

Diagnostic Value of Ultrasonography and Magnetic Resonance Imaging in Pregnant Women at Risk For Placenta Accreta

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Abstract: Background: Placenta accreta (PA) encompasses various types of abnormal placentation in which chorionic villi attach directly to or invade the myometrium. PA is a significant cause of maternal morbidity and mortality and is now the most common reason for emergent postpartum hysterectomy. **Objectives:** To evaluate whether ultrasonography and magnetic resonance imaging can detect placenta accreta reliably in at-risk patients. **Design:** A prospective observational study. **Setting:** AL-Hussein University teaching hospital. **Patients:** 50 pregnant women with abnormal placentation and previous uterine surgery were collected after meeting the inclusion criteria depending on gray-scale sonographic findings which suggested placenta accreta. Ultrasonography (US) and resonance imaging (MRI) findings were classified as positive and negative according to presence or absence of imaging criteria of placenta accreta. Cases attended the antenatal clinic of Obstetrics and Gynecology Department of AL-Hussein University hospital and investigated in Department of Radiodiagnosis during the period from January 2016 to January 2017. **Results:** From 50 patients with placenta previa only 18 patients were confirmed to have placenta accreta after delivery based on pathological findings and examination by ultrasound and MRI, all cases have placenta previa on top of cesarean deliveries 37 of them have placenta previa anterior, 13 of them have placenta previa posterior, 43 of cases have placenta previa centralis (complete, incomplete) and 7 of cases have placenta marginalis; Accreta cases were more detected in placenta previa centralis. **Conclusion:** The result of the present study shows that the use of prenatal transabdominal gray-scale ultrasonography can detect or suspect placental invasion.

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1. Introduction

Both ultrasound and MRI have been used in the prenatal diagnosis of placenta accreta, but the accuracy of these two imaging techniques remains uncertain. Previous case reports have described MRI findings in accreta without and with the use of gadolinium contrast material [1, 2], and more recent larger studies have shown the accuracy of these two imaging techniques [3, 4]. Placenta accreta occurs where the placental villi penetrate into the myometrium, and the degree of villous invasion differentiates placenta accreta, increta, and percreta. In placenta accreta, chorionic villi implant on the myometrium without intervening decidua. In placenta percreta, chorionic villi penetrate through the entire myometrial wall; in placenta increta, they incompletely invade the myometrial wall.

Two of the strongest reported risk factors for placenta accreta are placenta previa and previous cesarean section. Women with placenta previa have a 3% risk of placenta accreta. There appears to be a synergistic effect of placenta previa and increasing

number of cesarean sections: the risk of placenta accreta increases to 11%, 40%, and 61% with one, two, and three previous cesarean sections [5]. With the rising rate of cesarean section, placenta accreta will be encountered more frequently. Other reported minor risk factors include dilation and curettage, previous uterine surgery, uterine anomalies, advanced maternal age, smoking, and hypertension. Elevated α -fetoprotein and HCG serum markers may also be observed during the second trimester [6–9].

Failure to diagnose placenta accreta prenatally places the mother at increased risk of life-threatening hemorrhage and surgical complications, including injury to the ureters and urinary bladder [10, 11]. The site and time of delivery have to be determined, and necessary blood and blood products and recruitment of a skilled anesthetic and surgical team have to be ensured [12].

The aim of this work is to study the accuracy of transabdominal, transvaginal ultrasound examination and magnetic resonance imaging for detection of

placental location and placental invasion in the uterine wall.

2. Materials and methods

This study was carried out on 50 pregnant women attending the antenatal clinic of Obstetrics and Gynecology Department of AL-Hussin University Hospital, cases have investigated in Department of Radiodiagnosis during the period from January 2016 to January 2017.

The patients included in the study were; All pregnant women (Age ranged from 18- 45, Parity ranged from 1-5. Gestational age 33- 39 weeks. Cesarean section ranged from 1-5) coming for antenatal care with vaginal bleeding from placenta previa centralis or incomplete centralis on top of previous cesarean section, D & C, hysterectomy, myomectomy scars or coming for elective cesarean section with anterior placenta, posterior Previa with previous cesarean delivery based on transabdominal real- time imaging.

