

Role of MRI in the Localisation of Uncommon Forms of Ectopic Pregnancies

Masilamani Priya¹, Rangasami Rajeswaran², Chandrasekharan Anupama², Andrew Chitra³

ABSTRACT

Introduction: The objective of our study was to evaluate the role of MRI in the localisation of uncommon forms of ectopic pregnancies. Setting: Tertiary care centre. Design: Retrospective study design

Material and methods: We retrospectively reviewed the foetal MRI referrals during July 2013 to June 2016. Four patients with a diagnosis of 5 ectopic pregnancies were included in our study. The MR Studies were read by two radiologists who were blinded to the US data. The outcome consisted of laparotomy in 1 patient, laparoscopy in 2 patients and suction and evacuation in 1 patient.

Results: Out of the 219 pregnant women referred for foetal MRI there were 215 intrauterine pregnancies and 5 ectopic pregnancies (Two ectopic pregnancies were seen in 1 woman). This included 2 interstitial pregnancy, 1 angular pregnancy, 1 tubal pregnancy and 1 scar pregnancy. MRI was most useful in the diagnosis of interstitial and angular pregnancy. In the detection of the other ectopic pregnancies encountered, there was no significant difference between the ultrasound and MRI.

Conclusion: MRI can be used as a supplementary tool following US in the localising the focus of uncommon forms of ectopic pregnancies, especially in differentiating interstitial from angular pregnancy.

Keywords: Ectopic Pregnancy, MRI, Interstitial Pregnancy, Angular Pregnancy, Cornual Pregnancy, Scar Pregnancy.

INTRODUCTION

Ectopic pregnancy is one where the fertilised ovum gets implanted at a site other than the uterine endometrium. During the first trimester, ectopic pregnancy is one of the important causes of maternal mortality.¹ The incidence of ectopic pregnancies is on the rise due to increase in some of the predisposing factors. Ectopic pregnancies can occur in various abnormal locations, the most common site being the ampulla in the fallopian tube.² Trans vaginal ultra sound is the first line tool in investigating an ectopic pregnancy in conjunction with clinical and laboratory data and is sufficient for making an accurate diagnosis in most of the cases. However ectopic pregnancies can also occur in rare locations like ovary, peritoneal cavity, omentum, uterine interstitium, cervix, uterine scar and anomalous uterine horn and ultrasound findings can be inconclusive in some of these cases. The objective of our study was to evaluate the role of MRI in the localisation of uncommon forms of ectopic pregnancies and to study its utility as a problem-solving tool in selected cases, where ultrasound findings tend to be equivocal.

MATERIAL AND METHODS

We retrospectively reviewed the foetal MRI referrals during July 2013 to June 2016. Institutional ethical clearance was obtained. Out of the 219 pregnant women referred for foetal MRI there were 215 intrauterine pregnancies and 4 pregnant women with 5 ectopic pregnancies (Two ectopic pregnancies were seen in 1 woman). Sonography had been performed on a high resolution US scanner (Voluson GE). Demographic, clinical, sonographic and treatment details of four pregnant women with ectopic pregnancies, were retrieved from the medical case records. MR imaging was performed with a 1.5 T superconducting system (Avanto Siemens, Erlangen, Germany) with a 16- element torso array coil. MR Imaging protocol in our institution consists of 3 plane T2 weighted images obtained at axial, coronal and sagittal planes with respect to uterus, axial T1/ T1FS/ GRE and STIR images. The MR Studies were read by two radiologists who were blinded to the US data. The outcome consisted of laparotomy in 1 patient, laparoscopy in 2 patients and suction and evacuation in 1 patient.

STATISTICAL ANALYSIS

Microsoft office 2007 was used for the analysis. Descriptive statistics like mean and percentages were used to analysis the data.

RESULTS

The clinical, sonological and MRI features are summarised in table 1[original table]. In the 219 pregnancies studied by MRI, there were 215 intrauterine pregnancies and 5 ectopic pregnancies (Two ectopic pregnancies were seen in 1 woman). This included 2 interstitial pregnancy, 1 angular pregnancy, 1 tubal pregnancy and 1 scar pregnancy. MR diagnosis correlated with sonography in 2 ectopic pregnancies. In a patient with bilateral interstitial pregnancy and another patient with angular pregnancy, sonography was inconclusive with diagnosis of angular / interstitial

¹Associate Consultant, ²Professor, Department of Radiology and Imaging Sciences, ³Professor, Department of Obstetrics and Gynaecology, Sri Ramachandra University, Chennai, Tamil Nadu, India

Corresponding author: Dr M. Priya, Associate Consultant, Department of Radiology, Sri Ramachandra University, Porur, Chennai – 600116, Tamil Nadu, India.

