

# Ruptured Interstitial Ectopic Pregnancy at 18 Weeks Gestation Diagnosed by MRI: A Case Report

Ehab SM Hamouda<sup>1\*</sup>, Annemieke S Littooij<sup>2</sup>, Edwin WH Thia<sup>3</sup>, Chiou L Ong<sup>1</sup>

1. Department of Diagnostic and Interventional Imaging, KK Women's and Children's Hospital, Singapore

2. Department of Radiology, University Medical Center, Utrecht, Netherlands

3. Department of Obstetrics and Gynecology, KK Women's and Children's Hospital, Singapore

\* **Correspondence:** Ehab SM Hamouda, Department of Diagnostic and Interventional Imaging, KK Women's and Children's Hospital, Singapore, 100, Bukit Timah Road, Singapore 229899, Singapore  
(✉ hamodaehab@hotmail.com)

Radiology Case. 2013 Oct; 7(10):34-42 :: DOI: 10.3941/jrcr.v7i10.1472

## ABSTRACT

Ectopic pregnancy in the interstitial part of the fallopian tube is a rare event, associated with a high rate of complications due to delayed diagnosis. Rupture of such pregnancy often results in catastrophic hemorrhage. Several reports highlighted the role of magnetic resonance imaging in establishing the diagnosis of interstitial pregnancy, but magnetic resonance imaging findings of a ruptured advanced interstitial ectopic pregnancy have not been published before. The authors therefore present characteristic findings on magnetic resonance imaging of a ruptured interstitial ectopic pregnancy which had reached 18 weeks, in a 25-year-old woman who presented with acute abdominal pain.

## CASE REPORT

### CASE REPORT

A 25-year-old woman (gravida4, para1) with a history of two prior terminations of pregnancy, presented at 18 weeks gestation with severe abdominal pain for 1 hour. She denied fever, nausea, vomiting, diarrhea, vaginal bleeding or leaked liquor. There was tenderness in the right iliac fossa with voluntary guarding. She had screening ultrasound performed at 10 and 12 weeks gestation, which revealed a gestational sac, reported as intrauterine and containing a live embryo.

Urgent ultrasonography showed a live fetus with heart beats demonstrated by M-Mode sonography (Figure 1), intraperitoneal free fluid and multiple hypoechoic structures without vascularity on color doppler, likely representing blood clots. Some of these blood clots seen adjacent to the placenta (Figure 2). A myometrial defect on the right side of the uterine fundus was also demonstrated (Figure 3). These findings were suggestive of uterine rupture. However, the exact cause of uterine rupture was not clearly demonstrated on ultrasound.

Urgent unenhanced magnetic resonance imaging (MRI) abdomen and pelvis was performed to better visualize the whole uterus. Intraperitoneal free fluid, which was isointense on T1 weighted (T1W) and hypointense on T2 weighted (T2W) images was demonstrated (Figure 4) with a hematocrit level seen in the lower part of pelvis consistent with hemoperitoneum (Figure 6 C). The pregnancy was located eccentrically in the right fundal region and surrounded by thin asymmetric myometrium. The decidua was clearly visualized adjacent to the gestational sac (Figure 5). Defect in the myometrium was seen at the right side of the uterine fundus (Figure 6). These MRI findings suggested a ruptured interstitial pregnancy.

At laparotomy, 1.5L of blood was evacuated from the peritoneal cavity. The interstitial pregnancy with an intact amniotic sac and fetus (Figure 7) was on the right side of the ruptured uterine fundus. The endometrial cavity, round ligaments, extrauterine parts of the fallopian tubes, and ovaries were normal. The pregnancy could not be saved and the ruptured uterus was repaired. The patient recovered well.

## DISCUSSION

In an interstitial ectopic pregnancy, the fertilized ovum implants in the proximal segment of the fallopian tube covered by thin myometrium. Left undetected, such a pregnancy may develop till the early second trimester with the potential risk of catastrophic hemorrhage and greater maternal mortality risk than ampullary ectopic pregnancy [1]. The majority of ectopic pregnancies are tubal (95%), most commonly in the ampulla of the fallopian tube [2]. Two to four percent of ectopic pregnancies are interstitial [1].

Risk factors associated with the higher incidence of interstitial ectopic pregnancy include congenital uterine anomalies, previous ectopic pregnancy, in vitro fertilization and ovulation induction, pelvic inflammatory disease, previous intrauterine procedures and use of intrauterine contraceptive devices [3].

