

Utility of Ultrasound and Magnetic Resonance Imaging in Prenatal Diagnosis of Placenta Accreta: A Prospective Study

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Objectives: determine the utility of ultrasound and magnetic resonance imaging in prenatal diagnosis of placenta accreta. **Methods:** Thirty patients presented in the department of gynecology and obstetrics and fulfilling the inclusion criteria were selected for the study. Study was a cross sectional design conducted at department of Radiology, Nishtar Hospital Multan, from 1st January 2019 to 1st December 2019.

Result: Only 10 patients with placenta accreta were positive on USG while other 9 patients were found to be negative; and 3 patients were misdiagnosed to have placenta accreta on USG. Table-I Only 15 patients with placenta accreta were positive on MRI while other 4 patients were found to be negative; and 2 patients were misdiagnosed to have placenta accreta on USG. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 52.6%, 72.7%, 76.9%, 47.1% and 60% for USG while 78.9%, 81.8%, 88.2%, 69.2% and 80% for MRI, respectively

Conclusion: It can be concluded that there is no significant difference between MRI and USG in terms of accuracy for prenatal diagnosis of placenta accreta.

Keywords: Ultrasound, Magnetic Resonance Imaging, Prenatal

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INTRODUCTION

A condition in which there is abnormal placentation along with direct attachment or invasion of myometrium by chorionic villi is known as placenta accreta. The morbidity and mortality resulting from placenta accreta are significant. It is also the most common indication for postpartum hysterectomy in emergencies [1]. The reason for its increased incidence over the past decade is thought to be repeated cesarean sections of pregnant patients. Studies have indicated that placenta accreta has prevalence of 1 in 500 cases [2]. There are no studies regarding the incidence of placenta in local literature. Possible risk factors for placenta accreta include history of one or more cesarean sections or surgery of the uterus, anomalies of the uterus, Asherman's syndrome, multiparity, dilatation and curettage and smoking [3].

The clinical manifestation of placenta accreta is that at the time of placental separation it results in massive bleeding [4]. The

hemorrhage can in turn result in further complications such as DIC (disseminated intravascular coagulopathy), ARDS (adult respiratory distress syndrome), renal failure and might also prove to be fatal for pregnant patients with placenta accreta. Hysterectomy in emergency is the only mode of treatment in such cases but these are also associated with certain complications such as ureter or bladder injury and even pulmonary embolism [5]. For proper management of patients with placenta accreta timely and accurate prenatal diagnosis is very important. On the basis of the diagnosis the plans for delivery and surgery in facilitated tertiary care setting can be made possible.

Planning of cesarean section can be done electively if the diagnosis is made timely at 37 weeks so that spontaneous labor can be prevented. With the passage of time the diagnosis and management of placenta accreta is becoming more and more difficult and has presented with

clinical challenges [6]. In order to obtain correct and timely diagnosis clinicians should know the exact clinical findings and risk factors of placenta accreta while radiologists must be aware of the imaging findings and protocols so that optimal case management can be done. In this study we are going to compare magnetic resonance imaging with color Doppler ultrasonography in terms of their efficacy in antenatal diagnosis of placenta accreta. This can help in better recommendations for clinicians as well as can provide evidence of accuracy of both imaging techniques.

Methodology

It is a prospective study which was conducted in department of radiology Nishtar hospital Multan, from 1st January 2019 to 1st December 2019. Ethical approval for the study was obtained from ethics committee of the hospital. Sample size was calculated using the reference study by Sanyal Kumar [7]. Non probability consecutive type of sampling technique was used. Informed consent of the patients was obtained before their inclusion in the study. Thirty patients presented in the department of gynecology and obstetrics and fulfilling the inclusion criteria were selected for the study. Inclusion was based on the following criteria; patients presented with suspicion of placenta accreta as seen on risk factors and clinical findings and patients with diagnosed placenta previa on ultrasonography and patients with previous cesarean section. Patients with known contraindication to magnetic resonance imaging such as cochlear implants, pacemakers etc. and patients who were claustrophobics were excluded from the study.

After selection of the patients details like age, parity, gravidity, previous procedures done etc. were recorded in the form of a predesigned Performa. Color Doppler ultrasound and MRI without contrast was done in all the thirty patients. Interpretations of the radiological findings were done by a consultant radiologist with experience more than 5 years. Gestational age of the patients was not specified in our study. Imaging was performed at the time of presentation of the patients but was avoided before 20 weeks of gestation.

Ultrasonography was done using color Doppler and gray scale settings tranabdominally or transvaginally in all patients. Settings for Doppler were kept optimum for fetal safety. The following findings were noted during ultrasonography; placenta previa, loss of clear retroplacental spaces, irregular urinary bladder in consistency of its wall with extensive vascularity associated with it and myometrial thickness.

MRI was done in all patients using a 1.5 T MRI scanner. The procedure was performed with maternal breath holding. If during primary survey placenta accreta was suspected, further images in perpendicular planes of placenta-myometrium or myometrium-bladder interface were obtained. Following findings were evaluated via MRI imaging; uterine bulging, placenta previa, dark intraplacental bands,, heterogeneous signal intensity within placenta, disorganized vascularity of placenta, bladder tenting, evident invasion of pelvis by placental tissue and focal interruptions in myometrial wall.

Findings thus obtained by USG and MRI were compared with each other and with the final diagnosis which was confirmed at the time of the delivery or by pathological examination. All the data was recorded in the form of a designed performa and data collection was done by the researcher himself. Data thus obtained was subjected to statistical analysis via computer software SPSS version 23. Mean and standard deviation was calculated for quantitative variables. Frequency and percentage was calculated for qualitative variables. Furthermore sensitivity, specificity, positive predictive value, negative predictive value were also calculated for both color Doppler ultrasound and magnetic resonance imaging. Comparison of sensitivity and specificity of both imaging studies was compared using McNemar test.