How to cite this article: Masilamani Priya, Rangasami Rajeswaran, Chandrasekharan Anupama, Andrew Chitra. Role of MRI in the localisation of uncommon forms of ectopic pregnancies. International Journal of Contemporary Medical Research 2017;4(9):1898-1901.

Pt Age	Gestational age (weeks)	Risk factor	Sonographic findings	MRI findings	Management	Final diagnosis
30	6	Infertility on treatment	Bilateral interstitial or angular pregnancy	Bilateral interstitial pregnancy	Laparoscopy, bilateral cornua dissected, gestational sac contents suctioned out	Bilateral interstitial pregnancy
29	28	Infertility on treatment	Twin gestation in septate / bicornuate uterus, each in one cavity.	1 foetus in right cornu and other in rudimentary left horn.	Laparotomy	Left tubal pregnancy, this foetus died later in the pregnancy
36	10	Previous LSCS	Gestational sac was visualised in the anterior aspect of lower uterine segment with an empty endometrial cavity - Scar pregnancy	Scar pregnancy	Laparoscopic excision of gestational sac	Scar pregnancy
29	10	Nil, Routine antenatal check up	Left angular/interstitial pregnancy	Left angular pregnancy	Suction and evacuation	Left angular pregnancy

Table 1: Clinical, sonographic and MRI features

pregnancy and MRI was useful in accurately localising the implantation site.

DISCUSSION

Out of the five ectopic pregnancies encountered, four could be diagnosed correctly by MR imaging. In one case of intra uterine and tubal pregnancy (twins) at 28 weeks gestational age, the tubal pregnancy was reported in MRI as pregnancy in a rudimentary horn [figure 1a,1b]. Laparotomy led to a final diagnosis of tubal pregnancy in this patient. Thus when there is advanced pregnancy, it may be difficult to diagnose the exact site of the ectopic pregnancy. In one patient with bilateral interstitial pregnancy, there was doubt on ultrasound imaging whether it was an angular or interstitial pregnancy [figure 2a]. MRI could demonstrate uterine wall medial to the gestational sac suggesting interstitial pregnancy [figure 2b]. Correct diagnosis could be obtained with both modalities in the case of scar pregnancy [figures 3a,3b,3c]. In the patient with angular pregnancy, ultrasound features were equivocal with diagnosis of interstitial/angular pregnancy [figures 4a,4b], whereas MRI was useful in making the correct diagnosis of angular pregnancy [figure 4c]. Ectopic pregnancy refers to the implantation of the fertilised ovum outside the uterine cavity. The great majority of ectopic pregnancies occur in the ampullary portion of the fallopian

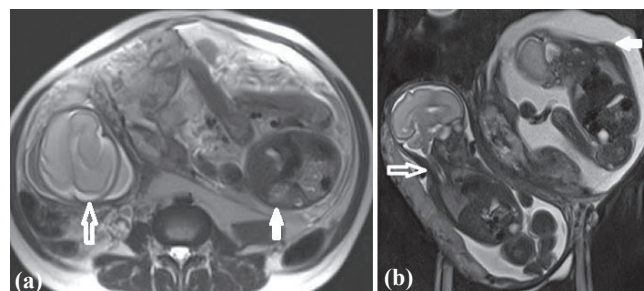


Figure-1: (a) T2 weighted axial image of MRI pelvis showed imaging features suggestive of twin gestation, with one fetus within right cornu [white hollow arrow] and the other fetus on the left within a probable rudimentary horn [white solid arrow], (b) T2 weighted coronal image of MRI pelvis shows one fetus within right cornu [white hollow arrow] and the other fetus on the left within a probable rudimentary horn [white solid arrow].

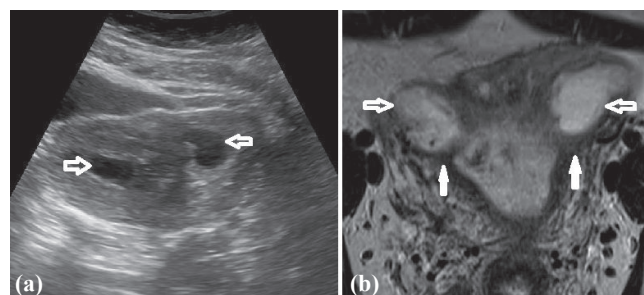


Figure-2: (a) Transabdominal ultrasound image of axial section of uterus shows two gestational sacs, one in each cornu [white hollow arrows], suggesting the presence of interstitial/ angular pregnancy, (b) T2 weighted coronal image of uterus in MRI pelvis shows two gestational sacs [white hollow arrows], one in each cornu, lateral to the uterotubal junctions [white solid arrows], consistent with the diagnosis of interstitial pregnancy.