Early diagnosis of interstitial ectopic pregnancy, in first trimester relies heavily on transvaginal ultrasound, which may be supplemented with a 3D-dimensional approach. Timor-Tritsch et al [4] established 3 sonographic criteria for the diagnosis of interstitial pregnancy (Figure 8): (1) an empty uterus, (2) a chorionic sac separate and at least 1 cm from the lateral edge of the uterine cavity, and (3) a thin myometrial layer ( $\leq 5$ mm) surrounding the gestational sac. Ackerman et al [5] described the interstitial line sign, which refers to visualization of an echogenic line that runs from the endometrial cavity to the cornu of the uterus abutting the gestational sac. These criteria can differentiate interstitial ectopic pregnancy from angular pregnancy and pregnancy in a rudimentary horn. However, they are reproducible only in the first trimester. In our case, the patient's earlier scans missed the diagnosis of interstitial ectopic pregnancy which may be attributed to delayed performance of the scans close to the second trimester, where the gestational sac enlarges and the ultrasound diagnosis becomes more difficult and equivocal.

Tsafir et al [6] suggested three sonographic criteria for diagnosis of pregnancy in a rudimentary horn: (1) a pseudopattern of an asymmetrical bicornuate uterus, (2) the absence of visual continuity tissue surrounding the gestational sac and the uterine cervix, and (3) the presence of myometrial tissue surrounding the gestational sac. On MRI, the pregnant horn is attached by a fibrous band to the uterus with no cavity or endometrial connection with the uterus [6].

MRI may provide additional information in suspected interstitial ectopic pregnancy. Previous case reports have suggested that the presence of a junctional zone between the gestational sac and the uterine cavity is highly suggestive of interstitial pregnancy [7]. However, this sign is reproducible only in early interstitial pregnancy. In our case, visualization of the decidua adjacent to the eccentrically located gestational sac was highly suggestive of interstitial pregnancy and helped eliminating the diagnosis of angular pregnancy.

MRI is also useful in distinguishing pregnancy in a rudimentary horn from interstitial ectopic pregnancy. For pregnancy in a rudimentary horn the gestational sac is visibly

located outside the myometrium, whereas in interstitial pregnancy the gestational sac is located eccentrically in the uterine fundus and is surrounded by asymmetric thin myometrium [7].

Though interstitial pregnancies are known to rupture earlier than 12 weeks of gestation [1], instances of interstitial pregnancy that advance to term, or near term, are not unknown [8, 9]. Diagnosis of interstitial pregnancy by ultrasound in the second trimester of pregnancy is equivocal. The main advantage of MRI as compared with ultrasound is the ability to visualize the whole uterus, and thus identify the exact site of implantation, in case this was not done earlier by ultrasound (either transvaginal or transabdominal).

The major disadvantage of performing an MRI in a case of ruptured interstitial pregnancy (and ectopic pregnancy in general) is procrastination of treatment in a possibly life-threatening situation. Thus, it should be emphasized that MRI should only be performed in cases of equivocal ultrasound findings, provided patients are hemodynamically stable.

We present a rare case of ruptured interstitial ectopic pregnancy diagnosed on MRI at 18 weeks gestation as it was not clearly determined by ultrasound. We therefore suggest the following MRI criteria for diagnosis of ruptured advanced interstitial ectopic pregnancy: (1) eccentric location of the chorionic sac, covered by asymmetric thin myometrium on the uterine fundus, (2) clear visualization of the decidua adjacent to the chorionic sac, and (3) myometrial defect and hemoperitoneum which are signs of rupture.

Current management of interstitial ectopic pregnancy involves medical (methotrexate therapy) and surgical management. Surgical management is indicated in ruptured or advanced interstitial ectopic pregnancy [10]. Our case was treated by laparotomy as it was ruptured.

