

MRI in Cesarean Scar Ectopic Pregnancy

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Introduction

Ectopic pregnancy overall is the leading cause of death in the first trimester [1]. The incidence of pregnancy implantation in unusual sites, like cesarean scar is rising due to increased incidence of cesarean sections, pelvic inflammatory disease and dilatation and curettage [2]. Up to 72% of cesarean scar pregnancies occur in women who have had 2 or more cesarean deliveries [3-5]. The dehiscent myometrial defect may be related to incomplete healing or increased fibrosis along the uterine scar. Fibrosis occurring after multiple cesarean deliveries leads to poor vascularity, which impairs healing. Multiple cesarean deliveries also increase the risk of implantation on the scar, likely due to an increased scar surface area [4-6]. Cesarean scar ectopic pregnancy can be devastating because of complications such as uterine rupture and massive hemorrhage, leading to increased maternal morbidity and mortality [7].

Early recognition of this type of pregnancy is therefore critical in directing treatment, preventing maternal complications, and allowing successful preservation of the uterus [8]. Transvaginal Ultrasonography is the most commonly used imaging modality. Sonographic criteria, which could be helpful in diagnosis of cesarean scar pregnancy, are defined by Vial et al; however, transvaginal Ultrasonography cannot put a definitive diagnosis in all cases [9]. MRI reveals localization of the gestational sac and its relationship with adjacent organs and assesses the possibility of myometrial invasion and bladder involvement more clearly. Therefore, it provides very important information in determining the treatment plan [10].

The aim of this study is to cast the light on the role of MRI in cases of cesarean scar ectopic pregnancy as experienced in our hospital.

Materials and Methods

Patient selection

This study was conducted in the period from July, 2011, until August, 2015. It included nine patients; their ages between 37 and 45 years (mean age, 41 years). They had low-lying gestational sacs on antenatal scans and were referred to the radiology department for consultation.

Following transvaginal ultrasound, MRI was requested for confirmation of the diagnosis of cesarean scar ectopic pregnancy or for detection of placental invasion. Pelvic MRI was performed on the same or the next day of ultrasound.

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The local ethics committee approved the study, and an informed written consent was obtained from each patient prior to MRI.

MRI

MRI studies were obtained using a 1.5 Tesla MRI (Optima MR 450W, GE Healthcare, South Carolina, USA) using a pelvic coil. The patient was asked to empty the urinary bladder prior to the study. The sequences used were sagittal T2 fast spin echo (FSE) (TR/TE, 7058/147.4 ms; slice thickness, 5 mm; matrix, 320x320) and sagittal, axial and coronal T2 FS (fat-suppressed); (TR/TE, 6500.8/147.2 ms; slice thickness, 5 mm; matrix, 320 × 320). We intended to give the patients intravenous contrast, but all refused except for one. Post contrast T1 FS images were obtained in sagittal and coronal planes (TR/TE, 453/7 ms; slice thickness, 5 mm; matrix, 300 × 300). Gadopentetate Dimeglumine (Magnevist; Schering, Berlin, Germany) was used as a contrast medium. The contrast medium was given intravenously by an automatic MR-compatible injector. The dose was 0.1 mmol/kg (**Figure 1**).

Interpretation of MRI

The diagnosis of Cesarean scar ectopic pregnancy was done when empty uterine and cervical cavities were noted, and a gestational sac seen embedded within the site of cesarean scar, with thin myometrium adjacent to the sac. Bulging of the sac through the myometrium, with or without invasion of the urinary bladder, was checked in all cases. No bladder invasion was detected in any of the patients.