All patients were being subjected to full history taking, Complete general, and abdominal examination. Including gestational age, maternal status, fetal status, fetal disposition in uterus, and fetal wellbeing, Routine laboratory investigations, Abdominal ultrasound examination for detection of placental location and possibility of placental invasion, Magnetic resonance imaging to detect placental site and placental invasion Ultrasound examination was done with the bladder partially to filled to allow for optimal visualization of the uterine serosa at the bladder wall interface. Images were obtained in the midline, right and left maternal sagittal planes. All scans were performed with high-resolution B-mode duplex apparatus using atransabdominal SIEMENS (3.5MHz) curvilinear probe.

Ultrasound finding for diagnosis of placenta accrete; the absence of the normally visible retroplacental clear zone, the presence of placental sonolucent spaces or irregularities of bladder –uterine serosa was noted. Also, measurement of smallest myometrial thickness (SMT) was obtained, and it represented the area of greatest thinning of themyometrium, at the site of placental implantation. The most common transabdominal gray scale in predicting placenta accreta was the presence of smallest myometrial thickness \leq 1mm with of presence of multiple placental Sono lucencies.

MRI imaging protocols; all cases were subjected to ultrasound and MRI examination. All had multiple previous cesarean deliveries with or without concomitant placenta previa. Previous cesarean sections with or without concomitant vaginal bleeding; anterior placenta with poor visualization of the region of the

cesarean scar on sonography; multiple cesarean deliveries with an anterior placenta and advanced maternal age; low –lying placenta and advanced maternal age; and anterior placenta with focal loss of the retroplacental myometrial zone on ultrasound.

The following criteria for the diagnosis of placenta accreta on MRI were used: markedly heterogeneous placenta, extraplacental dark bands on T2- weighted images, and disorganized abnormal placental vascularity loss of the retroplacental T2 dark zone was also noted. The most common MRI features in predicting placenta accreta were the presence of uterine bulging, heterogeneous signal intensity within the placenta, and dark intraplacental bands on T2 – weighted images. MRI performed better than ultrasound in identifying patients with placenta accreta posterior so, sensitivity 88% and specificity 100% That it added little to the diagnostic accuracy.

The patients who had signs of diagnostic criteria of placenta accreta were informed and counseled about the possible diagnosis, and the high possibility of hysterectomy was carried out for a patient with placenta accreta.

Statistical analysis:

Data were analyzed using Statistical Program for Social Science (SPSS) version 16.0. Quantitative data were expressed as the mean \pm standard deviation (SD). Qualitative data were expressed as frequency and percentage. P-value <0.05 was considered significant, <0.001 was considered as highly significant and >0.05 was considered insignificant.

3. Results:

The study carried out on 50 pregnant women attending the antenatal clinic with Age ranged from 18- 45, Parity ranged from 1-5, Gestational age 33- 39 weeks and Cesarean section ranged from 1-5. Out of 50 patients with placenta previa only 18 patients were confirmed to have placenta accreta after delivery based on pathological findings and examination by ultrasound and MRI.