## TEACHING POINT

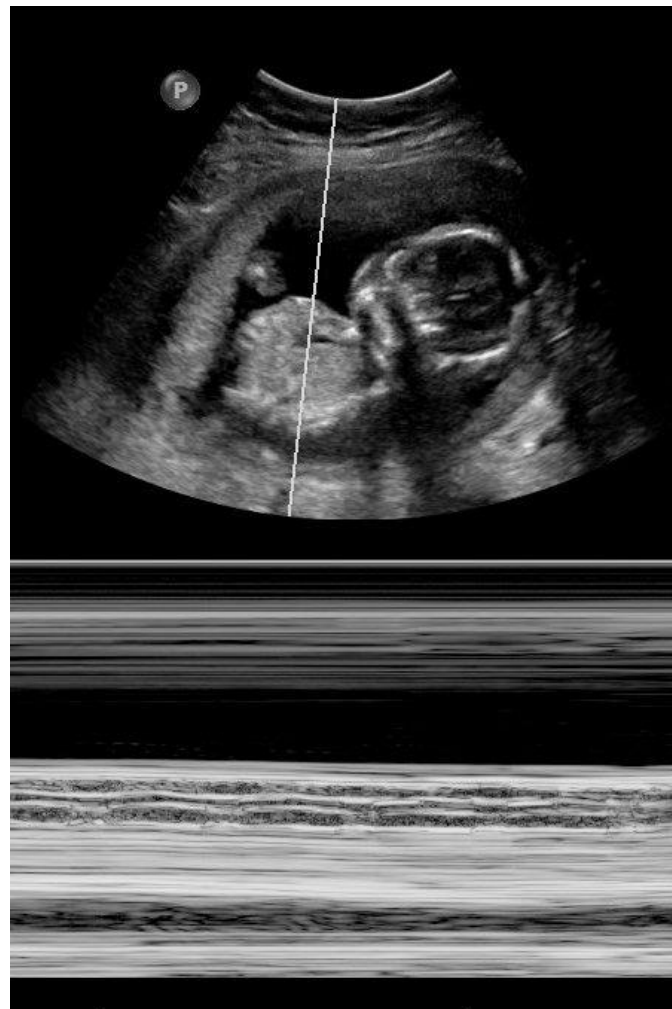
The diagnosis of interstitial pregnancy is challenging, particularly at an advanced stage due to the equivocal ultrasound findings. MRI features of advanced interstitial ectopic pregnancy include eccentric location of the gestational sac, covered by asymmetric thin myometrium on the uterine fundus, and clear visualization of the decidua adjacent to it.

## REFERENCES

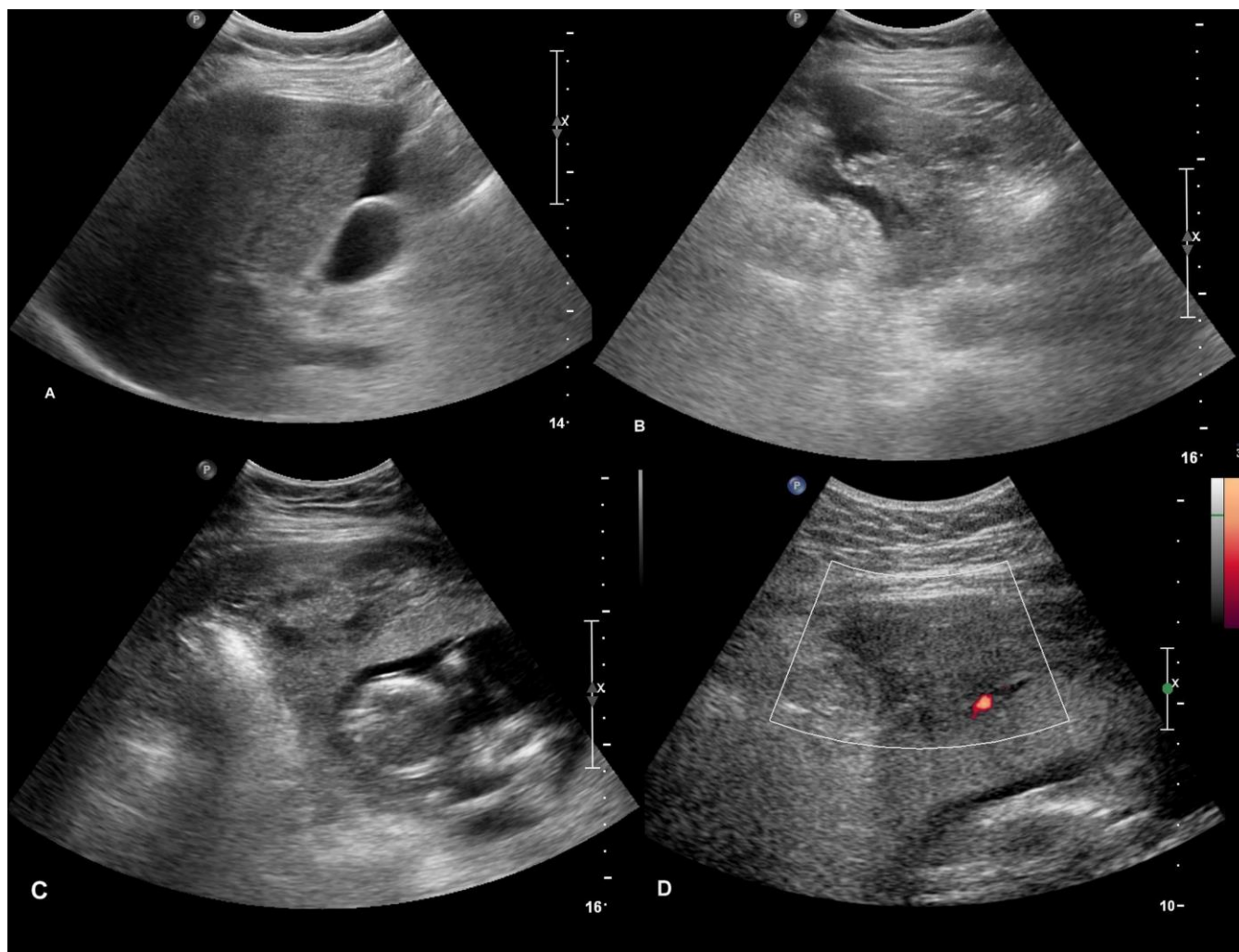
1. Tulandi T, Al-Jaroudi D. Interstitial pregnancy: results generated from The Society of Reproductive Surgeons Registry. *Obstet Gynecol* 2004; 103:47-50. PMID: 14704243.
2. Williams PL, Laifer- Narin SL, Ragavendra N. Ultrasound of abnormal uterine bleeding. *Radiographics* 2003; 23(3):703-18. PMID: 12740471.

