First trimester bleeding

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Causes

- Abortion
- Ectopic pregnancy
- Molar pregnancy (GTD)

Spontaneous abortion

Causes:

- Chromosomal abnormalities
- Defective implantation
- H Mole
- Fibroids
- Maternal infections
- Medical disorders - DM, HTN, etc
- Uterine abnormalities - septate/bicornuate/retroverted etc
- Environmental factors - smoking, alcohol
- Maternal age >30yrs
- Paternal factors
- Immunological
Spontaneous abortion

**Threatened abortion**

**Signs and symptoms:**
- Abdominal pain
- Vaginal bleeding - scant (spotting)
- Cervical os closed
- Uterus non tender

Ultrasound performed frequently to confirm viability

**Missed abortion**

**Signs and symptoms:**
- No abdominal pain
- No/minimal vaginal bleeding
- Cervical os closed
- Uterus smaller

Ultrasound - Non viable fetus

**Incomplete abortion**

**Signs and symptoms:**
- Severe abdominal pain
- Heavy vaginal bleeding
- Cervical os open
- Uterus tender
- Retained products of conception

- Static or slow decline in hCG
- Ultrasound shows RPOC

**Inevitable abortion**

**Signs and symptoms:**
- Severe abdominal pain
- Heavy vaginal bleeding
- Cervical os open
- Uterus smaller and/or tender
Inevitable abortion: Abortion in progress

Interstitial pregnancy

Blighted ovum
Impending abortion (in progress)

RPOC

Missed abortion
Spontaneous abortion

Complete abortion

Signs and symptoms:
- Diminishing or absent abdominal pain
- No vaginal bleeding
- Cervical os closed
- Uterus firm

Normal uterus on Ultrasound

Gestational trophoblastic disease

Hydatiform mole  Choriocarcinoma

Signs and symptoms:
- Exaggerated signs of pregnancy - high hCG
- Passage of vesicles
- Bleeding
- Larger than expected uterus

Complete H mole

Normal uterus on Ultrasound
Signs and symptoms:
- Approx 10-12 days after implantation
- Trophoblast heroes through the endothelium and the blastocyst
Ectopic pregnancy

- Defined as an extrauterine pregnancy
- Leading cause of pregnancy related mortality in the first trimester
  \textit{9\% of pregnancy related deaths}
- Incidence of 1.9\%
- John Bard described the first case with surgical outcome in 1759 in NY

Risk factors for Ectopic pregnancy

- Prior gynecologic infection
- Infertility
- Prior ectopic pregnancy
- History of intrauterine contraceptive device use
- Prior gynecologic surgery
- History of prior placenta previa
- In vitro fertilization (IVF)
- Congenital uterine or tubal anomalies
- Smoking
- Prior DES exposure

Clinical presentation

- Less than 50\% present with classic triad of pelvic pain, vaginal bleeding and amenorrhea
- Other symptoms include those of early pregnancy

Human Chorionic Gondaotropin (HCG)

- Glycoprotein hormone produced initially by the embryo during first week and later by syncytiotrophoblasts within the placenta
- Sustains progesterone production by the corpus luteum
- HCG levels peak at 9-11 weeks (30-100IU/mL)
- Declines to 5-10 IU/mL at week 20
Common locations of ectopic pregnancy

- 95% of ectopic pregnancies are **tubal**, occurring mostly in the isthmus or ampulla

Locations

- 95% tubal, 5% other
  - Ampulla (75-80%)
  - Isthmus (10-15%)
  - Fimbria (5%)
- Cornual region of uterine fundus (<5%)
- Ovary (<1%)
- Cervix (0.1%)
- Abdominal pregnancy - intraperitoneal surface or between the leaves of the broad ligament (0.03%)

Uterine findings of ectopic pregnancy

- Approximately 26% of patients have a normal pelvic ultrasound
- Thick decidual cast without a gestational sac
- Pseudogestational sac (10%): intrauterine fluid surrounded by thick decidual reaction
- Trilaminar endometrium
- Thin walled decidual cyst at junction of endometrium and myometrium

