Video Case

Bleeding during pregnancy

- **Bleeding in early pregnancy (abortion)**
- **Bleeding in early pregnancy (ectopic pregnancy)**

Obstetric Hemorrhage :

- **Antepartum Hemorrhage**
- **Postpartum Hemorrhage**

→ Slides
→ Important
→ Golden notes
→ Extra
→ 439 Doctor's notes
→ 441 Doctor's notes
→ 441 Female Presentation
→ Reference

Reviewed By
RAAOUM M. JABOR

Video Case

Bleeding in Early Pregnancy (Abortion)

Objectives:

- → Define vaginal bleeding in early pregnancy.
- → List the differential diagnosis for bleeding in early pregnancy +/- abdominal pain.
- → Define spontaneous abortion and mention its incidence.
- → Mention and differentiate types of spontaneous abortion (missed , complete , incomplete, threatened , septic)
- → Discuss the maternal and fetal factors that result in abortion.
- → List the causes of spontaneous abortion .
- → Discuss treatment options for spontaneous abortion.

- → Slides
- → Important
- → Golden notes
- → Extra
- → 439 Doctor's notes
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Female Presentation

Video Case | Editing File

Spontaneous Abortion

Definitions

Spontaneous abortion (miscarriage)

- Loss of pregnancy **before 20 weeks'** gestation.
- It affects up to 20% of recognized pregnancies. A lot of women go unrecognized, they think it's their next period
- About 80% of spontaneous abortions occur in 1st 12 weeks.

- Note that medically the term abortion refers to miscarriage this differs from the terms elective therapeutic or induced abortions

Stillbirth / intrauterine fetal demise

- Loss of pregnancy **after 20 weeks'** gestation.

Early pregnancy bleeding

Early pregnancy bleeding is defined as bleeding that occurs **before 12 weeks' gestation.**

DDx of Bleeding in the first trimester (first 12 wks) + abdominal pain						
Non-viable intrauterine pregnancy		**Viable intrauterine pregnancy**			Extrauterine pregnancy / **Ectopic pregnancy**	
Molar pregnancy	**Spontaneous abortion**	Threatened abortion	**Physiologic implantation bleeding**	Subchorionic Hemorrhage	Unruptured	Ruptured

Causes of early pregnancy bleeding

Fetal causes

- **First trimester abortion :**
  - **Cytogenetic etiology**: the most common cause of spontaneous abortion in the first trimester is chromosomal abnormalities.
    - 50% of recognized early spontaneous abortion are attribute to chromosomal abnormality, most of them trisomies.

- **Second trimester abortion :** less likely to be chromosomal abnormality
  - **Abnormal placentation**

Spontaneous Abortion

Maternal causes

- **Increased maternal age** (>35 called Advanced maternal age), smoking and alcohol will increase the risk of chromosomal abnormalities then to spontaneous abortion.
- **Abnormalities of the reproductive organs** (**second trimester** miscarriage)
  - **Cervical incompetence**
  - **Congenital abnormal uterus**, ex Septate uterus
  - **Uterine leiomyomas / fibroids** : especially submucous fibroid
  - **Uterine adhesions**
- **Systemic diseases** (**second trimester** miscarriage)
  - Including diabetes mellitus, hyperthyroidism, hypothyroidism, genetic disorders, infections, hypercoagulability (e.g., antiphospholipid syndrome, which is associated with recurrent miscarriage).
    - **Antiphospholipid syndrome** : Ex. systemic lupus erythematosus , SLE produce antibodies against their own vascular system and fetoplacental tissues. **Treatment is** subcutaneous heparin
- Psychological stress.
- **Less well-defined causes include**:
  - History of spontaneous abortion
  - Having an IUD placed.

