

Role Of MRI Versus Ultrasound In Assessment Of Placental Abnormalities Regarding Morphology, Location And Implantation.

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ABSTRACT

In recent years, there has been increased interest in magnetic resonance (MR) imaging for the evaluation of placental abnormalities regarding location and implantation, since it can provide information on depth of invasion and more clearly depict posterior placentas.

KEYWORDS

Ultrasound.
MR.
Previa.
Accreta

ARTICLE STRUCTURE

1) Review of literature.

- 1.1. Anatomical background
- 1.2. Pathology of the placenta
- 1.3. Sonography and placental abnormalities
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INTRODUCTION

In recent years, there has been increased interest in magnetic resonance (MR) imaging for the evaluation of placenta accrete (PA), since it can provide information on depth of invasion and more clearly depict posterior placentas. It can be used as complementary imaging modality and problem solving method especially with equivocal ultrasound or Doppler examination and when further characterization is required.

PATIENTS AND METHODS

1. Patients:

The current study had been approved by Fayoum Univrsity Hospital Ethical

committee, Fayoum University; all the included fifty cases gave informed consent.

Inclusion criteria:

- 1_ age: range from 20 to 45 years old.
- 2_ patients with suspected placental abnormalities in morphology ,location and \ or implantation by ultrasound.
- 3_ previous cesarean section.
- 4_ history of curettage or myomectomy.

Exclusion criteria:

- 1_ first trimester pregnancy.
- 2_ patients with fundal placenta.
- 3_ patients with claustrophobia, pacemaker , insulin pump and\or vascular clips.

2. Methods:

All of the cases (50/50 cases) were subjected to both Ultrasound (US) and (MRI) of the pelvis prior to elective delivery (P36 weeks gestation).

2.1. Ultrasound examination

Scanning was performed using LOGIQ S8, GE (General electric medical system) ultrasound machine where:

- (1) Transabdominal approach (gray scale, color \power Doppler and B-flow) for all cases using 3-5 MHz sector transducer.
- (2) Transvaginal approach (gray scale and color\power Doppler) using 7–8 MHz endoluminal transducer .

2.2. Magnetic resonance imaging

MRI was performed for all cases using (Toshiba Titan 1.5- Tesla)

MRI evaluation of the placenta was done in all cases with placenta previa included in the study to provide more accurate diagnosis of the placental location, type of previa and to check for radiological signs of placental invasion even if preliminary US was negative .

Cases were imaged in the supine position using phased-array pelvic coil.

The maternal pelvis was scanned using the following protocol:

- (1) T2-weighted pulse sequence-fast spin echo (FSE).
- (2) T1-weighted sequence-spin echo (SE).
- (3) Balanced fast field echo (B-FFE).
- (4) T2 Single Shot spin echo (SSh-SE).

For all the aforementioned sequences slice thickness = 5–6 mm with 1 mm gap, flip angle=90_ and FOV=370–400 mm.

Sequences (1) and (2) were performed with respiratory triggering to control maternal and fetal motion artifacts.

Total scanning time is 32 min.

No intravenous injection of gadolinium was used in all cases.

3. Image analysis:

Ultrasound analysis (transabdominal approach) was performed.

Placenta previa was subdivided according to the position of the placenta relative to the internal cervical os following Elsayes et al. (1) into: (1) low-lying, (2) marginal, (3) complete, (4) central.

Placenta previa findings that were considered suggestive of accreta/percreta on US had been based on *Magied, Asmaa M. Abdel, et al.(2018)* and included: (1) loss of the retroplacental hypoechoic clear zone, (2)

focal bulge with myometrial thinning (<1mm), (3) loss of the bladder wall-uterine interface, (4) presence of placental lacunae (vascular spaces), and (5) presence of hypervascularity of the interface between the uterine serosa and the bladder wall on color Doppler imaging.

Regarding MRI; findings of placenta accreta/percreta following *Silver, Robert M.,et al. (2015)* in addition of being previa included: (1) uterine bulging, (2) heterogeneous signal intensity within the placenta, (3) dark intraplacental bands on T2-WI, (4) focal interruptions in the myometrial wall, (5) tenting of the bladder, (6) direct visualization of the invasion of pelvic structures by placental tissue.

