South African Society for Ultrasound in Obstetrics and Gynaecology

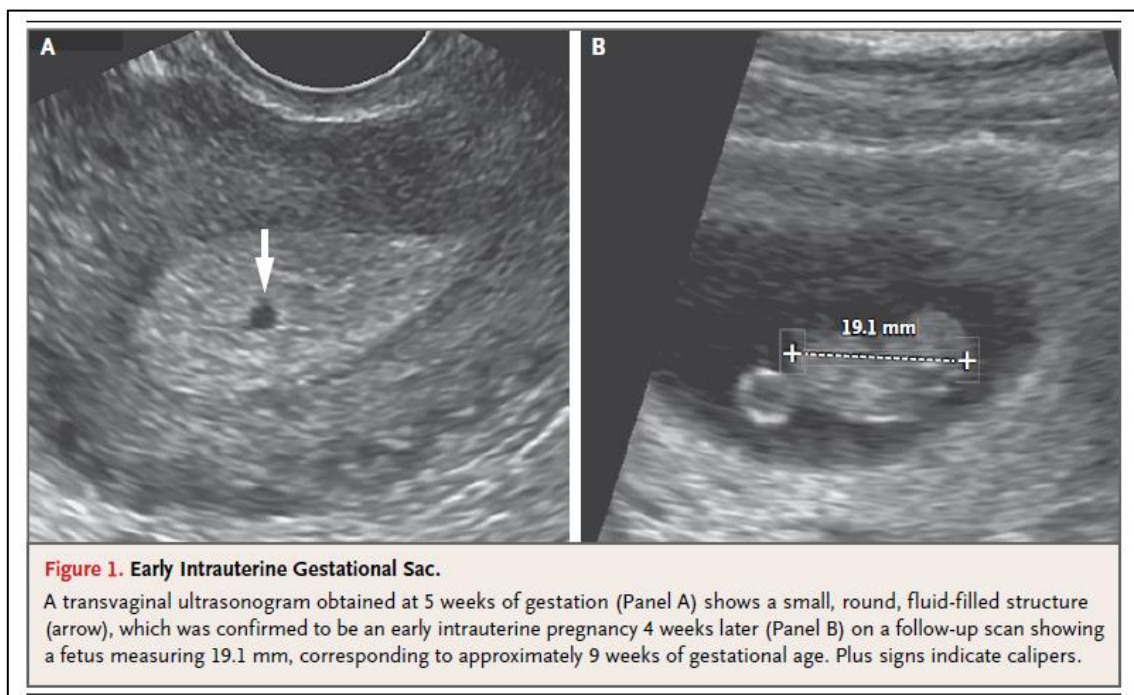BEST PRACTICE GUIDELINE FOR ULTRASOUND DIAGNOSIS OF EARLY PREGNANCY FAILURE

It is generally accepted that early pregnancy failure is defined as the absence of certain sonographic features of a viable intrauterine gestation at a certain point in time after conception. Note that suggested criteria have been developed with consideration for both false positives and false negatives, as there is considerable interpregnancy variability in the appearance of specific time-based features. The main focus of the guideline is to avoid the inadvertent evacuation of a viable intrauterine pregnancy or to avoid missing an ectopic pregnancy.

The gestational sac: time-based events

- A **gestational sac** can first be visualized by transvaginal ultrasound at 4.–4.5. weeks gestational age as a  2–3mm anechoic/hypoechoic rounded intrauterine fluid collection with no visible contents (in absence of an transvaginal probe consider referral to a specialist OBGYN)
- The mean sac diameter (MSD) is the mean of the three orthogonal dimensions of the fluid containing sac. It's growth rate is 1.13 mm per day but is often variable.
- Finding suggestive of a true gestational sac include:
    a. The **intradecidual sac sign** (present before the double sac sign) i.e., the gestational sac is located eccentrically within the echogenic decidua (see picture below). This needs to be distinguished from a small endometrial cyst

which is located at the endometrial-myometrial junction, or a small intracavitary fluid collection as seen with ectopic pregnancy.

b. The **double decidual sac sign** i.e., presence of two concentric echogenic rings surrounding the gestational sac. The outer ring is the decidua parietalis and the inner decidua capsularis and the chorion.

c. The yolk sac is visualised within the gestational sac from 5.0-5.5 weeks onwards and unequivocally confirms an intrauterine gestation.

d. The early embryo is 1-2mm in length and can be visualized adjacent to the yolk sac at approximately 6 weeks at which time cardiac flickering is mostly visualized (see picture below)



**Figure 1. Early Intrauterine Gestational Sac.**
A transvaginal ultrasonogram obtained at 5 weeks of gestation (Panel A) shows a small, round, fluid-filled structure (arrow), which was confirmed to be an early intrauterine pregnancy 4 weeks later (Panel B) on a follow-up scan showing a fetus measuring 19.1 mm, corresponding to approximately 9 weeks of gestational age. Plus signs indicate calipers.

Source: Diagnostic Criteria for Nonviable Pregnancy Early in the First Trimester; Diagnosis of early pregnancy failure. N Engl J Med 2013; 369:1443-51.