3. Maliha WE, Gonella P, Degnan EJ. Ruptured interstitial pregnancy presenting as an intrauterine pregnancy by ultrasound. *Ann Emerg Med.* 1991; 20:910-2. PMID: 1854079.
4. Timor-Tritsch IE, Monteogudo A, Matera C, Veit CR. Sonographic evolution of cornual pregnancies treated without surgery. *Obstet Gynecol* 1992; 79:1044-1049. PMID 1579304.
5. Ackerman TE, Levi CS, Dashefsky SM, Holt SC, Lindsay DJ. Interstitial line: sonographic finding in interstitial (corneal) ectopic pregnancy. *Radiology* 1993; 189: 83-89. PMID: 8372223.
6. Tsafirir A, Rojansky N, Sela HY, Gomori JM, Nadjari M. Rudimentary horn pregnancy: First- trimester prerupture sonographic diagnosis and confirmation by magnetic resonance imaging. *J Ultrasound med* 2005 Feb; 24 (2):219-23. PMID 15661954.
7. Filhastre M, Dechaud H, Lesnik A, Taourel P. Interstitial pregnancy: role of MRI. *Eur Radiol* 2005; (15):93-95. PMID: 15647954.
8. Ng PH, NorAzlin MI, Nasri NI. Term interstitial pregnancy with uterine conservation. *Int J Gynaecol Obstet* 2007; 99:251. PMID17888439.
9. Scarella A, Marquez R, Schilling H, Palomino A. Antenatal diagnosis of a third trimester interstitial pregnancy: a case report. *J Obstet Gynaecol Res* 2012; 38: 570-573. PMID22353551.
10. MacRae R, Olowu O, Rizzuto MI, Odejinmi F. Diagnosis and laparoscopic management of 11 consecutive cases of cornual ectopic pregnancy. *Arch Gynecol Obstet* 2009Jul; 280 (1):59-64. PMID: 19084981.

