The occasional ectopic pregnancy

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CASE

An 18-year-old woman is brought into your rural emergency department by paramedics after collapsing at home. She is noted to be pale and diaphoretic. She reports severe abdominal pain and vaginal bleeding. Her blood pressure is 105/70 mm Hg, and her heart rate is 110 beats/min. Her abdomen is exquisitely tender. She had a positive home pregnancy test 8 weeks ago. You suspect an ectopic pregnancy. How would you manage this patient?

INTRODUCTION

Vaginal bleeding and pelvic pain during the first trimester of pregnancy are common presentations to the emergency department, with about 15%–20% of all pregnancies being complicated by vaginal bleeding.[1,2] Of these, 2.6% will be ectopic pregnancies, which are responsible for 6%–15% of maternal deaths in early pregnancy.[1,3] Thus, it is extremely important for physicians to accurately diagnose this condition. We will discuss tools used to diagnose intrauterine pregnancy (thereby excluding an ectopic pregnancy) and subsequent management of ectopic pregnancy in the rural emergency department.

HISTORY

Most patients with an ectopic pregnancy will present before rupture with nonspecific complaints, such as vaginal bleeding or abdominal/pelvic pain, with a history of amenorrhea, similar to patients presenting with a viable intrauterine pregnancy or miscarriage.[4,5] Thus, a high index of suspicion is warranted in these scenarios. Amenorrhea from 4 to 12 weeks from the last menstrual period is reported in 70% of ectopic pregnancies, but absence of amenorrhea is found in 15% of ectopic pregnancies.[6] Occasionally, if rupture has occurred, the patient may present with syncope, hypotension or hypovolemic shock. It is important to elicit risk factors for ectopic pregnancy, including (from strongest to weakest) previous tubal surgery, previous ectopic pregnancy, in utero diethylstilbestrol exposure, previous genital infections, infertility, current smoking and previous intrauterine device use.[7] However, more than half of women with an ectopic pregnancy will have no identifiable risk factors.[8]

PHYSICAL EXAMINATION

In a systematic review, Crochet and colleagues[3] listed the sensitivity (Sn), specificity (Sp), positive likelihood ratio (+LR) and negative likelihood ratio (–LR) for the following physical examination findings: cervical motion tenderness Sn 0.45, Sp 0.91, +LR 4.9, –LR 0.62; peritoneal findings Sn 0.25, Sp 0.95, +LR 4.4, –LR 0.8; adnexal tenderness Sn 0.09, Sp 0.96, +LR 2.4, –LR 0.94; adnexal mass Sn 0.61, Sp 0.65, +LR 1.9, –LR 0.57. Overall, the findings on physical examination are more specific than sensitive, so a normal examination cannot rule out an ectopic pregnancy.[3]

INVESTIGATIONS

A complete blood count should be ordered to assess for anemia secondary to acute blood loss, and a blood type and screen should be ordered to assess for Rh(D) status. All Rh(D)-negative

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women should be given 300 μg of anti-D immune globulin to prevent alloimmunization.[6]

In cases of severe blood loss, a crossmatch of 2 to 4 units of packed red blood cells should be ordered, and coagulation testing may be required.

Use of β–human chorionic gonadotropin in ectopic pregnancy

Pregnancy can be confirmed with either a urine (qualitative) or serum (quantitative) β–human chorionic gonadotropin (HCG) test. A single serum β-HCG measurement cannot rule in or rule out an intrauterine pregnancy or ectopic pregnancy. Many clinicians are aware of the concept of the "discriminatory zone," but its clinical utility has been called into question. Above the values of 1500–3000 IU/L for transvaginal and 6500 IU/L for transabdominal ultrasound, an intrauterine pregnancy should be visualized. If an intrauterine pregnancy is not visualized and the β-HCG value is above the discriminatory zone, the clinician should be highly suspicious for an ectopic pregnancy. However, if the β-HCG is below the discriminatory zone and an intrauterine pregnancy is not visualized, the clinician should be just as suspicious for an ectopic pregnancy. Most symptomatic patients who present to an emergency department with ectopic pregnancy who have no visible intrauterine pregnancy on bedside ultrasonography have a β-HCG level below the discriminatory zone. Use of the discriminatory zone cutoffs for β-HCG achieves only 35% sensitivity, 58% specificity, a positive likelihood ratio of 0.82 and a negative likelihood ratio of 1.13 for ectopic pregnancy; this will not help with the exclusion of ectopic pregnancy as it will miss 65% of cases.[9–11] Therefore, when an intrauterine pregnancy cannot be confirmed on ultrasound, the use of the discriminatory zone is not helpful in differentiating between intrauterine pregnancy and ectopic pregnancy.