A detailed understanding and knowledge of timing of events for normal intrauterine development is vital as suspicious findings will alert one to consider other diagnoses. Evacuation of products of conception should NOT be undertaken unless fully diagnostic criteria for pregnancy failure are met. The table below refers to guidelines for the diagnosis

of early pregnancy failure by transvaginal ultrasound developed by the Society of Radiologists.

**Table 2. Guidelines for Transvaginal Ultrasonographic Diagnosis of Pregnancy Failure in a Woman with an Intrauterine Pregnancy of Uncertain Viability.***

| Findings Diagnostic of Pregnancy Failure | Findings Suspicious for, but Not Diagnostic of, Pregnancy Failure† |
|---|---|
| Crown–rump length of ≥7 mm and no heartbeat | Crown–rump length of <7 mm and no heartbeat |
| Mean sac diameter of ≥25 mm and no embryo | Mean sac diameter of 16–24 mm and no embryo |
| Absence of embryo with heartbeat ≥2 wk after a scan that showed a gestational sac without a yolk sac | Absence of embryo with heartbeat 7–13 days after a scan that showed a gestational sac without a yolk sac |
| Absence of embryo with heartbeat ≥11 days after a scan that showed a gestational sac with a yolk sac | Absence of embryo with heartbeat 7–10 days after a scan that showed a gestational sac with a yolk sac |
| | Absence of embryo ≥6 wk after last menstrual period |
| | Empty amnion (amnion seen adjacent to yolk sac, with no visible embryo) |
| | Enlarged yolk sac (>7 mm) |
| | Small gestational sac in relation to the size of the embryo (<5 mm difference between mean sac diameter and crown–rump length) |

* Criteria are from the Society of Radiologists in Ultrasound Multispecialty Consensus Conference on Early First Trimester Diagnosis of Miscarriage and Exclusion of a Viable Intrauterine Pregnancy, October 2012.
† When there are findings suspicious for pregnancy failure, follow-up ultrasonography at 7 to 10 days to assess the pregnancy for viability is generally appropriate.

Source: Diagnostic Criteria for Nonviable Pregnancy Early in the First Trimester; Diagnosis of early pregnancy failure. N Engl J Med 2013; 369:1443-51.

Ectopic pregnancy:

The fallopian tube is the commonest ectopic site. This condition has an estimated maternal mortality of 0.2/1000 pregnancies. Transvaginal ultrasound remains the gold standard for diagnosis. The visualized adnexal mass may have one of three characteristic appearances:

- An inhomogenous adnexal mass referred to as the 'blob sign', which moves independently to the ovary. This is regarded as the most sensitive sign and is seen in approximately 60% of cases.
- An inhomogenous adnexal mass containing a gestational sac referred to as the 'bagel sign', seen in approximately 20% of cases.

- A clear extrauterine/adnexal mass with a gestational sac and/or fetal pole with cardiac activity, also found in approximately 20% cases.

A centrally located pseudosac that **lacks** the 'double decidual sign' within the endometrial cavity may be present. Note that its presence is not diagnostic for an ectopic pregnancy.

Pregnancy of unknown location (PUL):

The term PUL refers to when a patient has a positive pregnancy test and the initial transvaginal ultrasound is unable to locate the pregnancy. The term PUL is not regarded as a diagnosis.

This challenging condition requires the clinician to distinguish a viable or failed intrauterine PUL from an ectopic persistent PUL. Currently, the use of two biomarkers i.e. human chorionic gonadotrophin (hCG) and progesterone and performance of a transvaginal scan are used in clinical practice for risk stratification. Most early pregnancies can be visualized at hCG levels below 1000IU/L. Serum progesterone is considered as a valuable indicator of viability and levels below 10nmol/L are likely to be associated with a failing PUL.

The M6 risk calculation model using the initial s-progesterone and hCG ratio (hCG at 48 hours/hCG at 0 hours) referred to as the M6 model has a 92% sensitivity for diagnosis of ectopic pregnancy. See http://earlypregnancycare.co.uk for M6 risk model to characterise PUL. If initial progesterone level < 2nmol/L (CANNOT be used if patient is taking progesterone supplements): failed pregnancy, low risk for ectopic, no follow-up needed. If higher or no progesterone test available: repeat hCG after 48 hours, calculate ratio and apply M6 to determine risk for evolving ectopic, failed PUL or viable IUP. The use of biomarkers does not replace clinical examination findings.

Source:

1. https://www.isuog.org/education/visuog/obstetrics/early-pregnancy/normal-early-pregnancy.html

2. Bobdiwala S, Saso S, Verbakel JY, Al-Memar M, Van Calster B, Timmerman D, Bourne T. Diagnostic protocols for the management of pregnancy of unknown location: a systematic review and meta-analysis. BJOG: An International Journal of Obstetrics & Gynaecology. 2019 Jan;126(2):190-8.

3. Van Calster B, Bobdiwala S, Guha S, Van Hoorde K, Al-Memar M, Harvey R, Farren J, Kirk E, Condous G, Sur S, Stalder C. Managing pregnancy of unknown location based on initial serum progesterone and serial serum hCG levels: development and validation of a two-step triage protocol. Ultrasound in Obstetrics & Gynecology. 2016 Nov;48(5):642-9.

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