Note that caffeine consumption, sex and exercise are not risk factors for miscarriage

Miscellaneous causes

- Trauma
  - Domestic violence
- Iatrogenic (e.g., amniocentesis or chorionic villus sampling)
- Environmental (exposure to toxins such as drugs)
- Unknown

Diagnosis and Investigation :

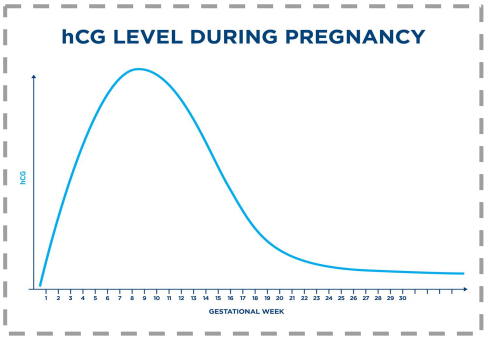
- **1- Pelvic examination** should be performed in all cases of vaginal bleeding. In cases of suspected spontaneous abortion, visualization of the **cervix** is necessary to confirm that the source of bleeding is uterine. Feel the internal os to see if it is open or closed.
  - **Speculum exam** is essential to rule out vaginal or cervical lesions that are causing bleeding.

When a patient presents with first trimester, vaginal, bleeding and abdominal pain it is essential to determine the location of the pregnancy by US

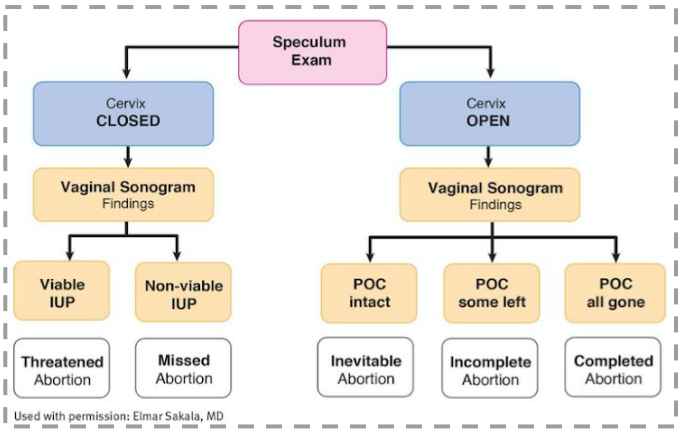
- **2- Ultrasound** is the **best imaging test** once there is absence of fetal cardiac activity or confirmed uterine bleeding.
  - **The time of identification of the following structures by transvaginal US (MCQs) :**
    - **Gestational sac** at → 4.5-5 weeks of EGA
    - **Yolk sac** at → 5-6 weeks of EGA
    - **Fetal pole** at → 5.5-6 weeks of EGA
    - **cardiac activity** at → 6-7 weeks of EGA

Spontaneous Abortion

- **3- B-hCG :** The pregnancy test detects human chorionic gonadotropin in the serum or the urine.
  - The hCG molecule is first detectable in serum 6-8 days after ovulation.
    - A titer of less than 5 IU/L is considered negative.
    - A titer of more than 25 IU/L is a positive result.
    - Values between 6 and 24 IU/L are considered equivocal, and the test should be repeated in 2 days.



  - **Rule of 10s:** Beta - HCG peaks at approximately **10th** week of EGA at approximately **100.000** then it decreases **at term** at about **10.000**
  - B-HCG should **rise 50% in 48 hours (normally)** in early pregnancy, A downtrending **B-hCG** in early pregnancy is consistent with a failed pregnancy.



POC = Products of conception **Products of conception** is a medical term used to identify any tissues that develop from a pregnancy.

IUP = An intrauterine **pregnancy**

Ultrasound / Sonography	
Vaginal sonogram	**Abdominal sonogram**
IUP can be seen on 5 weeks' gestation	IUP will not consistently be seen until 6 weeks' gestation.
β-hCG will exceed 1500 mIU to see it (discriminatory zone)	β-hCG threshold is 6500 mIU to see it (discriminatory zone)
So, **Transvaginal ultrasound and Serial of beta-HCG values give us diagnostic information to help us make diagnosis**	

- Hysterosalpingogram = most useful investigation in >3 consecutive 2nd trimester abortions

Types of abortion : MCQ

	Opened Cervix (internal OS)	Closed Cervix (internal OS)
Products passed	**Incomplete abortion**	**Complete abortion**
Products didn't pass	**Inevitable abortion**	**Missed abortion** **Threatened abortion**

