Ectopic pregnancy is the implantation of the conceptus outside of the endometrial cavity. It is also known as extrauterine pregnancy. The most common site of an ectopic implantation is the Fallopian tube (90%).

- **ADNEXAL PREGNANCY:** May occur in any portion of the Fallopian tube or ovary. Sites in the tube include; isthmic, ampullary, fimbrial, or interstitial portions. Ovarian implantations (which are rare) include; tubo-ovarian or abdomino-ovarian.

- **UTERINE ECTOPIC PREGNANCY:** When the conceptus implants on any site within the uterus outside the endometrial cavity, an ectopic pregnancy exists. Implantation sites can include; cornual, in a uterine sacculation, intramural, or cervical.

- **CERVICAL ECTOPIC:** A rare occurrence (1:16,000). Risk factors include previous uterine curettage. Cervical ectopics carry high morbidity and mortality rates and attempts to evacuate the uterus can cause massive hemorrhage. Total hysterectomy may be required if methotrexate treatment fails.

- **ABDOMINAL PREGNANCY**
  Rarely, a conceptus may leave the pelvis and implant in the peritoneum.

**CLINICAL FINDINGS:** no specific findings are diagnostic for ectopic pregnancy. Common signs that should cause suspicion include:

- **Positive pregnancy test**
- Abnormal rate of rise of serum hCG levels as expected for dates
- Palpation of an adnexal mass (in the presence of a positive serum hCG is highly suspicious)
- Pelvic pain or bleeding within 1 - 8 weeks following the first missed menstrual period
- Leukocytosis or slight fever
- Pain referred to the shoulder caused by intraperitoneal hemorrhage
Chapter 3: First Trimester Pregnancy

SONOGRAPHIC FINDINGS:
- Identification of an extrauterine GS with yolk sac is pathognomonic for ectopic pregnancy
- Empty uterus. An intrauterine GS should be identified with EV sonography when the serum hCG levels reach 800 - 1000 mIU/ml (2IS)
- Presence of an adnexal mass
- Free fluid in the cul-de-sac, adnexae or pericolic gutters
- Statistically, a viable gestation implanted normally within the endometrial cavity excludes ectopic. There is a 1 in 30,000 chance of concomitant intra and extra uterine implantations (heterotopic pregnancy) in a normal population. There is a 1 in 7,000 chance in patients undergoing ovulation induction.
- Presence of an endometrial decidual reaction

PITFALLS:
- Presence of endometrial fluid "pseudogestational sac." Absence of the double sac sign eliminates this pitfall
- Misidentification of a corpus luteum cyst as an adnexal ectopic

DIAGNOSIS (EV DOPPLER CRITERIA)
- "Ring of fire" surrounding gestational sac
- Presence of high velocity, low-resistance spectral waveform indicated typical trophoblastic flow patterns, but this may be mimicked by flow at the margins of a corpus luteum cyst
SONOGRAPHIC FINDINGS (ABDOMINAL ECTOPIC):
- *Absence of myometrium surrounding the pregnancy*
- *Poor visualization of placenta*
- Usually diagnosed later in gestation
- Presence of an empty uterus separate from the developed fetus
- Oligohydramnios
- Unusual fetal presentation

Abdominal pregnancy. A 19-week fetal head is seen in a deep position in the LUS. The empty uterus is seen anterior to the intact gestation.

OTHER DIAGNOSTIC PROCEDURES
While sonography has become the primary diagnostic modality in examining patient with suspected ectopic pregnancy, it can fail. When sonographic findings are inconclusive, other diagnostic procedures may be performed. They include:
- **Culdocentesis**: may reveal free blood in the cul-de-sac
- **Laparoscopy**: allows for direct visualization and analysis of adnexal and intra-abdominal masses.
- **Exploratory Laparotomy**: is used less frequently but allows for a definitive diagnosis
Chapter 3: First Trimester Pregnancy

Abortion is the termination of a pregnancy prior to 20 weeks of gestation. Spontaneous abortion (SAB) usually occurs 1 - 3 weeks after embryonic death. Approximately 12% of all pregnancies end in spontaneous abortion with 75% occurring before the 16th week. While the cause of SAB frequently cannot be determined in an individual patient, etiologies include: endocrine factors, failure of the corpus luteum, maternal Mullerian defects, interruption of embryonic development and specific chromosomal causes.

Pathologically, SAB begins with hemorrhage into the decidua basalis. Inflammation and necrosis occur around the region of implantation with subsequent detachment of the conceptus. Uterine contractions and expulsion of intrauterine contents occur through a dilated cervix. Missed abortion occurs when some of the products of conception remain and there may be organization of the blood clot surrounding the conceptus.