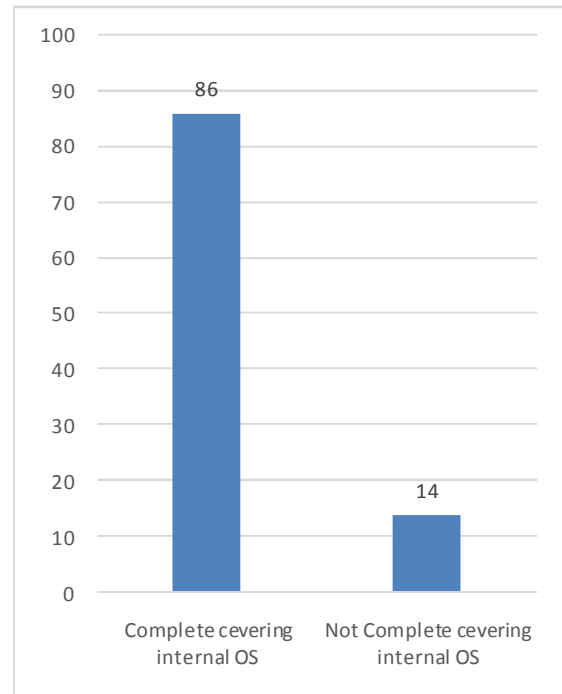
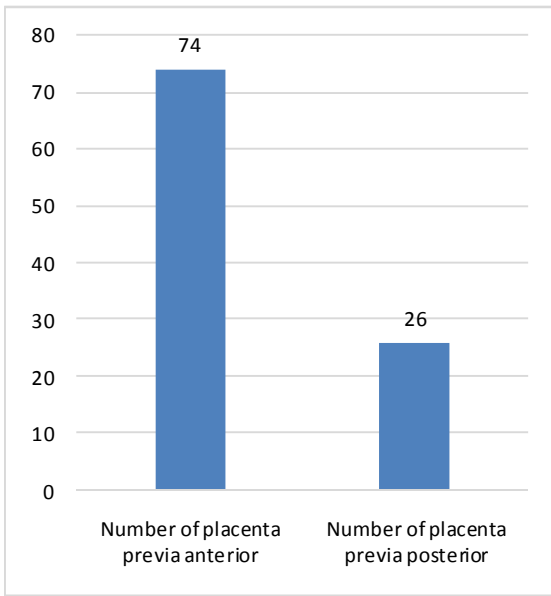
Table (1) distribution of complaint of the cases.

	Complain	
	N	%
Number of vaginal bleeding	43	86
Number of vaginal bleeding & antenatal follow up	7	14
X ²	5.623	
P. value	0.010	

86 % of patients presented with vaginal bleeding, 14% of patients had no symptoms but come for antenatal care as in Table (1).

Table (2) & Figure (1): Types of placenta previa according to ultrasound and MRI view.

	Placenta previa 50(100%)	
	N	%
Number of placenta previa anterior	37	74
Number of placenta previa posterior	13	26
X ²	4.625	
P. value	0.018	



N.B; Placenta previa was classified into grades as follows: Grade 1: low –lying placenta, Grade 2: Marginalis anterior, Grade 3: Partial placenta previa, Grade 4: Total placenta previa.

All cases have placenta previa on top of cesarean deliveries 37 of them have placenta previa anterior, 13 of them have placenta previa posterior no one of them have grade 1, 7 of them have grade 2, 23 of them grade 3 and 20 of the grade 4. It is significant in prediction of placenta accreta.

Figure (2) Distribution placenta centralis and marginalis by u.s.

43 of cases have placenta previa centralis (completely, incomplete) and 7 of cases have placenta marginalis. It is significant in the prediction of placenta accreta Specifically no anterior low lying (grade 1) or Marginal previa, placentas were invasive of the myometrium. Accreta cases were more detected in placenta previa centralis.

Table (3) distribution of placenta accreta according to pathology.

		Placenta accrete was classified according to pathology	
		N0	%
Normal MRI		32	64
Abnormal MRI n=(18)	PRE create	6	12
	Increta	3	6
	Accreta	9	18
X ²		5.696	
P. value		0.018	