If the patient is stable and an intrauterine pregnancy cannot be confirmed with ultrasound, trending the β-HCG level every 48 hours is a more useful measurement. About 99% of viable intrauterine pregnancies will have an increase in β-HCG level of at least 53% in 48 hours. For women with ectopic pregnancy, half will have decreasing levels and half will have increasing levels of β-HCG; however, 71% of the women with increasing values will have levels that increase more slowly than expected in a viable intrauterine pregnancy.[6,12] It is important to realize that if the β-HCG has doubled, this does not necessarily rule out an ectopic pregnancy, although it is less likely.

IMAGING

Point-of-care ultrasonography

With point-of-care ultrasonography, the finding of an intrauterine pregnancy is considered a negative test for ectopic pregnancy, with sensitivity of 99.3%, a negative predictive value of 99.9% and a negative likelihood ratio of 0.08.[13] Thus, point-of-care ultrasonography is an appropriate screening test to exclude ectopic pregnancy and the single most important test in the workup. Although these values apply to transvaginal obstetric ultrasonography (which is the preferred method of ultrasonography in this scenario), the transabdominal approach is a good starting point and is more likely to be available in rural emergency departments. It may also be quickly used to assess for free fluid in the abdomen using focused assessment with sonography for trauma (FAST).[14] The primary goal for the occasional ultrasonography scan in a rural emergency department is to assess it safely. The key to safety is not the ability to call a scan positive or negative, but knowing when to call it inconclusive. If you are not sure, continue management as if you have not done a scan.[15]

EQUIPMENT

- Any ultrasonography machine
- Low frequency (2–5 MHz) curvilinear probe (Fig. 1)
- Ultrasound gel or water-based lubricant

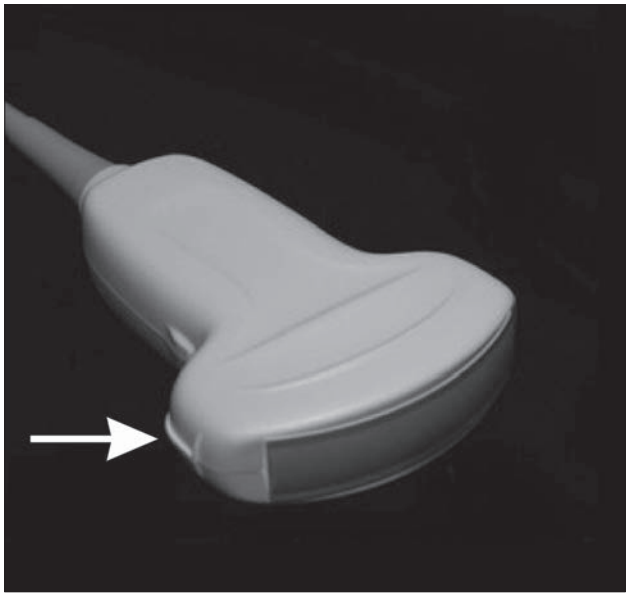


Fig. 1. Low frequency (2–5 MHz) curvilinear probe. The probe marker (white arrow) should always be pointed toward the patient's head (cephalad) or right side.

PROCEDURE

Begin with either the transverse or longitudinal view of the uterus when performing transabdominal obstetric ultrasonography (Fig. 2). The bladder appears as a fluid-filled hypoechoic (black) structure in the near field. A full bladder is optimal because it provides an acoustic window to visualize the uterus, as urine (fluid) conducts the ultrasound waves very well. The uterus appears as a solid structure visualized in the far field (bottom of the screen) immediately behind the bladder in the near field (top of the screen). The uterus is further identified by the hyperechoic (white) endometrial stripe (Figs. 3 and 4). To view the entire uterus, tilt the transducer from side to side.