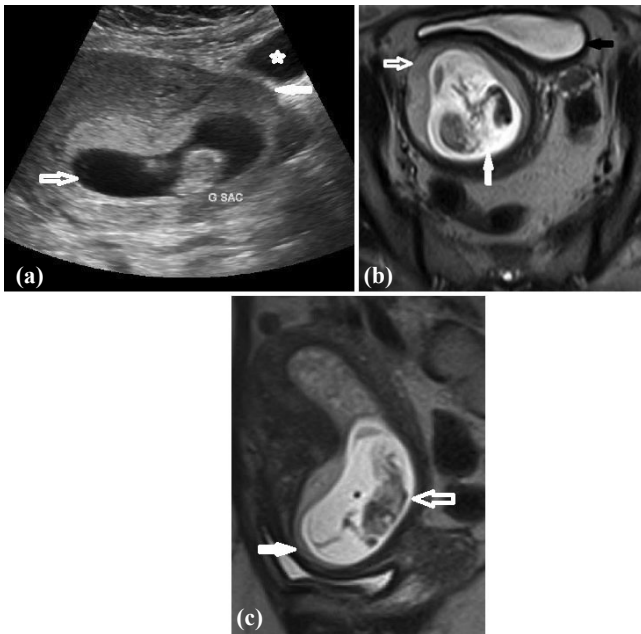


Figure-3: (a) transabdominal ultrasound image of sagittal section of uterus reveals gestational sac [white hollow arrow] in the lower uterine segment in the region of previous scar, with defect in the anterior myometrium [white solid arrow], posterior to urinary bladder, (b) T2 weighted axial image of MRI pelvis shows gestational sac [white solid arrow] in the region of scar in lower uterine segment, devoid of myometrium in its anterolateral aspect [white hollow arrow]. urinary bladder [black solid arrow] is seen anterior to the gestational sac, (c) T2 weighted sagittal image of MRI Pelvis shows the gestational sac [white hollow arrow] in the lower uterine segment and the myometrial defect [white solid arrow].

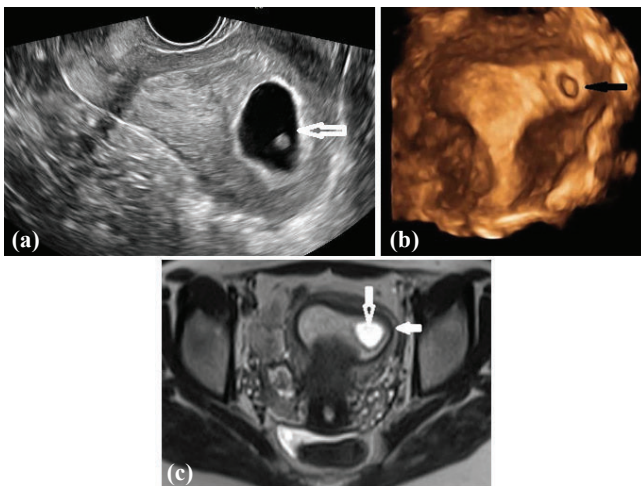


Figure-4: (a and b) Trans vaginal ultrasound image of sagittal section of uterus [fig 4a] and its 3D image [fig 4b] reveals a gestational sac [white hollow arrow in Fig 4a and black solid arrow in Fig 4b] in the region of left superior corner of uterus, suggestive of interstitial/angular pregnancy, (c) T2 weighted axial image of MRI pelvis shows a gestational sac [white hollow arrow] within the endometrium of left lateral angle of uterus [white solid arrow], medial to uterotubal junction.

tube. Other unusual locations of ectopic pregnancies can be extra uterine sites including ovary, peritoneal cavity and omentum, or intra uterine sites including Uterine interstitium,

cervix, caesarean scar and anomalous uterine horn.

Although TVS is highly accurate in detecting the site of ectopic pregnancy in most cases, the focus of uncommon forms of ectopic pregnancy may often be misinterpreted as in the case of interstitial pregnancy being misinterpreted as angular pregnancy on TVS. MR can be used in such cases for accurate localisation of the ectopic gestation with precise anatomic information.