Management

Conservative management; systemic methotrexate (1 mg/

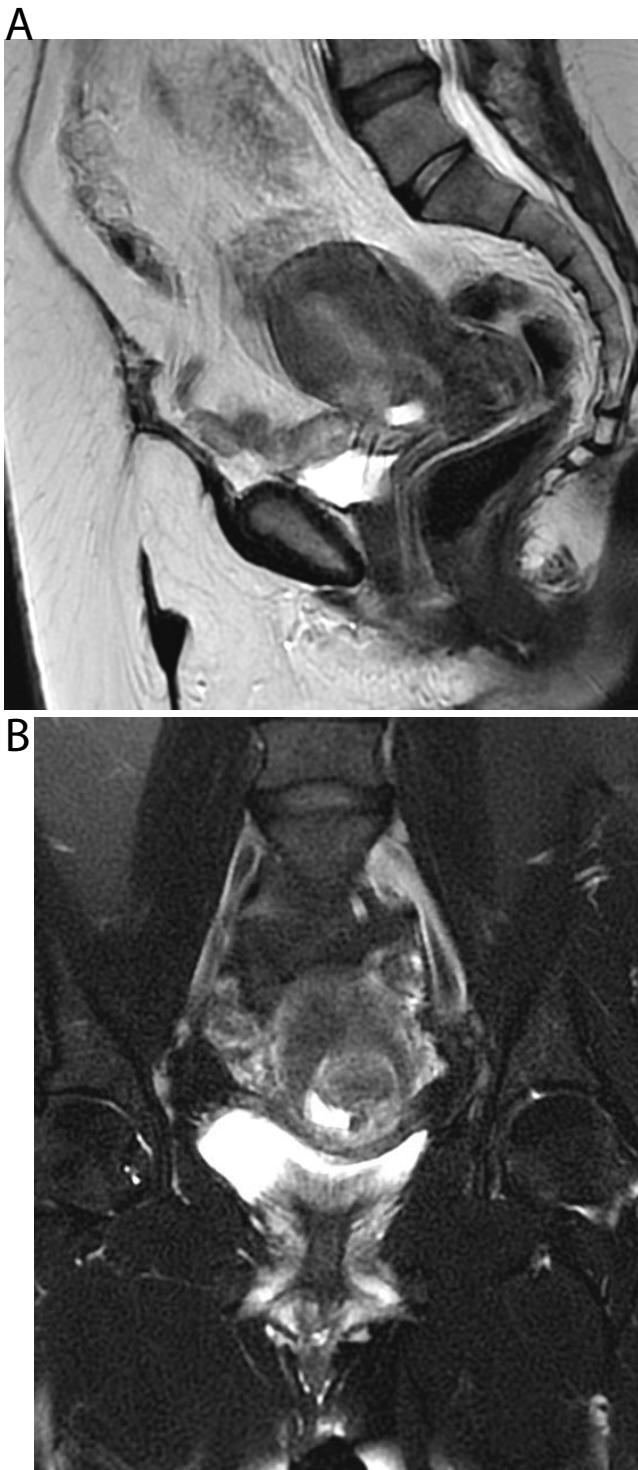


Figure 1 Sagittal T2 FSE and coronal T2 FS MRI in a 45 years old female with 6 previous cesarean sections and cesarean scar ectopic pregnancy (Gestational age=8 weeks).

kg) was the first line of treatment for the patients, followed by evacuation of retained products of conception (ERPOC) in seven patients. Follow up β -HCG testing was performed after six to eight weeks, reverting to normal levels. In the other two patients, hysterectomy was done due to failed methotrexate therapy.

Results

This study included nine patients with Cesarean scar ectopic pregnancy. On transvaginal ultrasound, cesarean scar ectopic pregnancy was diagnosed in six cases, however due to remarkable thinning of the myometrium adjacent to the gestational sacs (<5 mm), MRI was requested to exclude placental invasion. In the other three patients, no myometrial thinning was noted on ultrasound; however, MRI was requested to confirm the diagnosis; as incomplete abortion couldn't be totally excluded on sonographic basis. MRI confirmed the diagnosis of cesarean scar ectopic pregnancy in all the patients with no evidence of placental invasion to the uterine wall or urinary bladder.