INTRAUTERINE PREGNANCY

To identify an intrauterine pregnancy, first confirm bladder-uterine juxtaposition. This ensures that you are oriented toward the uterus and are not confirming a pregnancy within the adnexa. Confirmation of an intrauterine pregnancy requires visualization of all 3 of the following within the body of the uterus: 1) decidual reaction, 2) gestational sac and 3) yolk sac.[15] Identification of a fetal pole within the uterus absolutely confirms an intrauterine pregnancy.

Decidual reaction

At 2 weeks postfertilization, the endometrium undergoes a decidual reaction, formed by the decidua capsularis and decidua vera, which results in a strongly echogenic (white) lining around the gestational sac.[11]

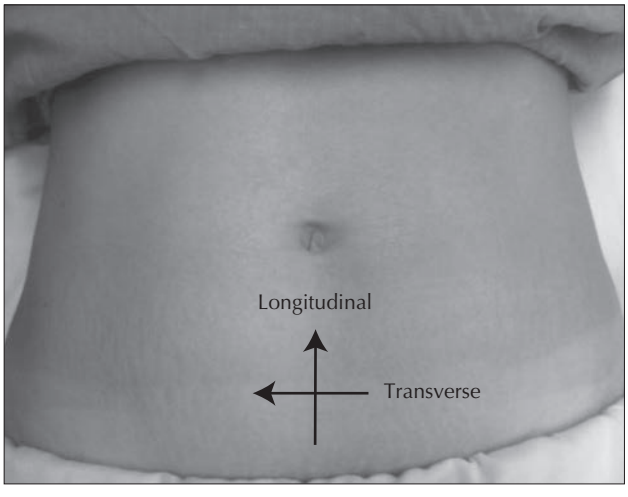


Fig. 2. Placement of the curvilinear probe to obtain transverse and longitudinal views of the uterus. The probe marker is pointed toward either the patient's right (transverse) or cephalad (longitudinal) direction (arrows).

Gestational sac

The gestational sac appears as a hypoechoic oval structure within the uterine fundus (Fig. 5). Early in pregnancy it may be difficult to differentiate the gestational sac of an intrauterine pregnancy from an endometrial cyst, hematoma, pseudogestational sac or blighted ovum, as they may all appear similar on ultrasonography.[11] A pseudogestational sac contains fluid in the endometrium and may occur in an ectopic pregnancy.[16] A blighted ovum should be suspected if the gestational sac is greater than 25 mm with no yolk sac visible and may occur in a nonviable pregnancy.[15]

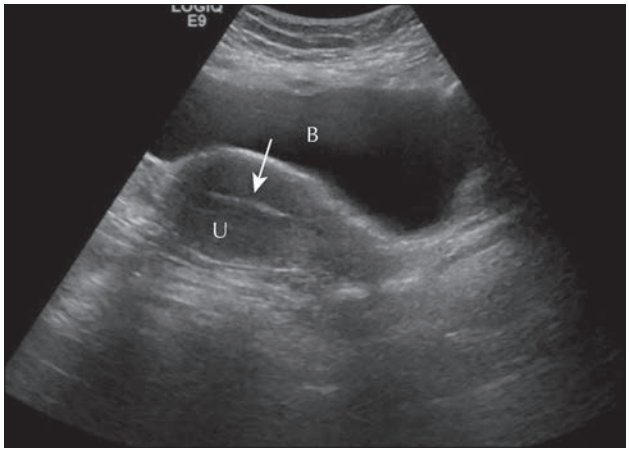


Fig. 3. Normal longitudinal view. The bladder (B) is the hypoechoic (black) fluid-filled structure seen in the near field with the uterus (U) directly posterior. The hyperechoic endometrial stripe (white arrow) can be visualized within the uterus.