Extrauterine findings of ectopic pregnancy

- Adnexal mass containing yolk sac or embryo
- Tubal ring sign: hyperechoic ring surrounding gestational sac
- Ring of fire sign: peripheral hypervascularity surrounding gestational sac
- Pelvic free fluid in cul de sac
- Pelvic hemorrhage: 90% (+) predictive value
- Simple adnexal cyst
- Solid adnexal mass
Common findings in ectopic pregnancy

a. Tubal ring sign - 2nd most common finding
b. Pelvic hemorrhage
c. Pseudogestational sac
d. Extraovarian adnexal mass - Found in more than 89% patients with ectopic pregnancy on US

Tubal Ring Sign

Extraovarian mass with tubal ring sign (arrowheads) separate from left ovary (arrow)

Tubal ring sign: variable appearance

Mimics

Corpus luteal cyst
Ring of Fire Sign

Tubal pregnancy demonstrating Ring of Fire sign, with peripheral vascularity on color flow Doppler and low resistance high peak systolic velocity.

Pseudogestational sac

Comparison of pseudogestational sac (A) and intrauterine pregnancy (B) containing gestational sac, surrounded by thick hyperechoic layer (arrow heads - decidua capsularis).
Hemoperitoneum

Mimic: hemorrhagic cyst rupture

Mimic: Ovarian capsular artery bleed

IUD and ectopic
IUD and ectopic

- IUD does not increase the risk of ectopic pregnancy.
  
  *Contraception. 1995*

- IUDs are more effective in protecting from intrauterine rather than ectopic pregnancy.
  
  *Clin Exp Obstet Gynecol. 2008*

Interstitial/cornual pregnancy

- Implantation of gestational sac in intramural portion of proximal fallopian tube
- Rare, incidence of 2-4%
- Often early rupture and severe hemorrhage (>12 weeks)
- Associated with high mortality/morbidity

Interstitial pregnancy

- US criteria proposed by Timor-Tisch et al [1992]
  - Empty uterine cavity
  - Eccentric gestational sac located > 1 cm from lateral uterine wall
  - Myometrial mantle sign: Thin myometrial layer(< 5 mm) surrounding sac

Interstitial pregnancy (cont'd)

- Eccentrically located gestational sac (arrow) near fundus (Fu) - *Bulging sign*
- Interstitial line: echogenic line (arrow) extending from endometrium to gestational sac
- 80% sensitive, 98% specific
- Hypo echoic myometrium separating the ectopic sac from the endometrial canal
- 3D shows the sac in the interstitial portion of Fallopian tube.
Angular pregnancy

- IUP implanted eccentrically in one of the lateral angles/corners of uterine cavity
- Large broad based connection with endometrium
- Outer border surrounded by myometrium (>5mm)
- 3D ultrasound helpful to differentiate
- More likely to be viable

Angular versus Interstitial pregnancy

<table>
<thead>
<tr>
<th>IUP/Angular Pregnancy</th>
<th>Interstitial</th>
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<tbody>
<tr>
<td>Ectopic pregnancy implanted in the intramural portion of tube</td>
<td></td>
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<tr>
<td>Separated from endometrial canal by thin band of endometrium</td>
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<tr>
<td>Higher mortality rate due to possible rupture</td>
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</tbody>
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Cervical pregnancy

- US criteria proposed by Kung et al. [2004]
  - Gestational sac within cervix
  - Empty uterine cavity
  - Normal endometrial stripe
  - Hourglass uterine with bulging cervical canal
  - Active cardiac activity below internal os

Cervical pregnancy (cont’d)

- Comparison of gestational sac and abortion in progress
  - Gestational sac (black arrow) containing fetal pole within cervix (Image A and B)
  - Abortion in progress. Differentiated from cervical pregnancy by sliding sign - gestational sac (white arrow) that can be manipulated by transducer (Image C)
Management options for Cervical pregnancy

- Hysterectomy
- Methotrexate
- Uterine artery embolization

Dilation and curettage results in excessive hemorrhage

Scar pregnancy

- + h/o C Section
- Rare: 0.15%
- Implantation through sinus tract within anterior uterine wall created during prior surgery

