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Original Article

Placenta previa; MRI as an adjunct to ultrasound in assessment of suspected placental invasion

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ABSTRACT

Objective: Evaluate adding MRI to ultrasound in imaging of placenta previa with suspected placenta accreta.
Patients and methods: evaluation of 23 pregnant females presenting with placenta previa was done. The age ranged from 20 to 39 years (mean = 30.9). All of the patients were subjected to ultrasonography (US) and magnetic resonance imaging (MRI) of the pelvis at gestational age of 25–37 weeks prior to elective delivery.
Results: 11 out of 23 patients were proved placenta accreta based on surgical and pathological reports. US suggested diagnosis of placenta previa/accreta in 8 patients and placenta previa without accreta in 15 cases. 7/8 was true positive (87.5%) & one was false positive (12.5%) with sensitivity 63.64%, accuracy 78.26%, and specificity 91.67%. MRI has suggested diagnosis of placenta previa/accreta in 8/23 & placenta previa with no accreta in 15/23 patients. MRI was found to give true positive results in 8/8 patients proved to be accreta. MRI gave true negative in 12 patients (80%) & false negative in 3 (20%) with sensitivity 72.73%, accuracy 86.96%, and specificity 100%.
Conclusion: Combining MRI and ultra sound provide more diagnostic information and may reduce unnecessary interventions with favorable outcome.

1. Introduction

During routine antenatal ultrasound examination, the placenta is usually overlooked, unless abnormality is detected [1]. Abnormal placental implantation is the commonest cause of antepartum hemorrhage which can lead eventually into emergent hysterectomy increasing risk of maternal and fetal morbidity and mortality [1,3].

Placenta previa is in the lower segment of the uterus, either overly or close to the internal cervical os. Normally, the lower edge of placenta is at least 2 cm from the internal cervical os margin [1,2] (Fig. 1).

Placenta accrete (PA) is a general descriptive term for abnormal placental attachment referring to chorionic villi relation to the uterine wall. It comprises placenta accreta; the chorionic villi are just in contact with the myometrium, placenta increta; where there is abnormal penetration of chorionic villi into myometrium and placenta percreta; complete invasion of myometrium into the uterine serosa [4,5] (Fig. 2).

The risk factors mostly contributing for placenta accreta development include previous history of cesarean section and a placenta previa plus maternal age. Most studies have found that prior cesarean section is the strongest risk factor for placenta previa [5,6]. Women with only placenta previa have 3% risk of developing PA while it increases to 24% in case of placenta previa and one prior cesarean delivery [5].

The combination of placenta previa and previous instrumentation has been attributed to significant development of placenta accreta, with rates reaching 50–67% [1].

Early diagnosis of abnormal placentation is of great importance to surgeons owing to increased risk of antepartum hemorrhage at the time of labour, thus adequate preoperative planning and patient counseling [5,7].

Ultrasound is considered the first imaging modality in evaluating the placenta. However, recently, MRI became an emerging tool for the diagnosis and characterization of placenta accreta in high-risk patients with strong clinical suspicion for placenta accreta or when the diagnosis is equivocal on ultrasound [5,7].

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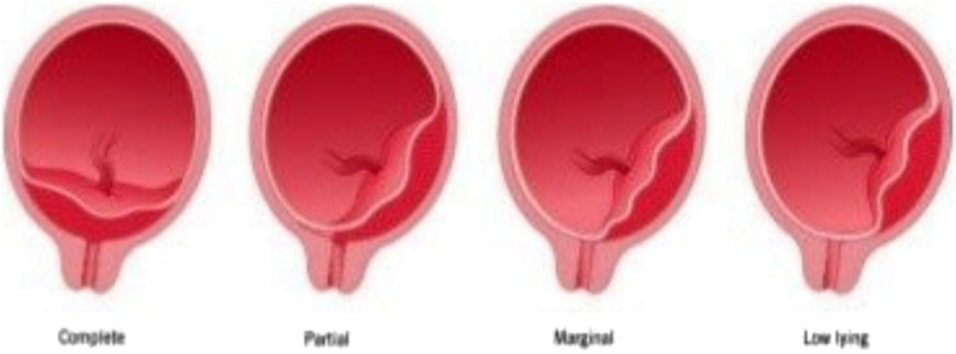

Fig. 1. Diagrammatic illustration showing different types of placenta previa [2].