Interstitial pregnancy is an ectopic gestation wherein the fertilised ovum implants in the interstitial segment of the fallopian tube that lies within the muscular wall of the uterus.³ It is believed that the interstitial segment allows for greater distention of the gestational sac than other standard forms of tubal pregnancies, by the time of presentation. Hence they are prone to suffer complications like uterine rupture and haemorrhage. Sonographic features include: Interstitial line sign⁴ - an echogenic line extending from the endometrium to the gestational sac. The gestational sac is located eccentrically in the lateral aspect of the uterine fundus and it is surrounded by less than 5 mm of myometrium. The diagnosis is confirmed by the MR, thus facilitating prompt treatment. Visualisation of an intact junctional zone between the gestational sac and the uterine cavity suggests an interstitial location.⁵ MR also helps in differentiating an interstitial pregnancy from angular and cornual pregnancies. Angular pregnancies refer to implantation within the endometrium of lateral angle of uterus, medial to the utero tubal junction.

Caesarean Scar pregnancy refers to implantation of fertilised ovum on the fibrous scar of previous caesarean section. It can also occur following other uterine surgeries like D and C, Myomectomy, Metroplasty, Hysteroscopy and manual removal of placenta. Here again, making an early diagnosis is critical in preserving uterine integrity and fertility. The diagnostic features seen in ultrasound are an empty uterus with a clearly visualised endometrium, empty cervix, gestational sac in the anterior portion of lower uterine segment at the scar site and thinned/absent myometrium between the gestational sac and urinary bladder (less than 5 mm).⁶ When ultrasound findings are inconclusive, MR delineation of the thinned/absent myometrium between gestational sac and urinary bladder on T2WI highly suggest the diagnosis. In addition, MR also helps in evaluating any bladder invasion if present and also provides valuable anatomic details useful to the surgeon. Sometimes it may be difficult to distinguish a miscarriage in progress and cervical ectopic pregnancy from a caesarean scar pregnancy. In the first two conditions, the gestational sac is centred within the endo cervical canal and the overlying anterior myometrium is of normal thickness.

Cornual Pregnancy – The term cornual pregnancy is often used interchangeably with interstitial pregnancy. However, cornual pregnancy refers to implantation of a fertilised ovum in a rudimentary uterine horn, unicornuate uterus, cornual region of septate uterus, a bicornuate uterus and a uterus didelphis. Sonographically cornual pregnancy may be confused with tubal ectopic pregnancy or a normal intrauterine pregnancy. A cornual pregnancy appears in MRI as a gestational sac which is surrounded by a wall similar in

appearance to normal myometrium in all pulse sequences.⁷ MR also helps in distinguishing a septate uterus from bicornuate uterus and in evaluating the nature of the septum, whether fibrous/muscular and also about of site of placental attachment.

CONCLUSION

Ultrasound remains the primary imaging modality in ectopic pregnancies. However in rare ectopic pregnancies/ eccentrically located intra uterine pregnancies, the USG findings may be inconclusive, where early diagnosis and management becomes all the more important. MR, with its excellent soft tissue contrast depicts zonal anatomy clearly, thereby facilitating accurate diagnosis. With it's Multiplanar reconstruction, MR also helps in providing additional anatomical information. Thus MR can be a useful adjunct to ultra sound in ectopic pregnancies in selected patients.

REFERENCES

1. Josie I. Tenore, M.D., S.M., ectopic pregnancy. *Am fam physician*. 2000;61:1080-1088.
2. Jennifer L Kulp and Kurt T Barnhart. Ectopic pregnancy: diagnosis and management. *Women's Health*. 2008;4:79-87.
3. T. Tulandi, D. Al-Jaroudi, Interstitial pregnancy: results generated from The Society of Reproductive Surgeons Registry *Obstet Gynecol* 2004;103:47–50.
4. Ackerman TE, Levi CS, Dashefsky SM et-al. Interstitial line: sonographic finding in interstitial (cornual) ectopic pregnancy. *Radiology*. 1993;189:83-7.
5. Tamai K, Koyama T, Togashi K. MR features of ectopic pregnancy. *EurRadiol* 2007;17:3236–3246.
6. Ash A, Smith A, Maxwell D. Caesarean scar pregnancy. *BJOG* 2007;114:253–263
7. Rex A. Parker, Motoyo Yano, Angela W. Tai, Michael Friedman, Vamsi R. Narra, Christine O. Menias. MR Imaging Findings of Ectopic Pregnancy: A Pictorial Review. *radiographics* September-October 2012;32:12-15.

Source of Support: Nil; **Conflict of Interest:** None

Submitted: 20-08-2017; **Accepted:** 22-09-2017; **Published:** 03-10-2017