The phases of abortion :

- → **threatened abortion** (50% of these pregnancies will continue to term successfully), other 50% will continue to:
  - → **Inevitable abortion,** then to → **incomplete abortion,** then to → **complete abortion .**

Types of Abortion

Type	Definition and Diagnosis	Management
Missed abortion	There's been a fetal demise usually for a number of weeks (usually more than 6 wks). • **Fetus is dead** ○ U\S: no fetal heartbeat, empty sac. • **Cervix is closed** • **No passage of content** • Brownish discharge (spottings mostly). • Gradual disappearance of pregnancy signs and symptoms.(Loss of breast tenderness, N/V) • Pregnancy test may remain +ve for 3-4 wks.	
Threatened abortion	Viable Pregnancy is complicated by vaginal in absences of other explanations (Often the cause is implantation bleeding). • **Fetus is alive** ○ U\S :Intact gestational sac with normal fetal heart motion • **Cervix is closed** • **No passage of content** • Mild bleeding. • Mild lower abdominal dull ache pain.	Observation and **reassurance** / Conservative : Symptoms will resolve or progress to inevitable abortion. According to doctor : Bed rest and progesterone has nothing to do to prevent abortion
Inevitable abortion	• **Fetus is dead** • **Cervix is open.** • **No passage of tissue.** Products are felt in cervical canal. • Heavy bleeding with clots. • Severe lower abdominal cramp pain. • Uterus is smaller than the gestational age	

Cont ..

Spontaneous Abortion

Type	Definition and Diagnosis	Management
Incomplete abortion	Usually occurs **>12 Week** gestation • Fetus is dead • Cervix is open. • Passage of some tissue , Often described by the woman as looking like **pieces of skin or liver.** ○ U\S: retained products of conception. • Heavy bleeding with clots. • Severe lower abdominal cramp pain. • Uterus is smaller than the gestational age	
Complete abortion	Usually occurs **>12 Week** gestation • Fetus is dead • **Cervix is closed.** • **Passage of all tissue** , without the need for any intervention ○ U\S: no intrauterine contents or debris. • Heavy bleeding with clots then abate > stop • Severe cramp pain then abate > stop • Uterus is smaller than the gestational age • Pregnancy symptoms abate (Pregnancy test becomes -ve).	No intervention needed

Treatment options of spontaneous abortions?

Management of **uncomplicated** Inevitable abortion, incomplete abortion, or missed abortion depends mostly on patient preference.

It is important to provide appropriate **support** for this process.

Conservative

for all types of abortion (except complete and threatened and septic) :
If the pt hemodynamic stable **wait and watch carefully** for 4 and sometimes to 6 weeks, after that risk of Disseminated intravascular coagulation and septic abortions are high.

if she didn't do it by herself ? induce it medically

Spontaneous Abortion

Treatment options of spontaneous abortions cont.

Medical

By misoprostol: it's a prostaglandin analogue used to induce labour.

Surgical

Indicated for **septic abortion**, **heavy bleeding**, or if there are maternal comorbidities.

- First trimester:
  - **Manual vacuum aspiration in clinic.**
  - **Dilatation and curettage (D&C) in OR.**
    - After the D&C, we always give Abx (because we inserted a foreign body that may cause endometritis
- Second trimester:
  - **Dilation and evacuation**

Remember that if a patient is Rh negative she will need a RhoGAM injection to protect agonist isoimmunization in future pregnancies

Complications of spontaneous abortions?

1. **Hemorrhage** → If a patient presents with heavy vaginal bleeding with retained products of conception then a Surgical evacuation should be performed .

2. **Endometritis** → Should be treated with oral antibiotics. (Gentamicin, to cover gram -ves)

3. **Septic abortion** → An infection of the placenta and fetus before 20 weeks' gestation which is inevitably associated with fetal death
   - **Caused by:**
     - Delay evacuation
     - Incomplete surgical evacuation
   - **Signs and symptoms** :
     - Fever and Chills
     - Lower abdominal discomfort
     - Foul vaginal discharge
   - **Treatment :** Women who present with septic abortion need emergency treatment with **high-dose antibiotic therapy** (ampicillin, gentamicin) and **surgical evacuation** of the uterine.