**Complete Abortion**
Evacuation of all products of conception.

**CLINICAL SIGNS:**
- **Rapid decline in hCG levels**
- Vaginal bleeding with presence of tissue/clots
- Cramping
- Cessation of pain and brisk bleeding after conceptus has been passed
- Disappearance of symptoms of pregnancy

**SONOGRAPHIC FINDINGS:**
- Empty uterus with "clean" endometrial stripe
- Moderate to bright endometrial echoes
- Presence of trophoblastic Doppler waveforms surrounding the endometrium normally persist for 3 days post SAB

**Incomplete Abortion**
Partial evacuation of products of conception. Diagnosed early after the clinical event.

**CLINICAL SIGNS**
- Slow fall or plateau of hCG levels
- Moderate cramping
- Persistent, heavy bleeding

Illustrated Review of OB/GYN Sonography
Jim Baun
SONOGRAPHIC FINDINGS:

- Presence of complex collection of echoes within endometrium due to air bubbles or retained bony fragments
- Persistence of trophoblastic waveforms near the endometrial cavity after 5 days post abortion

**Missed Abortion**

The presence of an embryo within the uterus without evidence of cardiac activity. May be retained for months following the embryonic demise. Occurs more commonly in the second trimester.

CLINICAL SIGNS:

- hCG levels less than expected for dates
- Loss of symptoms of pregnancy
- Decrease in uterine size
- Brownish vaginal discharge without frank bleeding

SONOGRAPHIC FINDINGS:

- Presence of a gestational sac with or without a fetal component
- Absence of fetal cardiac activity or limb motion
- Acoustic shadowing arising from the endometrium indicating the presence of air bubbles or calcified fetal parts
- Fetal size less than expected for dates
- Uterus smaller than expected for dates

**Threatened Abortion**

A condition in which the future of the pregnancy may be in jeopardy but the pregnancy continues.

CLINICAL SIGNS:

- Closed cervix
- Slight bleeding or cramping

DIAGNOSIS: Not able to diagnose sonographically
**Inevitable Abortion**

SAB is imminent when any of two or more of the following clinical signs are noted:
- Moderate effacement of the cervix
- Cervical dilatation > 3cm
- Rupture of membranes
- Bleeding for more than 7 days
- Persistent cramping

**Sonographic Findings:**
- Gestational sac identified in the cervix or lower uterine segment (distinguished from a cervical ectopic using Doppler)
- Cervical dilatation
- Sonolucent crescent surrounding the gestational sac

**Anembryonic Pregnancy**

The presence of a gestational sac in the uterus in which an embryo has failed to develop or died at a stage too early to be visualized. Formerly known as "Blighted Ovum."

**Clinical Findings:**
- Uterus small for dates
- Variable hCG levels. Rise normally then plateau or fall
- Vaginal spotting
- Closed cervix

**Sonographic Findings:**
- No identifiable embryo in a GS of 25 mm or larger
- Absence of double sac sign
**Gestational Trophoblastic Disease**

A spectrum of pathologic entities resulting from the excessive proliferation of trophoblastic tissue. While GTD most commonly occurs during or shortly after intrauterine implantation of a fertilized ovum, it can occur months to years after any type of pregnancy.

**Etiology**

Paternal genomes control the proliferation of trophoblastic tissue. Maternal genomes control the growth of the embryo. Excessive paternal genetic material resulting from duplicated chromosome in the sperm, lack of chromosomes in the ovum or fertilization of a single ovum by two spermatozoa may be the cause of GTD.

**Clinical Findings:**
- Grossly elevated hCG levels
- Hyperemesis gravidarum
- Rapid enlargement of the uterus
- Expulsion of vesicles
- Uterine bleeding in the first trimester
- Absence of fetal heart tones
- Theca lutein cysts (also caused by multiple pregnancies)
- Onset of preeclampsia
- Hyperthyroidism

**Complete Hydatidiform Mole**

The most common form of GTD, molar pregnancy occurs 1:1500 in the USA and 1:82 in Taiwan. There is a 5% risk of recurrence, and up to 20% of complete moles develop persistent disease requiring additional therapy. Risk factors include:
- Under 20 and over 40
- Of low economic status
- Whose diets are deficient in protein and folic acid

**Pathology:** The chorionic villi in complete moles are diffusely hydropic and are enveloped by hyperplastic and atypical trophoblasts. No identifiable embryonic or fetal tissue is present.
SONOGRAPHIC FINDINGS:
First trimester:
- Filling of endometrial cavity with echogenic, mostly homogenous material
- Presents a vesicular appearance
- May be fluid collections surrounding molar mass
- Appearance may mimic degenerating myoma
- Adnexal theca lutein cysts

Second trimester:
- Filling of endometrial cavity with areas of sonolucency surrounded by areas of mixed echogenicity
- Increased uterine size
- Adnexal theca lutein cysts

**PARTIAL MOLE**
Incomplete degeneration of the conceptus into trophoblastic tissue.

**PATHOLOGY:** Two types of chorionic villi are found in partial moles. While some appear relatively normal, others have hydropic swelling (trophoblastic hyperplasia). Fetal and/or embryonic tissue is frequently identified. These fetuses, however, typically exhibit the malformation of triploidy including syndactyly, hydrocephalus, and intrauterine growth retardation (IUGR).