The gestational age of the patients ranged from 7–10 weeks. The number of previous cesarean sections ranged from four to seven sections (**Figures 2 and 3**).

The clinical presentation of the patients is shown in Tables 1, 2 and 3 illustrate the sonographic and MRI findings in the cases.

Discussion

Cesarean scar ectopic pregnancy is considered among the rarest forms of ectopic pregnancies. Its prevalence is estimated between 1 per 1800 and 1 per 2226 pregnancies [3,11].

Up to 72% of cesarean scar pregnancies occur in women who have had 2 or more caesarean deliveries [3-5]. All the patients included in our study (100%) had at least four previous cesarean sections, the maximum number being seven.

Women with cesarean scar pregnancy may present with vaginal bleeding. Abdominal pain may not always be present [12]. One out of nine patients (11%) in this study presented with abdominal pain, while the rest (89%) presented with vaginal bleeding in the first trimester. On antenatal scan, all the patients (100%) had low-lying gestational sacs.

Transvaginal ultrasound has a reported sensitivity of 84.6% [12] and remains the imaging modality of choice for diagnosis of cesarean scar pregnancy, though MRI may play a greater role in its evaluation. The superior soft tissue characterization and anatomical information provided by MRI allows patients and clinicians to consider conservative management as initial therapy, especially with the increasing availability of minimally invasive uterine artery embolization [13]. MRI can accurately detect the exact location of pregnancy, thus confirming the diagnosis [1,14]. Differential diagnosis of caesarean scar ectopic pregnancy includes cervical pregnancy, early placenta accreta and incomplete abortion, when patients may mistakenly undergo curettage leading to life threatening hemorrhage [2]. In our study, MRI was done for six patients (67%) with thinned out myometrium adjacent to the gestational sac to check for placenta accreta. In the other three patients (33%), it was done to confirm the diagnosis; as incomplete abortion couldn't be totally excluded on sonographic basis.

Wu et al in their report of a case of cesarean scar pregnancy followed almost the same steps as in this study. The findings on initial ultrasound examination raised the suspicion of a cesarean scar ectopic pregnancy with possible isthmic-cervical involvement, while the proximity of the sac to the urinary bladder raised the possibility of urinary bladder involvement; however,

the diagnosis of cesarean scar ectopic pregnancy, however, all refused except for one patient. The most recent study regarding use of intravenous contrast in MRI done for patients with cesarean scar pregnancy was that by Huang et al [15], who concluded that contrast-enhanced MRI could be used as a reliable adjunct and

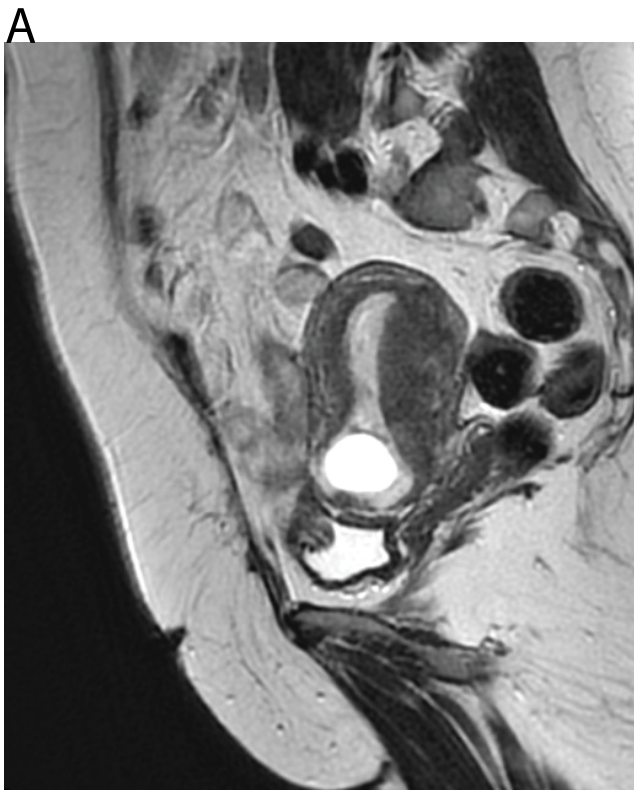


Figure 2 Sagittal T2 FSE and B- Coronal T2 FS (with IV contrast) MRI in a 35-years old female with five previous cesarean sections and cesarean scar ectopic pregnancy (Gestational age =9 weeks).

