Ultrasound in the First Trimester of Pregnancy

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First Trimester Sonography

- Localization of Gestational Sac
  - Intrauterine vs. ectopic
- Identification of abnormalities
  - Embryonic demise
  - Embryo at risk for demise
Sonographic Features: Normal First Trimester

- **Gestational sac**
  - **Shape:** smooth; round or oval
  - **Position:** fundal or mid-portion of uterus; eccentric
  - **Wall:** echogenic, at least 3mm thick due to trophoblastic/decidual reaction
    - Early, 50% show double decidua sign: 

- **Internal Structures:**
  - **Yolk sac:** initially most predominant structure
  - **Embryo**
  - **Cardiac activity**

- **Growth:**
  - **Rate:** embryo-1mm/d; sac-1.1mm/d
  - **Correlate development with dates and B-hCG levels**
Normal Intrauterine Pregnancy: 7 weeks

- Sagittal view of uterus (abdominal):
- Transverse view of uterus (endovaginal):

- Gestational sac
- Embryo
- Yolk sac
- Amnion
9 Week Gestation:

Embryo and Yolk Sac

Transverse uterus
M-mode Measurement of Cardiac Activity

- Cross section through heart
- Measures cardiac activity

Components of cross section
Adnexa of 9 Week Gestation

Corpus luteum filling right ovary

Left ovary

Transverse right adnexa

Transverse left adnexa
## Timing of Findings in Normal First Trimester Pregnancy

<table>
<thead>
<tr>
<th>Finding</th>
<th>Timing (LMP)</th>
</tr>
</thead>
<tbody>
<tr>
<td>B-hCG +</td>
<td>23d</td>
</tr>
<tr>
<td>Intradecidual sign</td>
<td>25 - 29d</td>
</tr>
<tr>
<td>Gestational sac</td>
<td>Earliest 34d, usually 37-38d</td>
</tr>
<tr>
<td>Yolk sac</td>
<td>Earliest 36d, usually 42d</td>
</tr>
<tr>
<td>Embryo</td>
<td>Earliest 43d, usually 45d</td>
</tr>
<tr>
<td>Cardiac activity</td>
<td>Earliest 43d, usually 45d</td>
</tr>
</tbody>
</table>

Findings by endovaginal ultrasound
Case:

• 28 yo female, LMP 3/13/00

• No significant PMH

• Presented on 5/2
  • several weeks of vaginal spotting
  • abdominal cramping
  • passage of clots over the past week

• B-hCG on 4/18 was 368, only 473 at presentation
No Intrauterine Pregnancy

Transverse view of uterine fundus
Hemorrhage and Debris in Cul-de-sac

Transverse of uterus and cul-de-sac

Free Fluid

Debris
Abnormal Right Adnexa

- Normal Right Ovary
- Right Adnexal Mass
- Sagittal of right adnexa, with doppler
- Normal Left Ovary
- Transverse of left adnexa
Pseudogestational Sac of Ectopic Pregnancy

Sagittal Uterus

Pseudogestational Sac

Endometrial Stripe
Sonographic Findings in Ectopic Pregnancy

- **Specific for Ectopic:**
  - Embryo in adnexa

- **Less Specific (must correlate with B-hCG):**
  - Empty uterus
  - Adnexal mass (>95% tubal)
    - classic = thick echogenic ring separate from ovary
    - tubal pregnancy > 2-3 cm at risk for rupture
  - Pelvic free fluid
  - Pseudogestational sac
Heterotopic Pregnancy

Normal Left Ovary

Left Adnexal Ring (ectopic sac)

Sagittal Left Adnexa

Nonviable intrauterine gestation

Sagittal Uterus
Spontaneous Abortion
(15-25% of all clinically recognized pregnancies)

- **Threatened abortion:**
  - vaginal spotting/bleeding, mild uterine cramping, closed os
  - may see intrauterine hematoma
  - if viable gestation, just observe, as many as 50% abort

- **Inevitable abortion:**
  - persistent cramps and bleeding, abortion in in progress, os open
  - appearance varies depending on retained products present

- **Missed abortion:**
  - products of conception retained at least 2mo after fetal death, pregnancy test becomes negative, os closed

- **Complete abortion:**
  - all products of conception have been expelled, os closed
Inevitable Abortion
(Spontaneous Abortion in Progress)

Anembryonic gestational sac

Clot passing through lower uterine segment

Sagittal of Fundus

Sagittal of Lower Uterus
Inevitable Abortion (continued)

Open os in inevitable abortion

Closed os in normal pregnancy

Sagittals of Uteri
Subchorionic Hemorrhage

Hemorrhage between chorion and decidua, compressing empty gestational sac

• subchorionic hematoma in 1st trimester with viable embryo | risk of spontaneous abortion
  • risk increases with hematoma size, older maternal age, <8wk gestation (LMP)
Summary

• **Normal First Trimester Pregnancy:**
  – Gestational Sac
    • Regular oval/round shape, eccentric, thick echogenic wall
  – Yolk Sac
  – Embryo
    • Presence, growth, cardiac activity
  – Appearance of corpus luteum

• **Ectopic Pregnancy:**
  – Extrauterine embryo or mass; classic adnexal ring
  – No IUP
  – Free fluid
  – Pseudogestational sac

• **Heterotopic Pregnancy:**
  – IUP and ectopic
Summary (cont’d)

- **Spontaneous Abortion:**
  - Abnormal gestational sac (ie. distorted, thin wall, empty)
  - Absence of yolk sac, embryo, cardiac activity
  - *Always give gestation benefit of the doubt. Correlate findings with B-hCG; dates may be wrong*
  - Variable appearance of blood/debris
  - Open os in inevitable abortion

- **Subchorionic hemorrhage:**
  - Hemorrhage between chorion and decidua
  - Normal pregnancy(small), threatened abortion, spontaneous abortion
  - Importance of size, maternal age, age of gestation
DIAGRAMS OF GESTATIONAL SAC:

Callen, PW, Ultrasound in obstetrics and gynecology, 3rd ed. W.B.Saunders Co. 1994
From ch. 6-Ultrasound Evaluation During The First Trimester, Roy A. Filly, M.D.

Figure 6-3