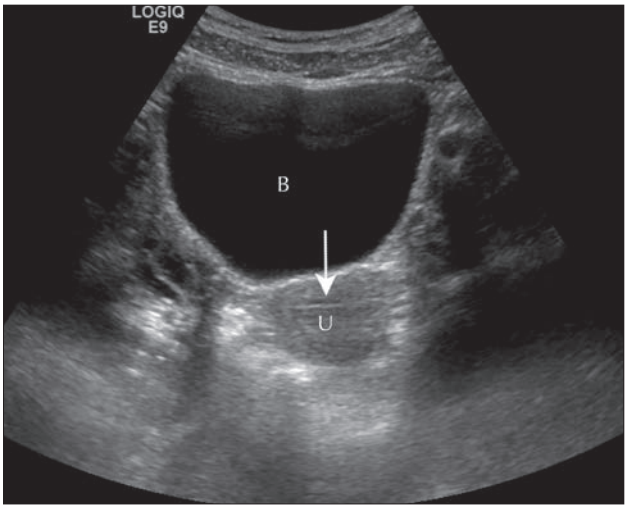


Fig. 4. Normal transverse view. The bladder (B) is the hypoechoic (black) fluid-filled structure seen in the near field with the uterus (U) directly posterior. The hyperechoic endometrial stripe (white arrow) can be visualized within the uterus.

Yolk sac

The yolk sac appears as an echogenic ring with an anechoic centre located within the gestational sac (Fig. 6). Identification of its presence within the gestational sac is the first definitive sign of an intrauterine pregnancy.[11] The yolk sac increases in size until week 10 and disappears by week 12.[17] A good way to remember this is to call this informally the "positive Cheerio sign."

Fetal pole

The fetal pole (or embryo) can be visualized next to the yolk sac around the fifth week of gestation.[11] It is a discoid mass of about 2 mm located within the gestational sac (Figs. 7 and 8). When the gestational sac grows to 18 mm, a visible fetal pole should always be seen.[18] At 6 weeks gestational age, cardiac activity is seen within the embryo. This can be visualized as a flickering area within the thorax of the fetal pole.

INDETERMINATE SCAN

If you are unable to confirm an intrauterine pregnancy, this may be deemed an indeterminate scan and can be documented as "no definitive intrauterine pregnancy." This will occur in about 30% of symptomatic first-trimester patients undergoing ultrasonography.[12] This may represent an early intrauterine pregnancy, embryonic demise, molar

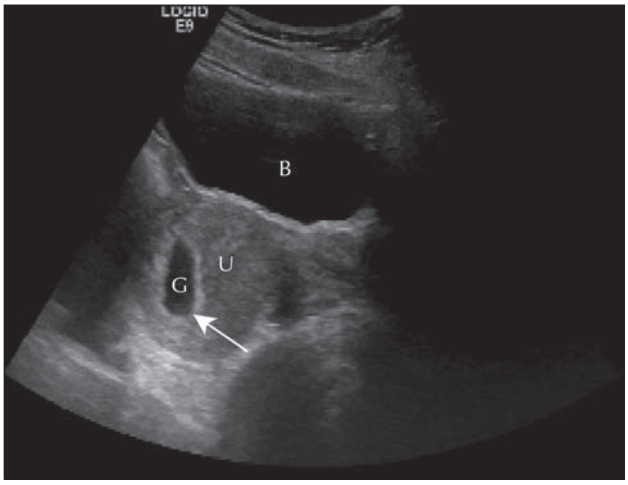


Fig. 5. Longitudinal view of the uterus (U) with decidual reaction (white arrow) and a visible gestational sac (G). The bladder (B) can be visualized in the near field.

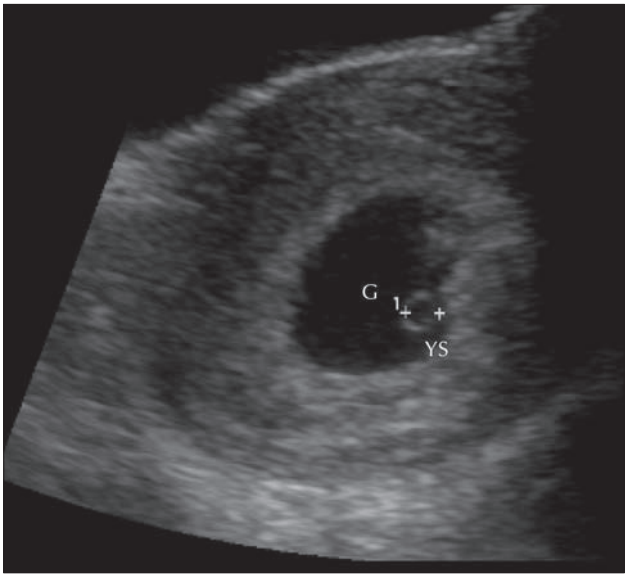


Fig. 6. The yolk sac (YS) can be seen within the gestational sac (G).

