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Pearls and pitfalls in first-trimester obstetric sonography

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ABSTRACT

Ultrasound is the primary imaging modality used in the evaluation of first-trimester vaginal bleeding and pelvic pain. This article will summarize the ultrasound findings in normal first-trimester pregnancy, failed pregnancy, ectopic pregnancy, subchorionic hemorrhage, retained products of conception, and gestational trophoblastic disease. Mastery of the spectrum of sonographic findings in the normal and abnormal first-trimester pregnancy allows the radiologist to make accurate diagnoses and helps to appropriately guide patient management.

1. Introduction

Vaginal bleeding and pelvic pain are common presenting complaints during first-trimester pregnancies. It is estimated that up to 15% to 20% of all pregnancies are complicated by vaginal bleeding [1]. The work-up includes serum B-HCG sampling as well as transabdominal and transvaginal sonography (TVS) to determine the gestational sac (GS) location and its shape, size, and internal contents. If present, the yolk sac(s), embryo(s), and heart rate(s) [HR(s)] are evaluated, and the presence of perigestational hemorrhage should be noted. The patient's last menstrual period (LMP) and serum B-HCG levels are correlated with the ultrasound findings to formulate a diagnosis and guide patient management. It is incumbent on the radiologist to be familiar with the normal and abnormal ultrasound findings of first-trimester pregnancy to avoid misdiagnosis.

2. Normal and abnormal features of first-trimester intrauterine pregnancy

2.1. The Gestational Sac

The GS implants in the uterine fundus at approximately day 23 of the menstrual cycle. The earliest imaging sign of an intrauterine pregnancy (IUP) seen on TVS is an eccentric, extraluminal, rounded GS located within the endometrium, termed the **intradecidual sign** [2,3] (Fig. 1). This sign can be observed as early as 4 ½weeks of menstrual age. The **double decidual sac sign**, representing the hyperechogenic peripheral decidua vera and the inner decidua capsularis with intervening anechoic endometrial lumen, is seen on TVS at about 5 menstrual weeks [2] (Fig. 2).

Teaching Points

- While the intradecidual sac sign and double decidual sac signs are reassuring and useful signs prior to the appearance of the yolk sac (YS), they will not be seen in 50% of intrauterine pregnancies [3–5].
- A nonspecific intrauterine fluid collection, which is not clearly demonstrated within the decidua, has a greater than 99% chance of being an early IUP than a pseudo-GS of ectopic pregnancy because the incidence of ectopics is low (approximately 2%) and pseudo-GSs are only seen in up to 10% of ectopics [6]. Thus, a stable patient with a small nonspecific intrauterine fluid collection presenting with vaginal bleeding and/or pelvic pain should be followed with ultrasound in 2 to 3 days to help differentiate an early IUP from a pseudo-GS of ectopic pregnancy.

The GS is composed of anechoic amniotic fluid and chorionic extraembryonic coelom, which may contain low-level echoes. By TVS, the YS is usually visualized within the extraembryonic coelom at approximately 5½ weeks or 8-mm mean GS diameter (MSD), and the embryo is usually seen at 6 weeks or 16 mm MSD. The embryonic heart motion is usually detected at an embryonic crown-rump length (CRL) of 5 mm [5]. More recently, the recommendation for the diagnosis of embryonic demise has been redefined as absent heart motion at a CRL of 7 mm in order to avoid false positives [7]. The amniotic cavity expands to obliterate the chorionic cavity by 14 to 16 weeks.

Adverse outcomes are frequently seen with very irregular or low-lying GSs, MSD >8 mm without a YS, or MSD >25 mm without an embryo [7]. An abnormally small GS size is a poor prognostic sign; an MSD <5 mm larger than the embryonic CRL is associated with a 94%

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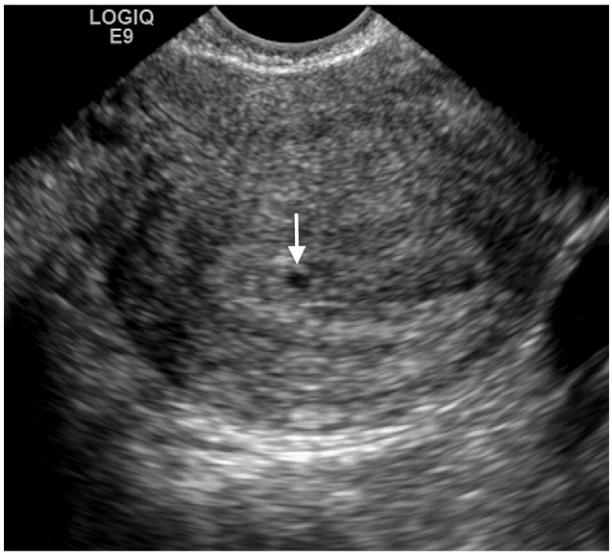

Fig. 1. Intradecidual sign. Transverse view of the uterus—eccentric GS within the endometrium (arrow).

