

The Role of MRI in the Assessment of Placenta Previa and Abnormal Placental Invasion

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Abstract

Background: Placenta accreta is a serious condition that may threaten life with increasing incidence in the past years. Placenta accreta denotes abnormal placentation including placenta accrete (direct myometrial placental abnormal attachment), placenta increta (myometrial placental invasion) and placenta percreta (complete placental invasion within the uterine walls with or without extra-uterine extension).

Lower anterior uterine segment is the commonest site for placenta accreta. Multiple cesarean section with presence of placenta previa are considered the commonest risk factors for placenta accreta. The percent of developing placenta accreta is 24% in females having placenta previa and previous one cesarean section and rises with increased number of previous to cesarean sections.

Aim of Study: This study was done aiming at the clarification of the role of MRI in the assessment of the uterine walls' invasion by the placenta in cases with placenta previa.

Patients and Methods: Prospective study of 50 pregnant women with age range between 35 and 45 years old. They were all referred from the Gynecology and Obstetric Department with clinical and ultra-sonographic criteria of placenta previa with suspected abnormal placental invasion. The clinical and sonographic data were assessed followed by MRI study of the abdomen and pelvis for placental assessment.

Results: This study diagnosed placenta previa accompanied by accreta in 18/50 cases & placenta previa with no abnormal placental uterine walls' invasion in 32/50 cases. After correlation with surgical and histo-pathological reports, 100% of the cases showed true positive results regarding the MRI detection of placenta accreta as well as true negative results occurred in 81% of cases and false negative in 19% of cases.

Conclusion: MRI study offers a superior choice for assessment of placenta previa and detection of placental invasion of the uterine walls (accreta type).

Key Words: MRI – Placenta previa – Placenta accreta.

Introduction

THE commonest etiology of post-partum hemorrhage is abnormal placental implantation leading to hysterectomy in many cases with growing risk of morbidity and mortality of the mother and fetus [1,2].

The placenta that lies at the lower uterine segment close to the internal cervical os is termed placenta previa, as in normal conditions, the lower margin of placenta is at least 2cm proximal to the internal cervical os margin [1,3].

Abnormal placental attachment to the uterine walls is generally termed Placenta Accreta (PA) referring to the relation of the chorionic villi to the uterine walls classified into accreta, increta and percreta [4,5].

Previous delivery by cesarean section, placenta previa as well as increased mother's age increase the possibility of placenta accreta development, with prior cesarean section considered as the most powerful predisposing factor for placenta previa and therefore placenta accreta [5,6]. Placenta previa and prior uterine intervention play a major role in the occurrence of placenta accreta [1].

Early diagnosis of PA is of huge importance, as in most cases with PA antepartum hemorrhage occurs, therefore satisfactory pre-operative planning is obligatory [5,7].

First diagnostic imaging modality for placental evaluation was Ultrasound, however with progres-

List of Abbreviations:

MRI : Magnetic Resonance Imaging.
PA : Placenta Accreta.
US : Ultra-Sound.
SE : Spin Echo Sequences.

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sive MRI advances, MRI rose as a competent diagnostic imaging modality in inconclusive cases by ultra-sound [5,7].

Patients and Methods

Patients:

The study was approved by the Ethical Committee of Kasr Al-Aini Hospitals (Cairo University), and an informed consent was taken making sure the confidentiality of the enclosed the medical records is respected. The study design is prospective study. This study incorporated evaluation of 50 patients, their age ranged from 35-45 years during three years (from June 2016 till May 2019) who were prospectively recruited for this study. All patients referred from the Gynecology and Obstetric Department of Kasr Al-Aini Hospitals (Cairo University) were pregnant women with clinical criteria and ultra-sound findings suggestive of placenta previa.

Methods:

Technique of MRI:

MRI was done using a 1.5T magnet scanner (GyroscanIntera; Philips Medical Systems, Best, the Netherlands) using phased-array pelvic coil. All the patients were imaged in the supine position, total study time ranged from 30 to 45 minutes. The SE sequences were done using respiratory triggering in order to minimize the maternal and fetal motion artifacts.

No contrast was given.

Descriptive analysis was done to generate frequency tables for various types of placenta previa and accreta.

Images analysis:

The placenta previa was classified by correlating the position of the placenta with that of the internal cervical os into:

- a- Low-lying.
- b- Marginal.
- c- Complete.
- d- Central [8].