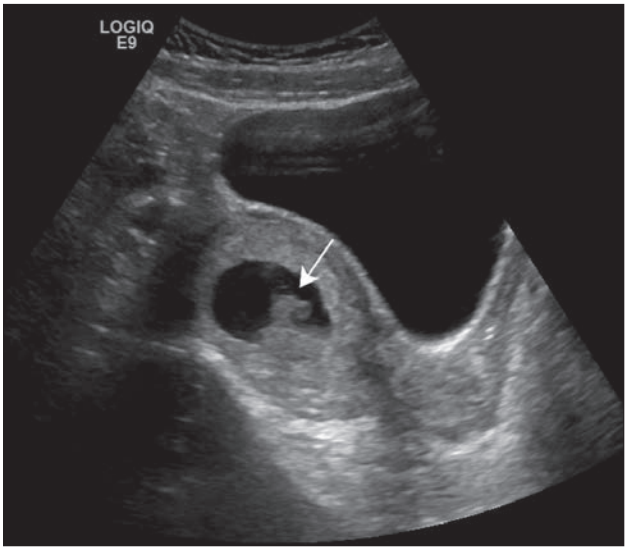


Fig. 7. Longitudinal view with visible fetal pole (arrow).

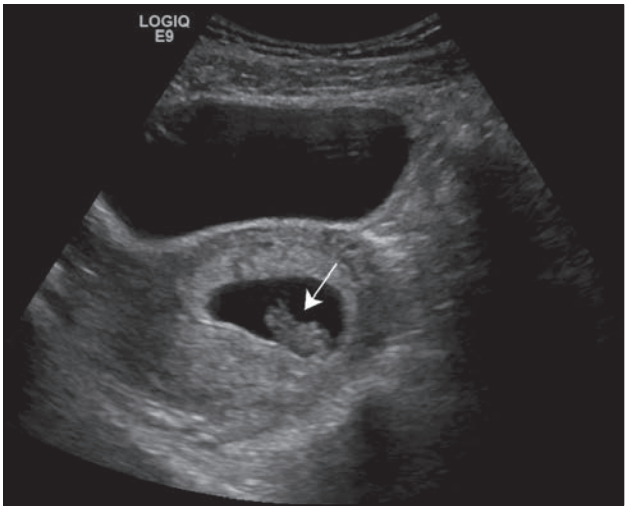


Fig. 8. Transverse view with visible fetal pole (arrow).

pregnancy or ectopic pregnancy. However, an ectopic pregnancy should be suspected until proven otherwise. Remember that all 3 criteria (mentioned in the "Intrauterine pregnancy" section) are required to confirm an intrauterine pregnancy, as well as confirming bladder-uterine juxtaposition. If only a gestational sac is visualized, this may represent a pseudogestational sac of an ectopic pregnancy. Therefore, the clinician must also confirm the presence of a decidual reaction and yolk sac, or a fetal pole within the gestational sac.

Heterotopic pregnancy

Increased caution is required for women undergoing fertility treatment, as the risk of heterotopic pregnancy is increased. The incidence of heterotopic pregnancy is about 1 in 30 000, but is as high as 1 in 3900 in women undergoing hormone-induced superovulation, intrauterine insemination or in vitro fertilization.[4] Thus, clinicians must have a higher index of suspicion for an ectopic pregnancy, even in the presence of an intrauterine pregnancy[12] (Fig. 9[6,7,14,15]).

