

# Role of Magnetic Resonance Imaging (MRI) in Detecting Abnormal Placentation in Suspected Patients

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## ABSTRACT

**Objective:** To determine the accuracy of magnetic resonance imaging (MRI) in detection of abnormal placentation.

**Methods:** We included 60 patients with suspicion of abnormal placentation of age 25 to 40 years presenting in 2<sup>nd</sup> or 3<sup>rd</sup> trimester with risk factors of abnormal placentation such as previous C-section, placenta previa and advanced age having signs of abnormal placentation on ultrasonography. The patients were recruited from Jan-2019 to Sep-2020 from the department of radiology, Lahore General Hospital, Lahore. All patients underwent MRI evaluation to determine placental abnormalities. All patients were followed till their delivery to confirm the diagnosis of abnormal placentation.

**Results:** Mean age was 31.24±3.75 years. Mean gestational age was 33.5±5.25 weeks. On MRI, placenta accreta was diagnosed in 23 (38.3%) cases, containing 15 (25%) cases of placenta accreta, 6 (10%) cases placenta percreta and 2 (3.33%) cases of placenta increta. The sensitivity of MRI was 84.0%, specificity was 94.3%, PPV was 91.2% and NPV 89.2%.

**Conclusion:** MRI is a superior imaging modality for the early evaluation of abnormal placentation in high risk suspected patients. It has an acceptable accuracy taking intra-operative or histopathology findings as gold standard.

**Keywords:** Abnormal placentation, Accuracy, Magnetic resonance imaging.

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## INTRODUCTION

Abnormal placentation is a common terminology to describe placenta accreta. It occurs as a result of pathologic conditions when the placental trophoblastic cells invades endometrial layers of placenta crossing the Nitabuch's layer as a result of defects in decidua basalis.<sup>1</sup>

The major underlying etiology of abnormal placentation is presence of uterine scar either due to C-section or other gynecologic procedures such as hysteroplasty, curettage or myomectomy.<sup>2</sup> Implantation of placenta on previous scar i.e. placenta previa significantly increases the risk of placenta accreta in subsequent pregnancies, the higher the number of previous C-sections the greater the chances are to develop abnormal placenta. The relative risk factors are advanced age >35 years, smoking habits and uterine malformations.<sup>2,3</sup>

The major adverse outcomes associated with abnormal placentation are excessive blood loss during delivery, hence need of multiple transfusions, longer hospital stay and sometimes requiring admission in intensive care units.<sup>4,5</sup>

Early diagnosis is of prime importance to prevent complications associated with abnormal placentation, and to pre-operative planning before delivery.<sup>6,7</sup> Ultrasonography is the initial first-line evaluation of pregnancy related problems.<sup>8</sup>

Magnetic resonance imaging (MRI) provides superior evaluation of human organs due to better contrast resolution, multi-planner imaging capability, and provision of stable images regardless of the position of baby.<sup>9</sup> Therefore, this study was conducted to determine the accuracy of MRI in detection of abnormal placentation.

## METHODS

We included 60 patients with suspicion of abnormal placentation of age 25 to 40 years in this follow-up validation study. The patients were recruited from Jan-2019 to Sep-2020 from the department of radiology, Lahore General Hospital, Lahore. Approval of hospital ethical review committee was obtained prior of starting data collection. The inclusion criteria were; pregnant women in 2<sup>nd</sup> or 3<sup>rd</sup> pregnancy trimester with risk factors of abnormal placentation such as previous C-section, placenta previa and advanced age having signs of abnormal placentation on ultrasonography. While the study exclusion criteria was; presence of artificial metallic structures inside the body such as cardiac pacemaker, prosthetic heart valve, and claustrophobic patients.

Data regarding women's age, and gestational age at presentation was collected for each patient.

All patients underwent MRI evaluation to determine placental abnormalities. MRI was done using Philips achieve 1.5-T MR Unit. Examination was done in supine position with partially filled bladder. T2 images were obtained in coronal, sagittal and axial planes to determine the placental positions. The images obtained were carefully evaluated for placental location with reference to cervical orifice. Placenta previa was categorized as low lying, central, marginal and complete on the basis of its attachment in relation to cervical orifice.