Also classification of placenta previa with abnormal placental invasion into accreta, percreta and increta was performed by the degree of placental invasion into uterine wall [8].

The standard reference of this study was the criteria found at cesarean section and their correlation with MRI findings.

Results

Our study included 50 pregnant women of suspected placenta previa clinically and sonographically with age range from 35 to 45 years old and gestational age ranging from 25 weeks to 37 weeks.

According to MRI findings, cases were classified into patients with placenta previa with no abnormal placental invasion and placenta previa with accreta.

Placenta previa was found in all cases including 24 cases of complete centralis type Fig. (1), 20 cases of partial centralis type Fig. (2), 4 cases of marginalis type Fig. (3) & 2 case of low-lying type Fig. (4). History of previous uterine intervention was given in 45 cases (90% of cases) (Table 1).

Placenta accreta was diagnosed by MRI in 18 cases including 13 patients with placenta accreta, 4 patients with placenta percreta and 1 patient with placenta increta Fig. (5).

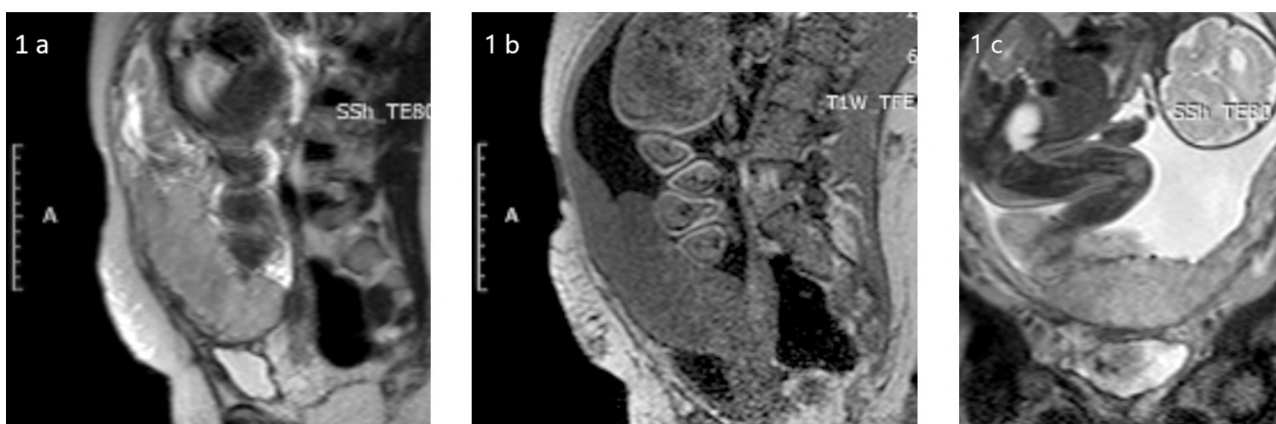


Fig. (1): A pregnant 36 years old female giving history of previous caesarian section with placenta previa complete centralis and evidence of accreta. (A) Sagittal T2 WI's , (B) Sagittal T1 WI's and (C) Coronal T2 WI's.

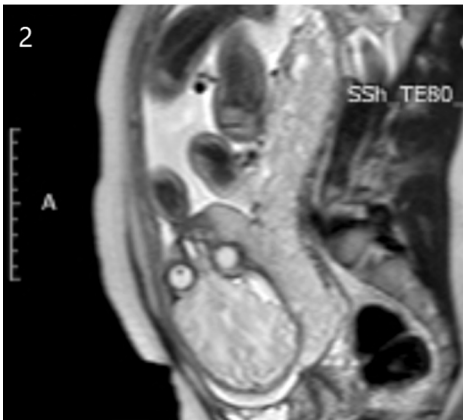


Fig. (2): A pregnant 38 years old female giving history of previous caesarian section with placenta previa partial centralis and no evidence of accreta. Sagittal T2 WI's.