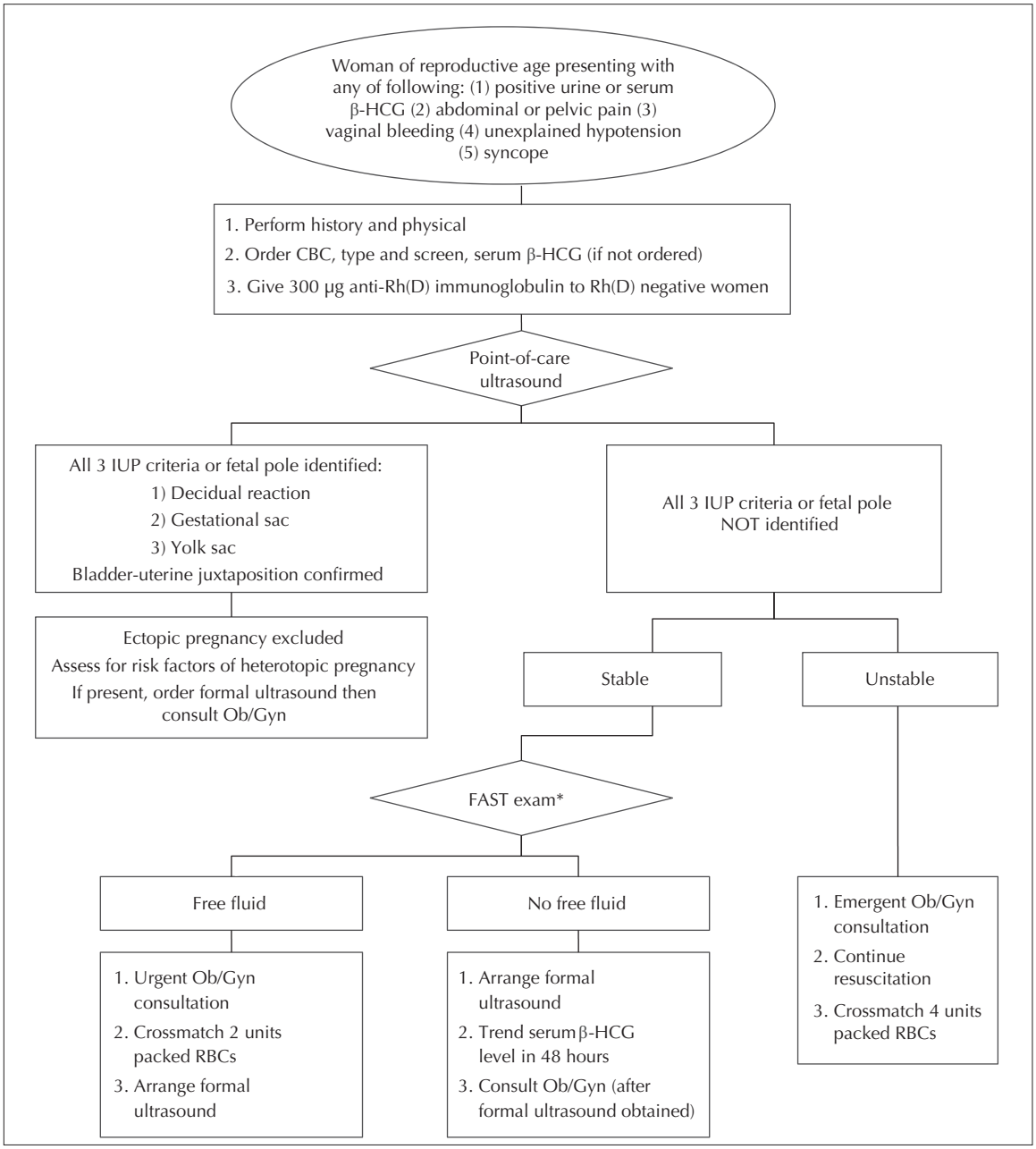


Fig. 9. Algorithm for management of ectopic pregnancy in the emergency department.[6,7,15] CBC = complete blood count; HCG = human chorionic gonadotropin; IUP = intrauterine pregnancy; Ob/Gyn = obstetrician–gynecologist; RBC = red blood cells. *For more information on how to perform a focused assessment with sonography for trauma (FAST) see Sue.[14]

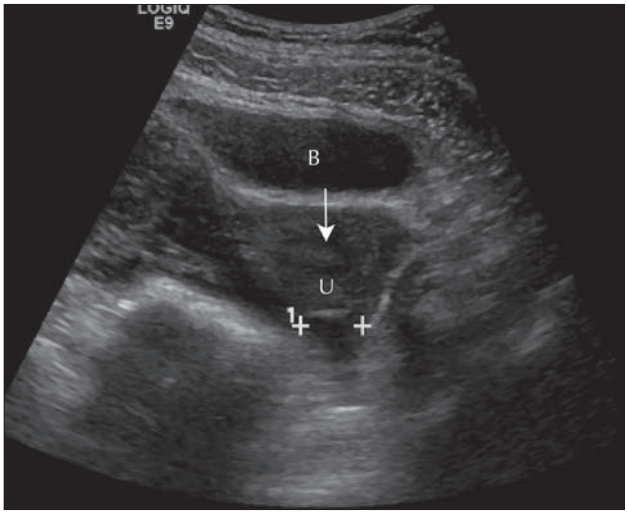


Fig. 10. Transverse view of the uterus (U), bladder (B) and endometrial stripe (white arrow). An intrauterine pregnancy cannot be confirmed. Free fluid is seen (+).