Criteria for diagnosis
- Empty uterus and cervical canal
- Development of sac in anterior portion of lower uterine segment (large FOV on transabdominal views)
- Thinning of myometrium between bladder wall and gestational sac

Scar Pregnancy (cont’d)

Gestational sac containing fetal pole within anterior wall of uterus underlying scar (arrow) on grey scale (Image A) and power Doppler (Image B)

Scar pregnancy (cont’d)

- High risk for rupture, hemorrhage and mortality
- Treated with methotrexate or KCl injections
Ovarian pregnancy

- Retention and fertilization of ova within ovary
- Uncommon, incidence of 0.5-3.0%
- Criteria proposed by Spiegelberg [1978]
  - Empty uterine cavity
  - Serum B-HCG \( \geq 1000 \) IU/L
  - Atypical cyst or chorionic villi within ovary
  - Normal fallopian tubes
  - Normalized B-HCG following therapy
- US: Adnexal cyst within or adjacent to ovary with wide echogenic rim

Heterotopic Pregnancy

- Intra and extrauterine pregnancy
- Incidence of 1:30,000 in 1948
- Presently up to 1:7000 secondary to IVF
- Heterotopic pregnancy occur in 1:100 cases of IVF, particularly when multiple embryos are transferred to the uterus

Heterotopic Pregnancy (cont’d)

- Typically presents with hemorrhage
- Often diagnostic challenge
- Treated by ablation of ectopic pregnancy while permitting continuation of intrauterine pregnancy

Heterotopic Pregnancy (cont’d)

- Heterotopic pregnancy (HP), with gestational sac within the right ovary (arrowhead) and uterus (arrow)
- Post-surgical specimen of HP
Abdominal pregnancy most commonly results from:

a. Fertilization of ova dispersed from prior trauma or surgery
b. Rupture of tubal or ovarian pregnancy with peritoneal or intraabdominal implantation
c. In vitro fertilization
d. Post tubal ligation

Abdominal pregnancy

- Intraperitoneal implantation excluding tubal, ovarian or intraligamentous implantation
- Uncommon, incidence of 1:11,000
- Majority present with hemorrhage, often leading to mortality

With an elevated beta HCG, what is the next step in management after seeing the image below?

- Laparoscopy
- Computed tomography
- Abdominal Ultrasound
- Observation

Abdominal pregnancy

Transabdominal pregnancy demonstrated right lower quadrant abdominal mass containing a structure suggestive of a fetal head (Image A). Post-operative specimen (Image B) reveals non-viable fetal head.
32 y.o. female, positive IUP, 6wks 5 days clinical gestational age

Twin Adnexal Ectopic Pregnancy

Unilateral Twin Ectopic Pregnancy

Rare, 1:200 ectopic pregnancies
Risk factors
  Tubal surgery
  Conception after tubal ligation
  Fertility drugs
  Assisted reproductive technology

Indications for Methotrexate Therapy

• Ectopic size < 3cm
• Stable or rising HCG levels with peak values below 15000 IU/ml(IRP)
• No cardiac activity within gestational sac
• No active vaginal bleeding
• Ectopic pregnancy fully visualized during laparoscopy
Contraindications to Methotrexate

- Poor patient compliance
- Hepatic or renal disease
- Leukocyte count of < 3000 or platelet count of < 100,000.

Summary

- Ectopic pregnancy is the leading cause of mortality among first trimester pregnancies
- Mortality typically results from hemorrhage
- Classic triad of pelvic pain, vaginal bleeding and amenorrhea occurs in less than 50% of ectopic pregnancies
- Imaging is often needed to establish a diagnosis

Take home points

- An abnormally elevated beta-HCG without an intrauterine pregnancy should prompt search for an ectopic pregnancy
- Normal pelvic US are found in nearly one-third of ectopic pregnancies
- The most common location of an ectopic pregnancy is the fallopian tube
- Diagnostic criteria may improve specificity with US findings such as the tubal ring and interstitial line signs

Reference