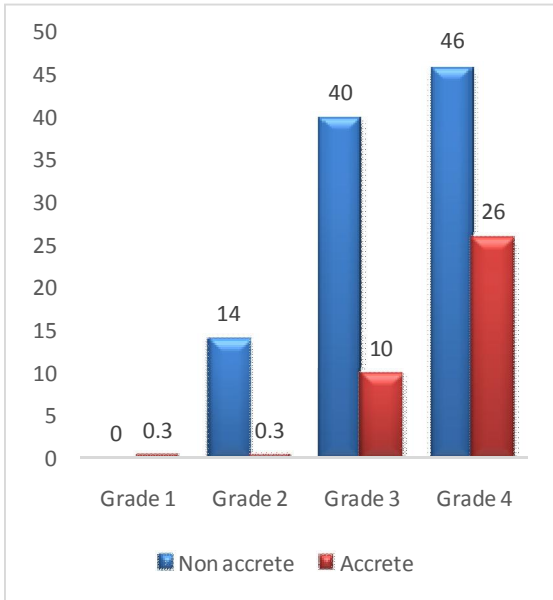


Figure (3) Grade of placenta previa among accreta and non accreta cases.

Specifically, no anterior low lying (grade 1) or Marginal Previa placentas were invasive of the myometrium. Accreta cases were detected in central Placenta previa.

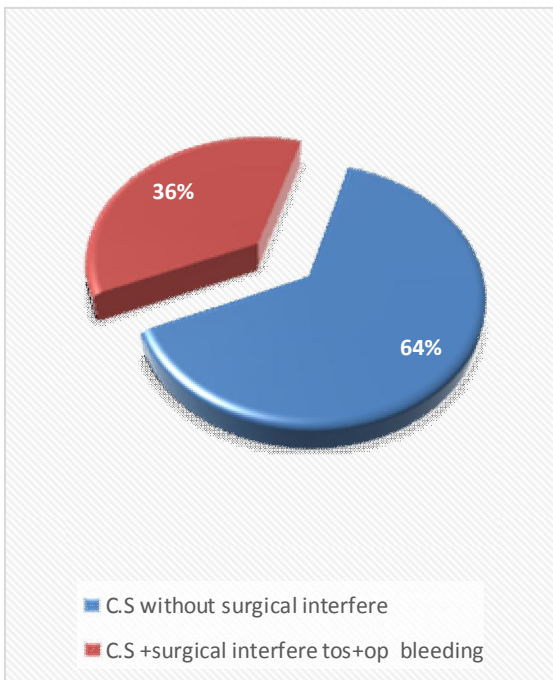


Figure (4): showed surgical procedure was done during delivery of cases.

Cesarean section done for all of the study group, 32 from them were delivered without

complication. And nine (9) from them were saved, and control of bleeding by ligation bilateral internal iliac ligation, two from them were saved and control of bleeding by ligation bilateral uterine artery and suture in bed, five from them were done a hysterectomy to control bleeding.

Assessment of MRI features:

50 pregnant patients were referred for MRI studies to further evaluate appositve ultrasound study or because of ultrasound findings suggestive of, but not conclusive for placenta accreta.

MRI was done to confirm U.S finding data whether suspected cases or not suspected cases of placenta accreta. All of the patients with invasive placentas had myometrial thinning and indistinctness at the site of placental invasion, loss of retroplacental zone, uterine bulging in the lower segment.

Abnormal thick intraplacental dark bands on T2, heterogeneous signal intensity within the placenta and loss of myometrial bladder interface were detected but not in all cases.

4. Discussion

Gray-scale ultrasound is the first-line imaging modalities for the diagnosis of placenta accreta. MRI is used as an adjunct tool when the sonographic examination is equivocal or when the placenta cannot be reliably visualized on sonography [13]. In this study, we have investigated 50 women with a history of one or more previous cesarean delivery in their third trimester for signs of placental invasiveness with the use of transabdominal gray-scale, and MRI then were correlated with the clinical outcome.

The pregnant patients selected from the Department of Obstetrics and Gynecology and were examined' in Radiology department with their age ranged between (18y-45y) and their gestational age ranged between (28w-39w). Most of the patients presented with intermittent vaginal bleeding.

In this present study, the two-dimensional real time US with high-resolution B-mode duplex SIEMENS apparatus with convex prob3.5 MHz was used for every case to evaluate signs of placental abnormalities (placenta previa-placenta accreta. Then, all cases were examined with MR imaging (GE Signa 1.5-T) superconducting system with a four element phased array surface coil. T2 -weighted images were obtained in all three planes (axial, sagittal, coronal).

