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 needed to minimize fetal motion artefact. T1-weighted gradient-echo sequence in any one plane to look for subchorionic hemorrhage.

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.
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 hystorotomy while 1 patient had no operative history.

Twelve out of 18 patients had placenta previa.

There were 10 patients with placenta acreta 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.

**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 Umezurik et al, median age was 30 years and 82% patients were second gravida or more with a median parity of 3.3.

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.9

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

| 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 | 8/55%                                                  |
| 6   | Myometrial thinning                       | 8/55%                                                    |
| 7   | Disruption of the normal T2 hypointense bladder wall | 3/27%                                                  |
| 8   | Vessels from placenta extending into the parametrum | 3/5.5%                                                  |
| 9   | Lobulated outer uterine contour           | 3/5.5%                                                    |
| 10  | Protrusion of placenta within the cervix  | 0/0%                                                     |
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.6,15,16

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.15

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 placation. Additional imaging perpendicular to the suspicious interphase and localization of abnormality in at least two orthogonal planes are suggested to avoid pseudo- images regarding signs due to obliquity of imaging planes.16 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.16

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 assessment using ultrasoundography 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 US features.

**Table 4 – MR Reporting template for placental accreta**

| Patients details- name/ age/ sex/ gravidia/parity status | Present gestational age | Short relevant history | Usg findings | MRI findings | Fetal lie | Internal os status | Placentation localisation | Accessory findings- intra/ retroplacental clot, fibroid, succenturiate lobe, vasa previa, ovarian cysts. | Features of invasive placenta | Present/ absent |
|--------------------------------------------------------|------------------------|------------------------|--------------|--------------|----------|-------------------|---------------------------|---------------------------------|-----------------------------|------------------|
| Dark intraplacental bands | Heterogenous signal of placenta | 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 | Present/ absent |

**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 US 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 heterogeneous placentation intensity with lumpy contour, rounded edges and irregularly distributed thick intraplacental bands. Less frequent findings are interrupted vesical wall, trans sersosal extension of placenta into the parametrium. Familiarity with MRI technique to assess the placenta and experience with imaging appearances of normal and invasive placitation 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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