FIGURES



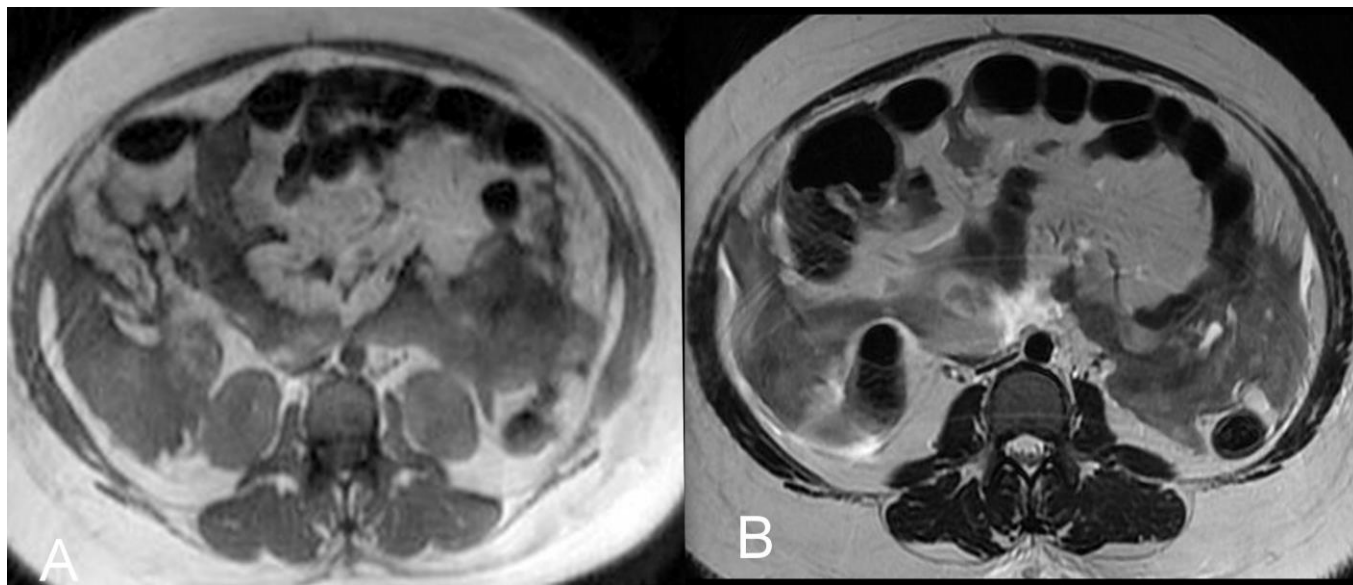
**Figure 1:** 25-year-old woman with interstitial pregnancy (18 weeks). Trans-abdominal ultrasonography, transverse view of the uterus (5 MHz curved transducer, Philips iU22) demonstrating fetal heart beats on M-Mode.



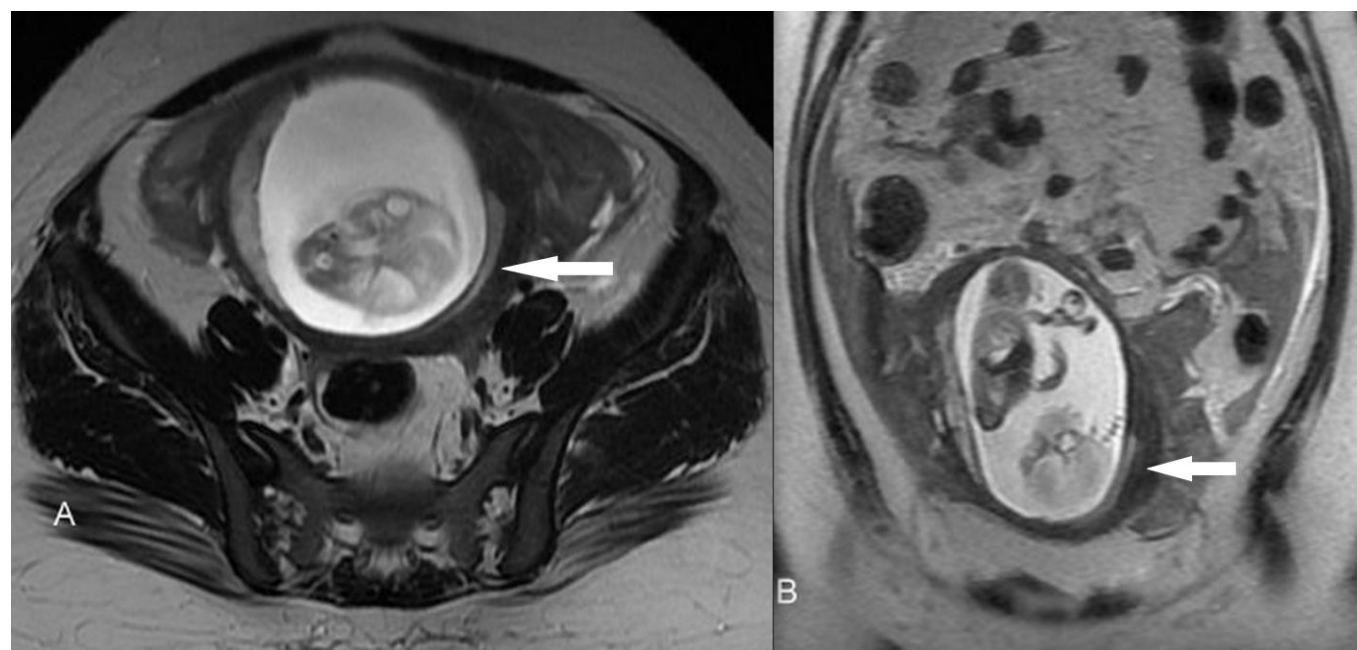
**Figure 2:** 25-year-old woman with interstitial pregnancy (18 weeks). Trans-abdominal ultrasonography, longitudinal view (A) and transverse views (B, C and D) of the abdomen (5 MHz curved transducer, Philips iU22) demonstrating intra-peritoneal anechoic free fluid (A and B) hypoechoic structures in the peritoneal cavity and adjacent to the placenta (B and C) without vascularity on color Doppler (D), likely representing blood clots. A color flow in a placental vessel is seen along the margin of the placenta (D).