**SONOGRAPHIC FINDINGS:**
- Focal or diffuse areas of increased echogenicity in or about the placenta
- When coexisting fetal tissue is present, the diagnosis is virtually certain
- Grossly abnormal fetus (triploidy malformations)

**MOLE WITH COEXISTING FETUS**
Falls outside the realm of true GTD. Theoretically, two conceptions occur; one develops normally, one develops into GTD. A rare occurrence.

**PATHOLOGY**
The concurrent presence of a normally developing gestation with some type of GTD.
**SONOGRAPHIC FINDINGS:**
- Similar to partial mole
- *Fetus usually has a normal karyotype*

**Invasive Mole**
Also called **CHORIOADENOMA DESTRUENS**. Occurs in 2-5% of all cases of gestational trophoblastic neoplasia. Believed to follow hydatidiform mole in 50% of the cases. 25% follow term pregnancy. 25% follow therapeutic abortion.

**PATHOLOGY:** Defined as invasive mole, which invades the myometrium or adjacent structures. May penetrate the uterine wall and cause uterine rupture and hemoperitoneum. Microscopic findings are the same as in hydatidiform mole. **Considered the malignant, non-metastatic form of GTD.**

**SONOGRAPHIC FINDINGS:**
- Presence of focal or diffuse echogenic material within the endometrial cavity
- May be seen extending into myometrium
- Irregular, sonolucent areas may be seen surrounding trophoblastic tissue
- Adnexal theca lutein cysts

**Choriocarcinoma**
Accounts for 5% of all gestational trophoblastic neoplasia. Arises in 5% of patients with previously existing molar pregnancy. May arise following ectopic pregnancy.

**PATHOLOGY:** A pure epithelial tumor composed of syncytiotrophoblastic and cytotrophoblastic cells. Microscopic examination reveals the absence of villi and sheets or foci of trophoblasts are identified on a background of hemorrhage and necrosis. May metastasize to the lung, brain, liver, bone, GI tract and skin. **Considered the malignant, metastatic form of GTD.**
SONOGRAPHIC FINDINGS:
- Elevated hCG in non-pregnant patient
- Enlarged uterus
- Eccentrically situated irregular, complex mass

PERSISTENT TROPHOBLASTIC NEOPLASIA

A complication of pregnancy that most commonly follows GTD, but can also (uncommonly) occur after normal term delivery, spontaneous abortion, or even ectopic pregnancy, is that of persistent trophoblastic neoplasia (PTN). Severe degrees of trophoblastic proliferation are at highest risk for PTN; lowest risk is associated with partial molar pregnancy (only 5% of cases). Invasive mole and choriocarcinoma are discussed above.
**Quick Quiz**

Time: 5 minutes

1. The occurrence rate for hydatidiform mole in the United States most closely approximates:
   a. 1 : 1500
   b. 1 : 500
   c. 1 : 200
   d. 1 : 20,000

2. All of the following conditions are associated with an elevated serum β hCG except:
   a. ectopic pregnancy
   b. incorrect dates
   c. hydatidiform mole
   d. chorioadenoma destruens
   e. multiple gestations

3. Fusion of the amniotic and chorionic membranes is usually complete by:
   a. 6 weeks
   b. 8 weeks
   c. 10 weeks
   d. 16 weeks

4. A gestational sac is always seen using endovaginal sonography when the serum hCG levels reach:
   a. 800 - 1,000 mIU/ml (2IS)
   b. 800 - 1,000 mIU/ml (IRP)
   c. > 1800 mIU/ml (2IS)
   d. > 1800 mIU/ml (IRP)

5. The most common site of an ectopic implantation is in the:
   a. uterine cornu
   b. cervix
   c. ampullary portion of the fallopian tube
   d. ovary

6. Which of the following findings can definitively exclude the presence of an ectopic pregnancy?
   a. presence of an intrauterine pregnancy
   b. negative serum β hCG
   c. absence of trophoblastic flow patterns in the adnexa
   d. none of the above

7. A malignant, metastatic form of gestational trophoblastic disease is:
   a. hydatidiform mole
   b. chorioadenoma destruens
   c. cystadenocarcinoma
   d. choriocarcinoma
   e. thecoma