The following features were suggestive of abnormal placentation; placental heterogeneity, bladder invasion, focal uterine bulging, and dark intraplacental bands. Abnormal placentation was labelled as accreta, percreta

and increta according to degree of placental invasion into the uterine wall.<sup>10</sup>

The final diagnosis of placenta accreta was made on intra-operative findings. Or in uncertain cases, histopathologic examination was carried out, it was done in 10 cases only. All patients were followed till their delivery to confirm the diagnosis of abnormal placentation.

Data was analyzed in SPSS v25. Sensitivity, specificity, negative predictive value and positive predictive value was calculated for MRI.

## RESULTS

A total of 60 pregnant women with mean age 31.24±3.75 years and range (25-40) years were studied. Mean gestational age was 33.5±5.25 weeks with age range of 18-39 weeks.

On MRI patients were diagnosed either having placenta previa alone or placenta previa with accreta. There were 29 (48.3%) patients having complete, 24 (40.0%) central, 5 (8.3%) marginal, and 2 (3.33%) cases were having low lying placenta (Table 1).

On MRI, placenta accreta was diagnosed in 23 (38.3%) cases, containing 15 (25%) cases of placenta accreta, 6 (10%) cases placenta percereta and 2 (3.33%) cases of placenta increta (Table 1).

On intra-operative/histopathology findings, among the 23 cases of placenta accreta on MRI, placenta accreta was diagnosed in 21 (91.3%) patients (Table 1).

The sensitivity of MRI was 84.0%, specificity was 94.3%, PPV was 91.2% and NPV 89.2% (Table 2).

Table 1. MRI and Intra-Operative/Histopathology Characteristics.

<i>MRI Diagnosis</i>	
Placenta Previa Alone	37 (61.7%)
Placenta Previa plus Accreta	23 (38.3%)
Type of Placenta Previa	
Complete	29 (48.3%)
Central	24 (40.0%)
Marginal	05 (8.3%)
Low Lying	02 (3.33%)
Type of Placenta Accreta (N=23)	
Accreta	15 (65.2%)
Increta	06 (26.1%)
Percereta	02 (8.7%)

Table 2. Accuracy of MRI.

Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
84.0	94.3	91.2	89.2

## DISCUSSION

Ultrasonography is the recommended first-line modality for evaluation of pregnancy and its complications using either standard trans-abdominal or trans-vaginal approach. It may also aid in diagnosis of abnormal placentation, moreover it is readily available, easy to perform and is cost-effective.<sup>11</sup> However, US has some limitations such as it is operator dependent, accuracy is dependent on body position and cannot accurately evaluate posterior placenta.<sup>12</sup> Some studies have also reported that the US efficacy is limited by unavailability of multi-planner images and cannot provide better images for soft tissue evaluation. While other studies have reported the superiority of MRI in evaluation of abnormal placentation, it can identify level of placental

invasion, type and location of abnormal placentation and hence can aid in surgical planning to prevent complications.<sup>13, 14</sup> MR images have been found to provide better evaluation especially in cases where US findings are ambiguous and non-specific.<sup>15, 16</sup>

In present study, we evaluated the accuracy of MRI in determining the presence and spectrum of abnormal placentation. The sensitivity of MRI was 84.0% and specificity was 94.3%.

A study by El-Assaly et al. determined the accuracy of MRI in suspected cases of abnormal placentation and reported that it has a sensitivity of 72.73% and specificity 100%.<sup>16</sup>

Another study by Hazem et al. conducted a similar study and reported that it has sensitivity of 100% and specificity 83.3%.<sup>17</sup>

A study by Wang et al. on diagnosis and surgical planning of abnormal placentation, the reported sensitivity of 88.9% and specificity 96.7%, PPV 84.8% and NPV 95.2%. While the accuracy of MRI for surgical planning of MRI was 97%, specificity 100%, PPV of 92.6% and NPV 100%.<sup>18</sup>

Another study by Sattar et al. on a study on diagnosis of morbidly adherent placenta (MAP) using MRI reported sensitivity of 88.37% and specificity 85.29%.<sup>19</sup>

So in conclusion, we found that MRI is a superior imaging modality for the early evaluation of abnormal placentation in high risk suspected patients. It has an acceptable accuracy taking intra-operative or histopathology findings as gold standard.

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