**Figure 3 (left):** 25-year-old woman with interstitial pregnancy (18 weeks). Trans-abdominal ultrasonography, transverse view of the uterus (12 MHz linear transducer, Philips iU22) demonstrates a defect in the myometrium (arrow).



**Figure 4:** 25-year-old woman with interstitial pregnancy (18 weeks). Non contrast axial T1 FSE weighted (1.5 T GE, 6 mm thickness, TR 600.60, TE 6.568) and axial T2 FSE weighted MRI (1.5 T GE, 4mm slice thickness, TR 7280, TE147.188) demonstrating intraperitoneal free fluid in the paracolic gutters, which is isointense on T1W and hypointense on T2W images consistent with acute blood.

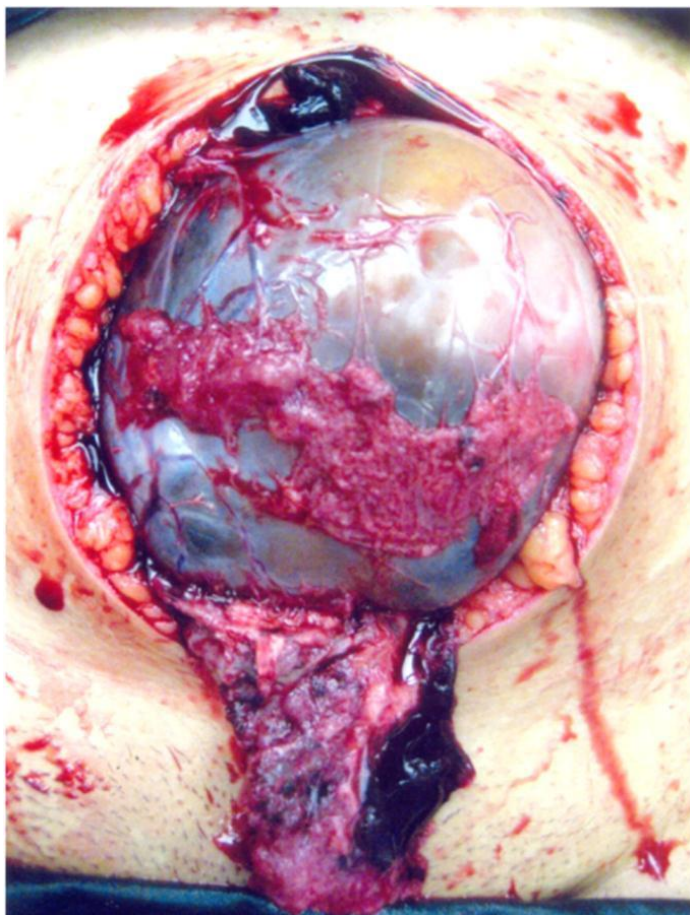


**Figure 5:** 25-year-old woman with interstitial pregnancy (18 weeks). Non contrast axial T2 FSE weighted MRI (1.5 T GE, 4mm slice thickness, TR 7280, TE147.188) and coronal T2 FSE weighted MRI (1.5 T GE, 6mm slice thickness, TR 782.928, TE 100. 8) demonstrating the gestational sac, which is located eccentrically in the right side of the uterine fundus and is surrounded by asymmetric thin myometrium. The decidua is clearly visualized adjacent to the gestational sac (arrow). Intraperitoneal T2W hypointense free fluid was also seen in the lower abdomen consistent with hemoperitoneum.