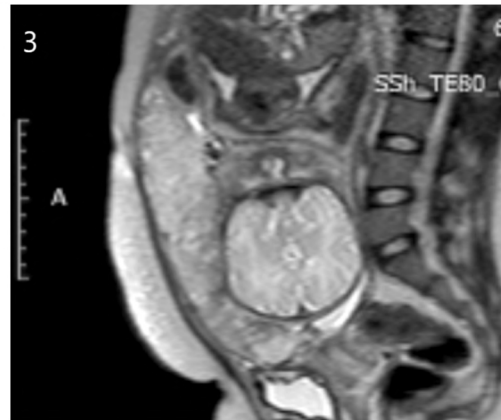


Fig. (3): A pregnant 43 years old female giving history of previous caesarian section with placenta previa marginalis and no evidence of accreta. Sagittal T2 WI's.

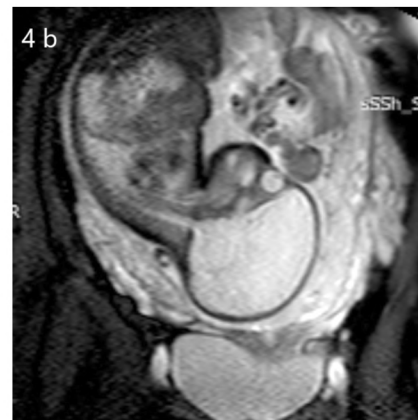
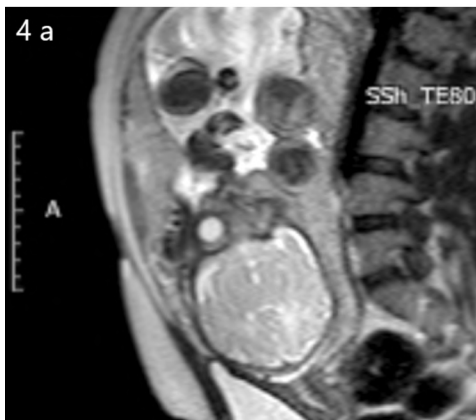


Fig. (4): A pregnant 42 years old female giving history of previous caesarian section with low lying placenta and no evidence of accreta. (A) Sagittal T2 WI's (B) Coronal spin echo WI's.

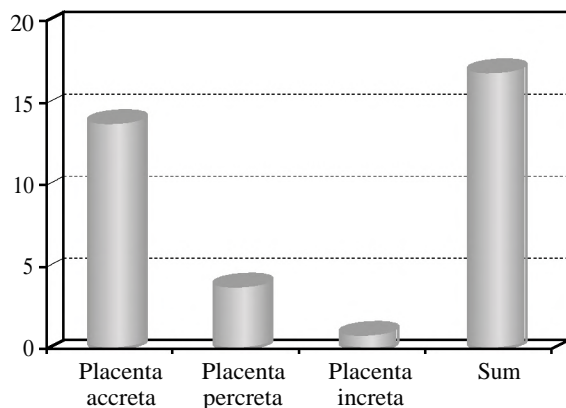


Fig. (5): Bar chart showing classification of placenta accreta cases according to their types.

Table (1): Classification of cases with placenta previa according to type.

Cases with placenta previa	Complete centralis type	Partial centralis type	Marginalis type	Low lying type
50 cases	24 cases	20 cases	4 cases	2 cases

After correlation with operative details and/or histopathology, MRI gave 100% positive results in cases diagnosed with placenta accreta (18 cases) while it gave true negative results in about 81 % of cases (26 cases) and false negative in about 19% of cases (6 cases) with sensitivity 72.73%, accuracy 86.96%, and specificity 100%.

Discussion

Placenta previa and previous cesarean sections are the major risk factors for PA with common postpartum hysterectomy [9]. Being of low-cost and owing to its accessibility ultrasound was the diagnostic modality of choice in placental assessment [5].

MRI emerged as a superior modality due to the limited ability of ultrasound in detection of depth of myometrial invasion in cases of placenta accreta and assessment of accreta in posterior wall placenta [10,11].

MRI was stated to be more efficient in abnormal placentation assessment by Teo et al. [12].

This study is a prospective study evaluating the efficiency of MRI in placenta accreta. We proved MRI study to have a sensitivity and specificity of 72.73% and 100% respectively in placenta accreta diagnosis in agreement with Warshak et al. [13], Masselli et al. [14] and Mansour and Khayat [15] yet conflicting with the results reported by of Dwyer et al. [16].

In agreement with Jakab et al., [17], spin echo sequences done in our study with controlled breath hold increased the specificity for MRI owing to the minimizing of motion artifacts resulting from the fetal motion and/or the mother respiration as well as the bowel peristaltic movements.