Teaching case

A 32 year-old G1 woman presents with a positive urine pregnancy test at 9 weeks 4 days from start of last normal menstrual period. She reports 5 days of moderate painless vaginal bleeding and chills. Physical examination shows a temperature of 101.5° orally, pulse 95, and BP 95/60 with normal bowel sounds, no rebound, and 5/10 suprapubic tenderness. Pelvic exam shows moderate amount of blood in vagina with a closed 5/10 tender cervix and an 8/10 tender uterus. No adnexal masses or tenderness.
Lab data shows a serum β-hCG level of 6,500 mIU/ml and ultrasound shows a gestational sac in the uterus with no fetus seen. The ovaries and tubes appear normal.

Q1: what are the different types of spontaneous abortion?

- Threatened abortion (baby is alive but patient is bleeding, what to do? Conservative (may be physiological bleeding)
- Incomplete abortion
- Inevitable abortion
- Complete abortion
- Missed abortion
- Septic abortion
- Recurrent abortion

Q2: which type or types is most likely in this case and why?

- **Septic abortion** Because she has: Fever, Tenderness, Hypotension and Tachycardia.
  +no fetus is seen in the uterus

Q3: why does this patient have a fever and tenderness and what needs to be done about it?

- The fever originates from infected **non-viable products of conception.** The patient needs immediate evacuation of the uterus and **antibiotics** in order to prevent worsening infection, sepsis and possible septic Shock.

Q4: If this patient was 6 weeks pregnant with no fever or tenderness, had an b-hCG level of 700 mIU/ml and a negative ultrasound with no evidence of a gestational sac, what would be your differential diagnosis if she had a small amount of bleeding and no fever or tenderness?

- **The first diagnosis to exclude would be ectopic pregnancy.** A closed cervical os could indicate either a threatened abortion with a gestation which was so early that it could not be visualized on ultrasound or completed abortion in which the products of conception have already passed though this is less likely given the small amount of bleeding she has had. A missed abortion occurs when the patient is asymptomatic but has a non-viable pregnancy, as diagnosed by falling β-hCG levels or ultrasound imaging.

Teaching case

Q5 How would you make the diagnosis is question 4

- If no intrauterine gestational sac can be seen on ultrasound, order serial beta β-hCGs since the initial B-HCG level is too low for ultrasound to show an intrauterine pregnancy (IUP) (which usually is seen onvaginal ultrasound at 1500-2000 mIU/ml β-hCG). If this is a viable intrauterine pregnancy, the β-hCG level usually will increase at least 66% when repeated in 48 hours. If it does not, then a viable intrauterine pregnancy is unlikely. If the patient is stable, repeated quantitative β-hCG levels can be performed and followed until negative. Diagnostic D&C can be performed as well once viable IUP has been ruled out.Once a diagnosis of ectopic or abnormal intrauterine pregnancy is confirmed, appropriate treatments can be implemented.

Q6 For a patient with any type of abortion, what blood test is essential to do?

- **Blood typing for Rh factor is essential followed by RHoGAM injection if patient is Rh negative.** This is vital to prevent Rh sensitization in a subsequent pregnancy.
- CBC, Hb levels to assess for possible anemia
- Check Rubella status (to reduce the incidence of Rubella Syndrome)

Q7 What are the causes of spontaneous abortion?

- **Fetal chromosomal abnormality** (the most common in the first trimester), Possible causes include infection, uterine malformation (septate uterus), immunologic dysfunction, diabetes, thyroid disease, subclinical infection, trauma, as well as teratogenic or environmental exposures. (these mostly are the causes in the second trimester)

Q8 What are the Treatment options for spontaneous abortion?