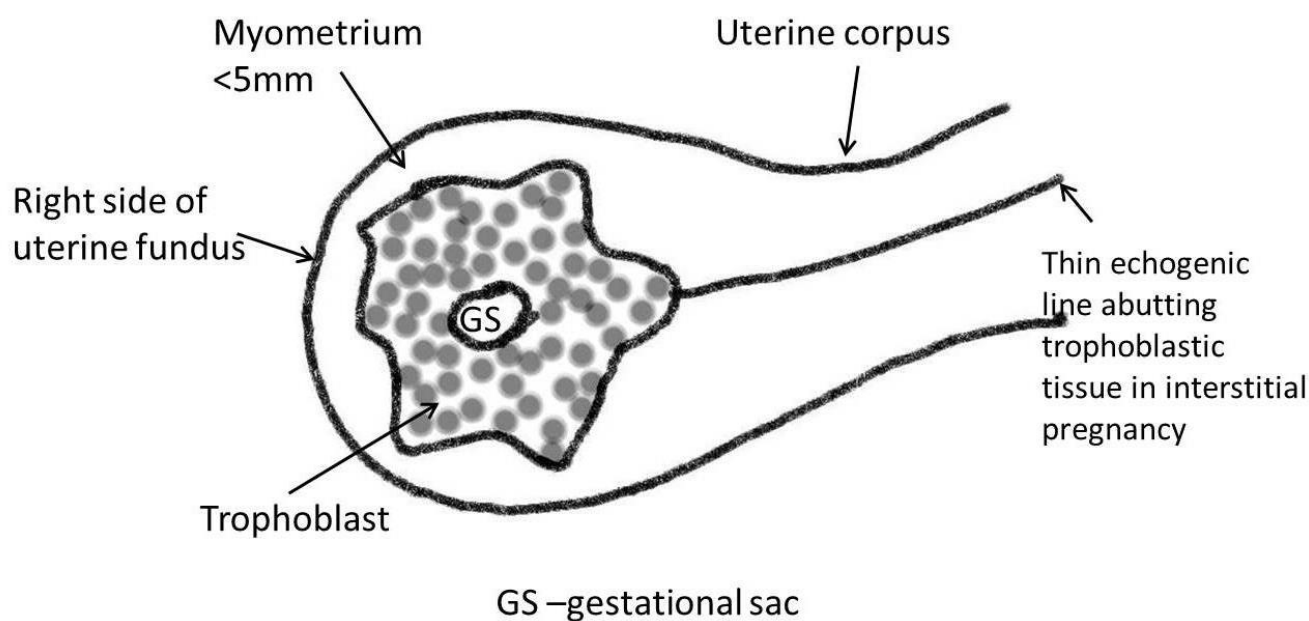




**Figure 6:** 25-year-old woman with interstitial pregnancy (18 weeks). Non contrast axial T2 FSE weighted MRI (1.5 T GE, 4mm slice thickness, TR 7280, TE147.188) and sagittal T2 FSE weighted MRI (1.5 T GE, 6mm slice thickness, TR 3600, TE142.1) demonstrating myometrial defect in the right side of the uterine fundus (thick arrows) and hypointense T2W intraperitoneal free fluid surrounding the uterus with a hematocrit level seen in pelvis consistent with hemoperitoneum (thin arrow).



**Figure 7 (left):** 25-year-old woman with interstitial pregnancy (18 weeks). Intraoperative photograph shows an amniotic sac in the abdominal cavity, indicating a complete uterine rupture.



**Figure 8:** Diagram depicting the sonographic criteria for diagnosis of interstitial pregnancy in the first trimester. A gestational sac eccentrically located in the one side of the uterine fundus, surrounded by asymmetric thin myometrial layer ( $\leq 5\text{mm}$ ) and the interstitial line sign, which refers to an echogenic line that runs from the endometrial cavity to the cornu of the uterus abutting the gestational sac.