CASE 1 CONTINUED

Despite resuscitation, the patient's condition continues to deteriorate. Her blood pressure is now 80/55 mm Hg and heart rate is 135 beats/min. Her abdomen is distended. Ultrasonography of her pelvis (Fig. 10) reveals a uterus with no definitive intrauterine pregnancy. Free fluid can also be visualized. You immediately consult an obstetrician–gynecologist. The patient is taken to the operating room, where it is confirmed she has an ectopic pregnancy in her adnexa. She receives appropriate management and is discharged home within the next few days.

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REFERENCES

1. Mazzariol FS, Roberts J, Oh SK, et al. Pearls and pitfalls in first-trimester obstetric sonography. *Clin Imaging* 2015;39:176-85.
2. Bennett G, Bromley B, Lieberman E, et al. Subchorionic hemorrhage in first-trimester pregnancies: prediction of outcome with sonography. *Radiology* 1996;200:803-6.
3. Crochet J, Bastian L, Chireau M. Does this woman have an ectopic pregnancy? The rational clinical examination systematic review. *JAMA* 2013 ;309:1722-29.
4. Sohoni A, Bosley J, Miss J. Bedside ultrasonography for obstetric and gynecologic emergencies. *Crit Care Clin* 2014;30:207-26.
5. Murtaza U, Ortmann M, Mando-Vandrick J, et al. Management of first-trimester complications in the emergency department. *Am J Health Syst Pharm* 2013;70:99-111.
6. Fung Kee Fung K, Eason E, Crane J, et al.; Maternal-Fetal Medicine Committee, Genetics Committee. Prevention of Rh alloimmunization. *J Obstet Gynaecol Can* 2003;25:765-73.
7. Lozeau AM, Potter B. Diagnosis and management of ectopic pregnancy. *Am Fam Physician* 2005;72:1707-14.
8. Stein JC, Wang R, Adler N, et al. Emergency physician ultrasonography for evaluating patients at risk for ectopic pregnancy: a meta-analysis. *Ann Emerg Med* 2010;56:674-83.
9. Wang R, Reynolds T, West H, et al. Use of β-HCG discriminatory zone with bedside pelvic ultrasonography. *Ann Emerg Med* 2011;58:12-20.
10. Layman K, Antonois M, Davis J. Pitfalls in emergency department focused bedside sonography of first trimester pregnancy. *Emerg Med Int* 2013:982318.
11. Soni N, Amtfield R, Kory P. First-trimester pregnancy. In: *Point-of-care ultrasound*. Philadelphia (PA): Elsevier; 2015. P. 184-198.
12. Barnhart KT. Clinical practice. Ectopic pregnancy. *N Engl J Med* 2009;361:379-87.
13. Stein JC, Wang R, Adler N, et al. Emergency physician ultrasonography for evaluating patients at risk for ectopic pregnancy: a meta-analysis. *Ann Emerg Med* 2010;56:674-83.
14. Sue K. The occasional ED ultrasound: focused assessment with sonography for trauma (FAST). *Can J Rural Med* 2015;20: 33-9.
15. Wiss R, Socransky S. *Point-of-care ultrasound for emergency physicians: "the EDE book"*. The EDE Course; 2012.
16. Nyberg DA, Mack LA, Harvey D, et al. Value of the yolk sac in evaluation early pregnancies. *J Ultrasound Med* 1988;7:129-35.
17. Nyberg DA, Laing FC, Filly RA, et al. Ultrasonographic differentiation of the gestational sac of early intrauterine pregnancy from the pseduogestational scan of ectopic pregnancy. *Radiology* 1983; 146:755-9.
18. Paspulati RM, Bhatt S, Nour S. Sonographic evaluation of first-trimester bleeding. *Radiol Clin North Am* 2004;42:297-314.

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