We agreed with Matsubara et al., [18] who stated that placenta previa centralis type was the commonest type of placenta previa as in our study this type represented 88% of cases (44 cases).

In this study, retro-placental clear space obliteration revealed the utmost sensitivity (64%), second to it was the interruption of the interface between the posterior bladder wall and uterus (52%) with low sensitivity regarding the presence of vascular lacunae. unlike Baughman et al., [9] who did not consider retro-placental clear space obliteration as a dependable sign if detected alone without other diagnostic criteria.

Our results are in concurrence with Varghese et al., [5], Lax et al., [7] and Algebally et al., [19] who stated that irregular thick intra-placental T2 dark bands as the most reliable sign of abnormal placentation on MRI. Other signs included heterogenous signal intensity of the placenta as well as bulging of the uterine lower segment, myometrial interruptions, tenting of the urinary bladder, and detection of invasion of pelvic structures [20].

We also agreed with Maurea et al., [11] who stated that placenta accreta type was the commonest type of placenta with abnormal placental invasion as in our study this type represented about 72% of cases with abnormal placental invasion (13 cases).

Operative details and/or histopathology confirmed the superiority and accuracy of MRI study in assessment of placenta accreta.

Conclusion:

MRI showed outstanding sensitivity and specificity in the detection as well as classification of placenta previa and placenta accreta thus providing

more accurate diagnostic information with more favorable pregnancy and delivery outcomes.

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دور التصوير بالرنين المغناطيسي في تقييم المشيمة المنزاحة وغزو المشيمة الغير الطبيعي

المقدمة: المشيمة الملتصقة هي حالة خطيرة قد تهدد الحياة مع زيادة الإصابة في السنوات الماضية. تشير المشيمة الملتصقة إلى المشيمة غير الطبيعية، بما في ذلك المشيمة المترامية (الإرتباط غير الطبيعي المشيمي العضلي الشاذ)، المشيمة المنغرسه (الغزو المشيمي العضلي) والمشيمة عميقة الإنغراس (الغزو المشيمي الكامل داخل جدران الرحم مع أو بدون تمديد رحمى خارج الرحم). الجزء السفلى للرحم الأمامى هو الموقع الأكثر شيوعاً للمشيمة. تعتبر العملية القيصرية المتعددة مع وجود المشيمة المنزاحة من أكثر عوامل الخطر شيوعاً لمرض المشيمة. النسبة المئوية لنمو المشيمة المتساقطة هي ٢٤٪ في الإناث اللأى يعانين من المشيمة المنزاحة والولادة القيصرية السابقة وترتفع مع زيادة عدد الأقسام السابقة إلى العمليات القيصرية.

الهدف من هذه الدراسة: أجريت هذه الدراسة بهدف توضيح دور التصوير بالرنين المغناطيسي في تقييم غزو جدران الرحم من قبل المشيمة في حالات المشيمة المنزاحة.

الوسائل والمرضى: دراسة مستقبلية ل ٥٠ امرأة حامل تتراوح أعمارهن بين ٣٥ و٤٥ عاماً. تم إحالتهم جميعاً إلى قسم أمراض النساء والتوليد مع معايير إكلينيكية وفوق صوتية لأشعة المشيمة مع الغزو المشيمي غير الطبيعي. تم تقييم البيانات الإكلينيكية وتصوير بالموجات فوق الصوتية عليها دراسة التصوير بالرنين المغناطيسي للبطن والحوض لتقييم المشيمة.

النتائج: كشفت هذه الدراسة عن المشيمة المنزاحة المصحوبة باللتصاق غير طبيعي في ١٨/٥٠ حالة ومشيمة منزاحة بدون غزو لجدران الرحم المشيمة غير الطبيعية في ٣٢/٥٠ حالة. بعد الإرتباط مع التقارير الجراحية والنسجية المرضية، أظهرت ١٠٪ من الحالات نتائج إيجابية حقيقية فيما يتعلق باكتشاف التصوير بالرنين المغناطيسي للمشيمة الغازية وكذلك النتائج السلبية الحقيقية وقعت في ٨١٪ من الحالات والسلبية الكاذبة في ١٩٪ من الحالات.

الإستنتاج: تقدم دراسة التصوير بالرنين المغناطيسي خياراً ممتازاً لتقييم المشيمة المنزاحة والكشف عن الغزو المشيمي لجدران الرحم (الغازية).