Results

Mean age of all patients was 28.92 ± 3.81 years with average gestational age 37.42 ± 2.87 weeks and 25 (83.3%) patients had history of previous cesarean section. USG for placenta accreta was positive in 13 (43.3%) patients and MRI for placenta accreta was positive in 17 (56.7%) patients. Both MRI and USG was positive in 14 (46.7%) patients. Patients who actually had placenta accreta were 19 (63.3%). Table-I

Only 10 patients with placenta accreta were

positive on USG while other 9 patients were found to be negative; and 3 patients were misdiagnosed to have placenta accreta on USG. Table-II Only 15 patients with placenta accreta were positive on MRI while other 4 patients were found to be negative; and 2 patients were misdiagnosed to have placenta accreta on USG. Table-III Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were 52.6%, 72.7%, 76.9%, 47.1% and 60% for USG while 78.9%, 81.8%, 88.2%, 69.2% and 80% for MRI, respectively. Table-IV.

Table-I: Baseline data

Variable	Value
Age, (Mean ±S.D)	28.92±3.81 years
Gestational Age, (Mean ±S.D)	37.42±2.87 weeks
Previous history of cesarean section, N (%)	25 (83.3)
Positive USG, N (%)	13 (43.3)
Positive MRI, N (%)	17 (56.7)
Both MRI and USG positive, N (%)	14 (46.7)
Patients with placenta accreta, N (%)	19 (63.3)

Table-II: 2X2 table for positive USG

USG results for placenta accreta	Definitive diagnosis for placenta accreta		Total
	Positive	Negative	
Positive	10	3	13
Negative	9	8	17
Total	19	11	30

Table-III: 2X2 table for positive MRI

MRI results for placenta accreta	Definitive diagnosis for placenta accreta		Total
	Positive	Negative	
Positive	15	2	17
Negative	4	9	13
Total	19	11	30

Table-IV: Outcome

Variables	USG	MRI
Sensitivity	52.6 %	78.9 %
Specificity	72.7 %	81.8 %
Positive predictive value	76.9 %	88.2 %
Negative predictive value	47.1 %	69.2 %
Accuracy	60 %	80 %

Discussion

Assessment of placenta is important part of evaluation of normal gestation. Non-ionizing radiations are used in the imaging during the antepartum period. These include the use of ultrasonography and MRI. Placenta is visible as an indenting in the gestational sac when evaluated using the USG in the first trimester. It is seen as more hyperechoic than the myometrium which underlines the placenta. Placenta becomes granular and homogenous in the second trimester and by the third trimester it turns into heterogeneous because of the intense vascularization and calcifications. As seen on the USG blood vessels are visible as continuous regular pattern with incident dipping of the vessel in the parenchyma of the placenta [8]. On the other hand on MRI scanning, on the margins of uterus placenta looks like a soft tissue structure which gives away signals of intermediate intensity. Different positions of placenta present differently on imaging studies. When patient has placenta percreta, the chorionic villi are visible as invading the myometrium beyond the serosa into the surrounding organs [9].

The diagnosis of placenta accreta is done by seeing the following findings on the imaging studies; suspicion of placenta previa, abnormal color Doppler imaging patterns, diminished thickness of the myometrium, suspicion of placenta lacunae, absence of clear space in the retroplacental plane. If bladder wall shows irregular patterns it points towards the presence of placenta percreta. Lacunae if present highly suggest the identification of accreta in as many as 78 to 93% of the cases of abnormal placental implantations [10, 11]. The gold standard for the evaluation of placenta implantation is color Doppler ultrasonography but recently radiologists have shown interest in the use of MRI as well. The findings on the MRI which suggest probable diagnosis of placenta accreta include the visible invasion in to the uterus by the placenta tissue, which include thinning of the myometrium and loss of uteroplacental interface and also when placenta is visible within or outside the myometrium.

The criterion on which the MRI diagnosis of placenta accreta is made is nonspecific as these findings are sometimes also present in the normal pregnancy especially in late trimester [12]. In a

study by Lax et al. [13] they found that three secondary findings in normal placentation on MRI are thick and irregular intraplacental T2 bands, heterogeneous placenta and bulging in the lower segment of the uterus. Similar MRI criteria were seen in patients of placenta accreta in another study by Teo et al. [14]. The most sensitive finding in the diagnosis of the placenta accreta by the MRI is the anomaly in the vascularization of the placenta and presence of intraplacental T2 dark bands.

When comparing MRI to USG in terms of the diagnosis of placenta accreta, some authors have shown that MRI is better than color Doppler USG especially in cases where placenta is located posteriorly and in cases where USG findings are ambiguous [15]. Similarly others also suggested that MRI is better than USG as it is better in defining the abnormal areas of placentation and also in determination of the level of invasion of other structures by placenta thus helping in better surgical management of the patients. In this study it has been found that both USG and MRI are almost similar in accuracy for diagnosing the placenta accreta. In cases where both USG and MRI were inconclusive use of other modalities was helpful. These findings are similar to the study done by Dwyer et al. [16].

A similar study comparing the MRI with USG in terms of their accuracy in prenatal diagnosis of placenta accreta was performed by Warshak et al [17]. The sensitivity and specificity of USG was 77% and 96% respectively while sensitivity and specificity of MRI with contrast was 88% and 100% respectively. Another study by Masselli et al. [18] showed sensitivity of both MRI and USG as 100% and 91% while specificity of 100% in both types of imaging studies.

Conclusion

It can be concluded that there is no significant difference between MRI and USG in terms of accuracy for prenatal diagnosis of placenta accreta.

Conflict of interest:

Nil

Funding Source:

Nil

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