ultrasound examination could not exclude this possibility with certainty. Further evaluation with MRI was performed, followed by medical management with surgical intervention.

We wanted to do post contrast MRI for all the patients to aid in

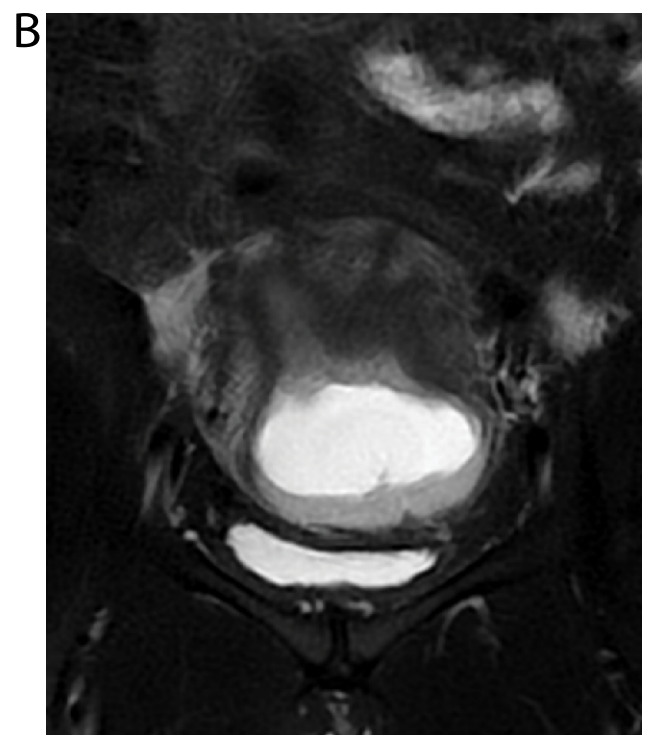


Figure 3 Sagittal T2 FSE and B- Coronal T2 FS MRI in a 39-years old female with four previous cesarean sections and cesarean scar ectopic pregnancy (Gestational age =10 weeks).

initial imaging modality for diagnosing CSP in selected cases. The imaging features of contrast-enhanced MRI may result in a more accurate diagnosis before specific treatment for CSP.

scar ectopic pregnancy. However, MRI should be kept in mind if the diagnosis cannot be made with certainty or if placenta accreta cannot be excluded on sonographic basis.

Conclusion

Transvaginal ultrasound is the first step for diagnosis of cesarean

Table 1 Clinical presentation of the patients in the study: *One of the patients complained of vaginal bleeding with dull-aching lower abdominal pain..

Clinical presentation	Number of patients (percentage)
Low lying gestational sac on antenatal ultrasound	9
Abdominal Pain	1
Vaginal Bleeding	9

Table 2 Sonographic findings in the patients.

Findings	Number of Patients
Empty uterus with a clearly visualized endometrium.	9
Empty cervical canal.	9
Gestational sac at the presumed site of the cesarean scar.	9
Thinned myometrium between the gestational sac and the urinary bladder.	6 (<5 mm)
Cardiac Pulsations in the gestational sac	None

Table 3 MRI findings in the patients.

Findings	Number of Patients
Empty uterine and cervical cavities with a gestational sac seen embedded at the site of cesarean scar), with thin myometrium adjacent to the sac.	9
Bulging of the sac through the myometrium.	None
Disrupted bladder wall integrity.	None

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