In this study, the most common transabdominal gray-scale features in predicting placenta accreta were the presence of a smallest myometrial thickness <1 mm with disruption of bladder-uterine interface and the presence of multiple placentas Sono lucencies, which was present in all four confirmed accreta cases. This is supported by a study done by **Twickler et al. (2000)** wherewho reported that presence of SMT <1

mm or large intraplacental lucencies using color Doppler was predictive of all cases of myometrial invasion (sensitivity 100%, specificity 72%, PPV 72% and NPV 100%). [14].

This also agrees with a study done by **Japaraj et al., (2007)** who reported that main gray-scale ultrasound feature was the presence of multiple placental lakes which was present in 6 out of 7 confirmed accreta cases. However, thinning or focal disruption of uterine serosa was present in only 4 out of 7 cases of accreta. [15] According to **Japaraj et al. (2007)** gray-scale ultrasound had a sensitivity of 85% and specificity of 100% in the diagnosis of placenta accreta.

In this study, thinning of myometrium < 1 mm or disruption of uterine serosa showed 100% sensitivity and specificity. In all cases in which the uterine serosa-bladder interface was abnormal or interrupted, there was a placenta accreta. This also agrees with **Comstock (2004)** where interruption of uterine bladder interface showed 93% sensitivity. [16] but disagree with study Feinberg and Williams where they found that interruption myometrial serosa is a definite sign but not a sensitive one. Also, loss of retroplacental clear zone showed 50% sensitivity, 43.1% specificity. This agrees with **Comstock et al. (2004)** where obliteration of retroplacental zone showed 57% sensitivity from 15-20 weeks' gestation but disagrees with Comstock after 20 weeks' gestation where the sensitivity increases to 80%.

The MRI findings of this study for cases of placenta accreta were uterine bulging, heterogenous signal intensity within the placenta, and dark intraplacental bands on T2-weighted images. When uterine bulging is present, the focal outward bulge can be seen, or there can be disruption of the normal pear shape of the uterus, with the lower uterine segment being wider than the fundus. The heterogenous signal intensity in the placenta with increase vascularity was also associated with placental invasion, especially when the heterogeneity is marked, and may represent either area of hemorrhage in the placenta or the lacunae that can be visualized at the US. The dark intraplacental bands can also be seen in patients with PA, appearing as nodular or linear areas of low signal intensity on T2-weighted images These MRI findings were similar to the results founded by **Lax et al.** [17].

In this study, MRI confirmed the diagnosis and increased sensitivity made by the US, and we can statistically evaluate the sensitivity and specificity of MRI which Agree with **Warshak et al.** found in a study of 42 patients the sensitivity and specificity of MRI for PA to be 88% and 100%. Respectively, on the contrary, a retrospective study of **Garret Lam et al.** showed the sensitivity of MRI was 38% as well as US sensitivity was 33%. [18].

Some authors have suggested that MRI is most clearly indicated when there is a posterior placenta or when the US findings are ambiguous. As MR. Imaging can better define areas of abnormal placentation, modify levels of invasion and ultimately change surgical management and should be used routinely. [19] Out of 18 cases of placenta accreta: 6 were percreta with evident bladder invasion and 5 were increta, 7 accreta.

The percreta cases underwent an emergent cesarean hysterectomy because of uncontrollable intraoperative bleeding after performing cesarean section for delivery of the baby. But except one case was not done for here hysterectomy only but also bilateral internal iliac artery ligation. In this cases, no attempts were made to remove the placenta from the implantation site.

Conclusion:

The result of the present study shows that the use of prenatal transabdominal gray-scale ultrasonography can detect or suspect placental invasion. MRI is a new diagnostic modality that improves the diagnostic accuracy in prediction of placental myometrial invasion in patients with previous C.S specially among cases with suspicious but in conclusive findings on ultrasonography.

Conflict of interest:

None declared.

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