Fig. 3. Anembryonic pregnancy. Transverse view of the uterus showing a 2.5-cm empty GS.

rate of first-trimester spontaneous abortion [8,9]. In a suspected case of pregnancy failure, follow-up sonography in 2 to 3days is recommended because lack of MSD or CRL growth during this interval is diagnostic. An anembryonic intrauterine pregnancy, or blighted ovum, is likely present if an embryo is absent at 16 to 24 mm MSD and is definitively diagnosed when the embryo is absent at an MSD >25 mm on TVS [10] (Fig. 3). The GS may have an irregular, abnormal shape in a blighted ovum.

Comparison with prior sonograms is also helpful in evaluating for pregnancy failure. Suspicion of pregnancy failure increases when a live embryo is not demonstrated on TVS 7–10 days after an exam demonstrating a YS or 7–13 days after an exam demonstrating an empty GS. Absence of a live embryo >11 days after seeing a YS or >14 days after seeing an empty GS is diagnostic of pregnancy failure [10].

Teaching Points

- If a GS is low lying, look for a fundal fibroid, which may be displacing a normal IUP inferiorly.

Normally, if an amniotic cavity is detected on TVS, an embryo with length similar to the MSD should be present. The **empty amnion sign** refers to visualization of an amniotic sac without a discernible embryo and is strongly associated with pregnancy failure [11] (Fig. 4). The **expanded amnion sign** refers to an embryo that lacks heart motion but is surrounded by visible amnion and is indicative of embryonic demise even when the CRL is less than 5 mm [8,12] (Fig. 5).

2.2. The Yolk Sac

A normal YS measures less than 5.6 mm internal diameter between 5 and 10 weeks and starts to regress by 11 weeks. Abnormal prognostic factors include absence of the YS in the presence of an embryo, and a large, calcified, or persistently deformed YS [8] (Fig. 6). The YS is no longer seen after the amniotic cavity expands to obliterate the chorionic cavity by 14 to 16 weeks [8,13].

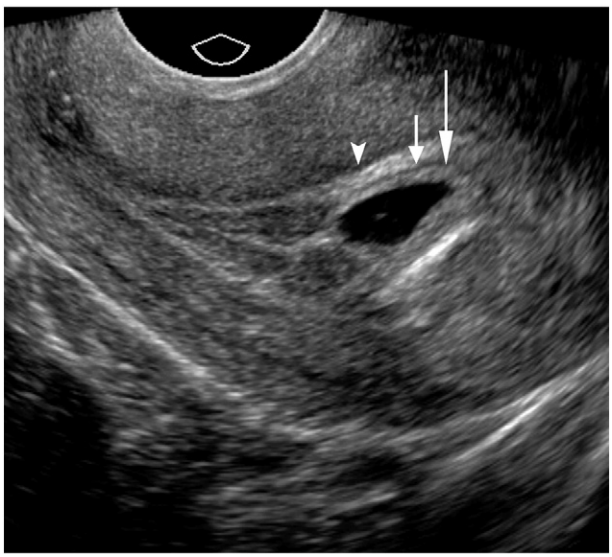

Fig. 2. Double decidual sign. Long view of the uterus–hyperechogenic peripheral decidua vera (arrowhead) and inner decidua capsularis (long arrow) with intervening hypoechoic endometrial lumen (short arrow).

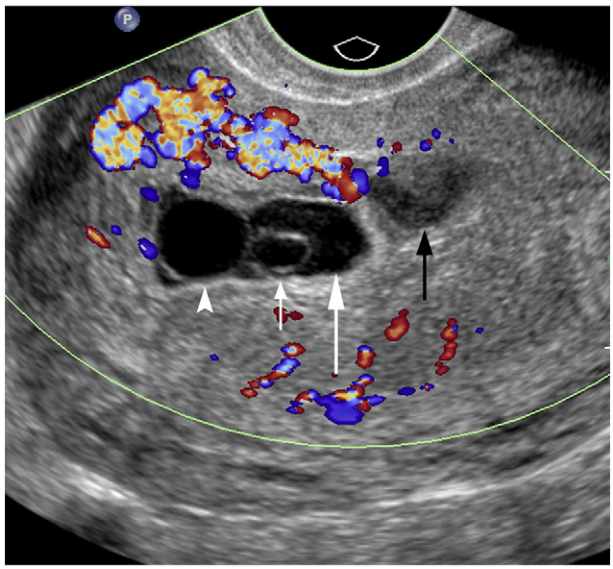

Fig. 4. Empty amnion sign. Empty amniotic sac (arrowhead). Mildly deformed YS (short white arrow). Note presence of echoes in the extraembryonic coelom (long white arrow). Small subchorionic hemorrhage (black arrow).