<b>Definition</b>	The fertilized ovum implants in the proximal segment of the fallopian tube covered by thin myometrium.
<b>Incidence</b>	2 to 4 % of ectopic pregnancies are interstitial.
<b>Risk factors</b>	Congenital uterine anomalies, previous ectopic pregnancy, in vitro fertilization and ovulation induction, pelvic inflammatory disease, prior intrauterine procedures and use of intrauterine contraceptive devices.
<b>Treatment</b>	Medical (methotrexate therapy) and surgical management. Surgical management indicated in rupture or advanced interstitial pregnancy.
<b>Prognosis</b>	High rate of complications particularly in the advanced stage with uterine rupture, massive hemoperitoneum and fetal and maternal demise.
<b>Findings on imaging</b>	
<b>Transvaginal ultrasound</b>	Empty uterus, a chorionic sac separate and at least 1 cm from the lateral edge of the uterine cavity, a thin ( $\leq 5$ mm) myometrial layer surrounding the gestational sac and the interstitial line sign, which refers to visualization of an echogenic line that runs from the endometrial cavity to the cornu of the uterus abutting the gestational sac. These criteria are reproducible only in the first trimester. In the second trimester the ultrasound findings are equivocal.
<b>MRI</b>	The presence of a junctional zone between the gestational sac surrounded by myometrium and the uterine cavity. This sign is reproducible only in the first trimester. In advanced interstitial pregnancy, the eccentrically located gestational sac, surrounded by asymmetric thin myometrium and clear visualization of the adjacent decidua are the diagnostic criteria.

**Table 1:** Summary table for interstitial ectopic pregnancy

	<b>ULTRASOUND</b>	<b>MRI</b>
<b>Interstitial ectopic pregnancy</b>	<p>First trimester: Empty uterus, a chorionic sac separate and at least 1 cm from the lateral edge of the uterine cavity, a thin (<math>\leq 5</math>mm) myometrial layer surrounding the gestational sac and the interstitial line sign, which refers to visualization of an echogenic line that runs from the endometrial cavity to the cornu of the uterus abutting the gestational sac.</p> <p>Advanced interstitial pregnancy: Ultrasound is equivocal.</p>	<p>First trimester: The presence of junctional zone between the gestational sac and the uterine cavity.</p> <p>Advanced interstitial pregnancy: Eccentrically located gestational sac, surrounded by asymmetric thin myometrium and clear visualization of the decidua adjacent to it. Defect in the myometrium and hemoperitoneum are signs of rupture.</p>
<b>Pregnancy in a rudimentary horn</b>	Pseudopattern of an asymmetrical bicornuate uterus, absent visual continuity between the cervical canal and the lumen of the pregnant horn and the presence of myometrial tissue surrounding the gestational sac.	The gestational sac is clearly located in a rudimentary horn with a band of tissue connecting the rudimentary horn to the uterus without an endometrial communication.
<b>Angular pregnancy</b>	Gestational sac in the lateral angle of the uterine cavity. A 5 mm or more myometrial layer surrounding the gestational sac.	Gestational sac in the lateral angle of the uterine cavity. No intact junctional zone between the uterine cavity and the gestational sac (first trimester). Non visualization of the decidua adjacent to the gestational sac (Advanced interstitial pregnancy).

**Table 2:** Differential diagnosis table for interstitial ectopic pregnancy



#### ABBREVIATIONS

MRI = Magnetic resonance imaging  
T1W = T1 weighted  
T2W = T2 weighted

#### KEYWORDS

Interstitial ectopic pregnancy; Magnetic resonance imaging

#### **Online access**

This publication is online available at:  
[www.radiologycases.com/index.php/radiologycases/article/view/1472](http://www.radiologycases.com/index.php/radiologycases/article/view/1472)

#### **Peer discussion**

Discuss this manuscript in our protected discussion forum at:  
[www.radiopolis.com/forums/JRCR](http://www.radiopolis.com/forums/JRCR)

#### **Interactivity**

This publication is available as an interactive article with  
scroll, window/level, magnify and more features.  
Available online at [www.RadiologyCases.com](http://www.RadiologyCases.com)

Published by EduRad



[www.EduRad.org](http://www.EduRad.org)