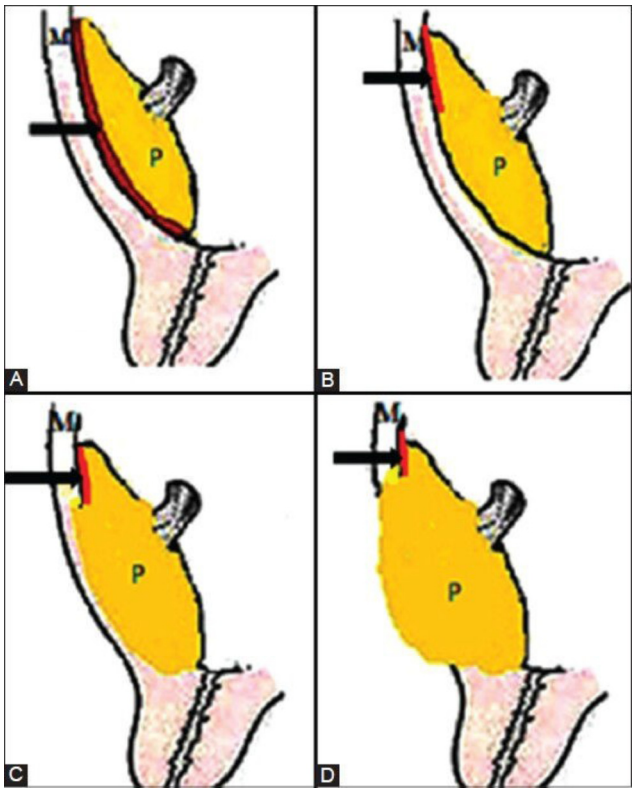

Fig. 2. Diagrammatic illustration showing different degrees of placental invasion (P, placenta; M, myometrium). Arrow shows stratum basalis of endometrium. (A) Low-lying placenta showing normal stratum basalis of endometrium (arrow). (B) Placenta accreta vera showing invasion of stratum basalis of endometrium and in contact with myometrium. (C) Placenta increta showing partial invasion of myometrium. (D) Placenta percreta showing invasion of myometrium and extension beyond serosa [5].

Table 1
MRI imaging protocol.

Sequence	TR (ms)	TE (ms)	FOV (mm)	Slice thickness (mm)
T2 FSE sagittal, axial and coronal	50	90	370–400	5–6
T1 SE axial and sagittal	535	15	370–400	5–6
Balanced fast field echo (B-FFE) sagittal and coronal	3	1	370–400	5–6
T2 Single Shot spin echo (SSh-SE) sagittal	150	309	370–400	5–6

2. Patients and methods

2.1. Patients

The study was approved by the hospital ethical committee and an informed consent was obtained from all patients. The study included twenty-three pregnant females presenting with placenta previa. All patients had placenta previa and risk factors as; mother's age exceeding 35 years, having many offsprings and prior interventional procedures of the uterus for instance cesarean sections, dilatation & curettage.

2.2. Methods

All of the patients (23/23 cases) were subjected to both ultrasound (US) and magnetic resonance imaging (MRI) of the pelvis prior to elective delivery (36 weeks gestation).

2.2.1. Ultrasound examination

Scanning was performed using LOGIQ 7 PRO, GE (General electric medical system) ultrasound machine where transabdominal approach was done for all patients using 5 MHz sector transducer. Transvaginal approach using 7–8 MHz endoluminal transducer was done in few cases (three) when placenta accreta was suspected and the interface between the myometrium and the urinary bladder was not clear due to considerable obesity and/or inadequate bladder filling.

2.2.2. Magnetic resonance imaging

All patients had a pelvic MRI done using a 1.5-T (Gyroscan Intera, Philips medical systems, Netherland).

The placenta was assessed for: more precise placental location, the type of previa and to demonstrate the presence of placental invasion radiological signs even if initial US evaluation was negative.

Using phased-array pelvic coil patients were scanned in the supine position. The scanning protocol is demonstrated in Table 1. The spin echo sequences were performed with respiratory triggering to control maternal and fetal motion artifacts.

No contrast agent was used in the MRI evaluation of the patients. Total scanning time was around 32 min.

2.3. Image analysis

Ultrasound examination (transabdominal and/or transvaginal approach) and MRI reporting were performed by qualified consultants of radiology.

Classification of placenta previa into: low-lying, marginal, complete and central was done by relating the position of the placenta to the internal cervical os [1].