- For incomplete, inevitable and missed abortions, management may include **expectant, medical or surgical** management. **We start with** Medical management with prostaglandins, or expectant management it may be associated with bleeding and still require surgical evacuation.if it's failed we will move to **Surgical management with dilation and curettage or manual vacuum aspiration which is more definitive.**

Approach of Bleeding in Early Pregnancy

1- +ve pregnancy test

2a- History :
Gestational age - Pain - Amount and color of the bleeding - Is there clots? Indicate heavy bleeding - Tissue passage - Discharge - Fever and NV ? indicate infection

2b- Past medical history:
Prior history of abortion, ectopic pregnancy or PID - is there sexual intercourse before bleeding in last 3 days ? Dilated blood vessel in cervix in pregnancy - trauma - chronic diseases - medications - IUD : increase the risk if she got pregnant on it - IVF - Rh status

3- Physical examination: speculum to see if cervix open or closed

- **Opened cervix :** abortion (incomplete, inevitable)
- **Closed cervix:** Normal , ectopic or abortion (complete, missed , threatened)

4- CLosed cervix : DO **ultrasound** to see gestational sac and its location

No sac seen in US
Pregnancy of unknown origin

Sac seen in US

Abnormal sac site :
ectopic pregnancy

Normal sac site :
Intrauterine pregnancy
Then look for other character : cardiac motion .....

5- serum hCG titers

< Upper limit in discriminatory zone with no intrauterine pregnancy on repeat US

≥ Upper limit in discriminatory zone with no intrauterine pregnancy on repeat US
Normally if reach this limit, Sac should appear in US

6- Repeat it after 48 hours

Ectopic pregnancy

Abnormal intrauterine pregnancy

Increased

Decreased

Not a viable pregnancy
(Abortion or ectopic pregnancy)
7- Repeat hCG until undetectable

Normal Increased :
more than 50 % from previous value

Abnormal Increased :
less than 50 % from previous value

7- Repeat it after 48 hours

Dr's notes 441

- Anti-d : We give it in women with Rh-ve and his husband Rh+ve
  - After abortion
  - In week 28 in pregnancy
  - After delivery in 72h.

- **What will happen in the next pregnancy if the mother is Rh-ve and her previous babe was Rh+ve if the mother didn't receive Anti-D (Rhogam)?**
  The fetal blood RBCs will be attacked resulting in anemia (hemolytic anemia) which might lead to death and The mother may bleed

- First trimester most common cause of abortion -> chromosomal abnormalities + Increased maternal age (>35)
- Second trimester most common cause of abortion -> cervical insufficiency

- **How to approach a married women that used to have regular periods, she came complaining of abnormal vaginal bleeding?**
  - **Confirm pregnancy**
  - **Take Hx:**
    1-nature of the blood (when did it start? Is it postcoital? Trauma? After exercise? Spottings? Tissue passage?)
    2-Symptoms of pregnancy (N/V...)
    3-Rh grouping
    4-LMP
  - **Physical examinations:**
    - 1-vitals
    - 2-Abdominal examination
    - 3- Speculum (rule out cervical/vaginal bleeding causes)
  - **Bedside scan** (check if there's an intrauterine pregnancy)
    - **when is an intrauterine pregnancy seen?** 4-5 weeks
  - **Serial B-HCG**

- **A pregnant women came to the ER with Spottings, she is supposed to be 7 weeks pregnant based on LMP, when we did a bedside scan we couldn't appreciate any fetal cardiac activity (non viable pregnancy), and when we measured the CRL (for GA specially in the first trimester) the results were = to 4 weeks (Baby has been non viable for the past 3 weeks). What is your next step?/What is your management options?**
  1- Conservative: We can wait up to 4 weeks) for the fetus to spontaneously abort if the patient is stable, after that we will need to admit the patient and start her on misoprostol
  2- Medical (misoprostol)
  3- Surgical: D&N (mostly for uncontrolled bleeding + septic abortions)

Online meded notes

- Threatened abortion may be reversed by putting the patient on bedrest.
- How do we decide what phase of abortion is the mother at?