RESULTS

Table (1): Comparisons of ultrasound findings in different operative findings.

Variables (mm)	operative findings				p-value (OR)	Sig.
	Negative (n=28)		Positive (n=22)			
	No.	%	No.	%		
Retro-placental hypoechoic zone						
Not clarified	0	0%	8	36.4%	0.02 (OR=3)	S
Clarified	28	100%	14	63.6%		
Prominent Vascular lacunae						
Absent	18	64.3%	10	45.5%	0.3	NS
Present	10	35.7%	12	54.5%		

Table (2): Comparisons of MRI findings in different operative findings.

Variables (mm)	operative findings				p-value (OR)	Sig.
	Negative (n=28)		Positive (n=22)			
	No.	%	No.	%		
Homogeneity of the Placenta						
Homogenous	24	85.7%	6	27.3%	0.005 (OR=16)	HS
Heterogeneous	4	14.3%	16	72.7%		
Dark Bands of T2						
Absent	24	85.7%	6	27.3%	0.005 (OR=16)	HS
Present	4	14.3%	16	72.7%		
Uterine Bulge						
Absent	22	78.6%	4	18.2%	0.004 (OR=16.5)	HS
Present	6	21.4%	18	81.8%		

Table (3): Comparisons of ultrasound and MRI findings in different operative findings.

Variables (mm)	operative findings				P- value	Sig.
	Negative (n=28)		Positive (n=22)			
	No.	%	No.	%		
Final US finding						
Negative	28	100%	8	36.4%	0.001	HS
Positive	0	0%	14	63.6%		
Final MRI finding						
Negative	24	85.7%	2	9.1%	<0.001	HS
Positive	4	14.3%	20	90.9%		

Table (4): Sensitivity and specificity of US and MRI in comparison with final operative findings in diagnosis of placental status.

Variable	Sensitivity	Specificity	+ve predictive	-ve predictive	Accuracy
US	63.6%	100%	63.6%	77.8%	81.8%
MRI	90.9%	85.7%	90.9%	85.7%	88.3%

DISCUSSION

Women with placenta previa and one cesarian delivery have been found to have 24% chance of placenta accreta. Their risk increases to as high as 67% with four previous cesarians and placenta previa. Therefore the surgical history of a patient is extremely valuable in identifying women at highest risk for accreta. **(Burton,et al, 2017)**

Ultrasound is virtually always the first imaging modality used to evaluate suspected placenta accreta. This modality has enjoyed great popularity because it is widely available, patient friendly, and relatively inexpensive.**(Riteau,et al 2014)**

However, some authors have pointed out that US might be limited in the extent to which it can assess depth of invasion in women with suspected placenta accreta. Others asserted that US lacks the necessary resolution to identify accreta in posterior placenta or the patient's body habitus presents a barrier through the scan. **(Burton,et al, 2017)**

MRI has been suggested as an alternative to US. It theoretically offers the advantage of greater soft tissue contrast, thereby providing enhanced resolution and allowing accurate measurement of depth of invasion. It has shown to be beneficial in some cases when ultrasound findings are equivocal or nondiagnostic. **(Riteau,et al 2014)**

The specificity of the US and MRI was higher in our study which may be due to the fact that on US basis we had made use of transvaginal sonography.

Concerning MRI we had performed spin echo sequences with controlled breath hold, such an option had provided images of better resolution and almost nil motion artifacts from fetal body motion and maternal bowel peristalsis and respiration.

The strength of our study was that: (1) it had evaluated the individual ability of MR imaging and Ultrasound to predict placenta accreta in the same group of cases, (2)

sensitivity and specificity of MR were estimated without the use of gadolinium.

CONCLUSION

Ultrasonography (US) is the main imaging modality and the primary investigation, it has 100% specificity and can be used as a good negative test.

MRI is a complementary technique used for better tissue characterization when ultrasound is not conclusive or equivocal as it is more sensitive.

ABBREVIATIONS

CS : Caeserian Section.

FOV : Field Of View..

MRI : Magnetic Resonance Imaging.

PA : Placenta Accreta.

US : Ultrasound.

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