- **Depending on:**
  - Passage of contents
  - Cervical os
  - Ultrasound

	Passage of contents	OS	U/S
IUP	no	closed	Live baby
Threatened **Patient will have vaginal bleeding**	no	closed	Live baby
Inevitable	no	open	Dead baby
Incomplete	yes	open	Retained parts
Complete	yes	closed	Nothing

- **Missed abortion is managed by:**
  - Misoprostol (first trimester)
  - Oxytocin
  - If U/S shows remaining contents D+C can be done

Summary

<table>
<tr><th></th><th>Threatened</th><th>Missed</th><th>Inevitable</th><th>Incomplete</th><th>Complete</th></tr>
<tr><td>Bleeding</td><td colspan="2">Spotting</td><td colspan="3">Heavy bleeding</td></tr>
<tr><td>Pain</td><td>Mild</td><td></td><td colspan="3">Sever</td></tr>
<tr><td>OS</td><td colspan="2">Close</td><td colspan="2">open</td><td>Close</td></tr>
<tr><td rowspan="2">Fetus state</td><td rowspan="2">Live fetus</td><td colspan="4">Dead (nonviable pregnancy = no fetal heart beats)</td></tr>
<tr><td>Fetus has dead but retained in uterus</td><td>Product are felt in cervical canal</td><td>Retained product</td><td>Uterine empty cavity</td></tr>
<tr><td>Passage of content</td><td colspan="3">No</td><td colspan="2">Yes</td></tr>
</table>

Reference

inspection of the skin. During the breast examination, clinicians **should initiate discussion about breast-feeding.** A pelvic examination should be performed, and the appearance and length of the cervix and the status of the last **Papanicolaou (Pap) smear should be documented, or a new Pap smear obtained.**

Prenatal laboratory testing should be undertaken as outlined in Table 7-1 if not done during preconception care. Screening for, and treatment of asymptomatic bacteriuria significantly reduces the risk of pyelonephritis and preterm delivery.

Women who are Rh negative should receive $Rh_0(D)$ immune globulin (Rh_0-GAM) at 28 weeks' gestation and postpartum, and at any point of care when sensitization may occur (e.g., threatened abortion or invasive procedures such as amniocentesis and chorionic villus sampling [CVS]). **Rubella vaccination is contraindicated during pregnancy,** and pregnant women who are found to be seronegative should be vaccinated immediately postpartum. **Testing for syphilis is mandated by law in virtually all states.** Early diagnosis and treatment of syphilis can reduce perinatal morbidity. Women who test negative for **hepatitis B surface antigen** and are at high risk for hepatitis B infection (e.g., health care workers) are candidates for vaccination before and during pregnancy. Infants born to women who test positive for hepatitis B surface antigen should receive both hepatitis B immune globulins (HBIG) and hepatitis B vaccine within 12 hours of birth, followed by two more injections of hepatitis B vaccine in the first 6 months of life. With the increasing incidence of whooping cough (pertussis) and serious complications in young children, secondary vaccination with Tdap (tetanus, diphtheria and acellular pertussis) vaccine should be given, ideally between 27 and 36 weeks of pregnancy.

Voluntary and confidential **human immunodeficiency virus (HIV) counseling and testing** should be offered and documented in the medical record. Diagnosis and treatment significantly reduce the risk of vertical transmission. Other tests such as screening for sexually transmitted infections (STIs) like **gonorrhea and chlamydia are generally considered routine.** All pregnant women at high risk for **tuberculosis** (TB) should be screened with a purified protein derivative (PPD) skin test when they begin prenatal care. For women who have received BCG (bacillus Calmette-Guérin) immunization (which can cause a positive test in the absence of TB), a blood test is available called the Interferon Gamma Release Assay (IGRA). A positive test implies that the person has been infected with TB bacteria. HIV and other perinatal (TORCH) infections are also discussed in Chapter 22.

Additionally, the clinician should use the first prenatal visit to confirm pregnancy and determine viability, estimate gestational age and due date, diagnose and deal with early pregnancy loss, provide genetic counseling and information about teratology, and provide advice on alleviating unpleasant symptoms during pregnancy. Information about nutrition, behavioral changes to expect, and the benefits of breastfeeding should be provided as prenatal care progresses. **Clinical pelvimetry should be performed sometime before labor begins** (see Chapter 8).

Confirming Pregnancy and Determining Viability

About 30–40% of all pregnant women will have some bleeding during early pregnancy (e.g., **implantation bleeding**), which may be mistaken for a period. Therefore, a pregnancy test should be performed in all women of reproductive age who present with abnormal vaginal bleeding.

The pregnancy test detects human chorionic gonadotropin (hCG) in the serum or the urine. The most widely used standard is the First International Reference Preparation (1st IRP). The hCG molecule is first detectable in serum 6 to 8 days after ovulation. A titer of less than 5 IU/L is considered negative, and a level above 25 IU/L is a positive result. Values between 6 and 24 IU/L are considered equivocal, and the test should be repeated in 2 days. A concentration of about 100 IU/L is reached about the date of expected menses. Most qualitative urine pregnancy tests can detect hCG above 25 IU/L.

It is important to differentiate a normal pregnancy from a nonviable or ectopic gestation. In the first 30 days of a normal gestation, the level of hCG doubles every 2.2 days. In patients whose pregnancies are destined to abort, the level of hCG rises more slowly, plateaus, or declines.

The use of transvaginal ultrasonography has improved the accuracy of predicting viability in early pregnancies. Using transvaginal ultrasonography, the gestational sac should be seen at 5 weeks' gestation or a mean hCG level of about 1500 IU/L (1st IRP). The fetal pole should be seen at 6 weeks or a mean hCG level of about 5200 IU/L. Fetal cardiac motion should be seen between 6 and 7 weeks or a mean hCG level of about 17,500 IU/L. **The presence of a gestational sac of 8 mm (mean sac diameter) without a demonstrable yolk sac, 16 mm without a demonstrable embryo, or the absence of fetal cardiac motion in an embryo with a crown-rump length of greater than 5 mm indicates probable embryonic demise.** When there is any doubt about these measurements, it is best to repeat the evaluation in 1 week before terminating the pregnancy. Using pulse wave Doppler of the heart to determine heart rate is not recommended.

INCIDENCE OF EARLY PREGNANCY LOSS

Because the incidence of conception is unknown, the incidence of spontaneous abortion (miscarriage)

cannot be determined with certainty. **Spontaneous abortion occurs in 10–15% of clinically recognizable pregnancies.** The term ***biochemical pregnancy*** refers to the presence of hCG in the blood of a woman 7 to 10 days after ovulation but in whom menstruation occurs when expected. In other words, conception has occurred, but spontaneous loss of the gestation takes place without prolongation of the menstrual cycle. When both clinical and biochemical pregnancies are considered, evidence would suggest that **more than 50% of all conceptions are lost, the majority in the 14 days following conception.**

Real-time ultrasonography has been used extensively to monitor the intrauterine events of the first trimester of pregnancy. **If a live, appropriately growing fetus is present at 8 weeks' gestation, the fetal loss rate over the next 20 weeks (up to 28 weeks) is in the order of 3%.**

TYPES OF SPONTANEOUS ABORTION

The terms and definitions in the remainder of this chapter refer only to clinically recognizable pregnancies.

Threatened Abortion

The term ***threatened abortion*** **is used when a pregnancy is complicated by vaginal bleeding before the 20th week.** Pain may not be a prominent feature of threatened abortion, although a lower abdominal dull ache sometimes accompanies the bleeding. Vaginal examination at this stage usually reveals a closed cervix. Approximately one-third of pregnant women have some degree of vaginal bleeding during the first trimester, and **25–50% of threatened abortions eventually result in loss of the pregnancy.** Current research suggests that there is a continuum of risk between threatened abortion and preterm birth. Thus, the use of ultrasound to assess the location of the placenta and the length of the cervix may provide a baseline to help assess changes after 20 weeks, and may help formulate a plan of management to prevent early preterm birth (see Chapter 12).

Inevitable Abortion

In the case of inevitable abortion, **a clinical pregnancy is complicated by both vaginal bleeding and cramp-like lower abdominal pain.** The cervix is frequently partially dilated, contributing to the inevitability of the process.

Incomplete Abortion

In addition to vaginal bleeding, cramp-like pain, and cervical dilation, an incomplete abortion involves **the passage of some of the products of conception,** often described by the woman as looking like pieces of skin or liver.

Complete Abortion

In complete abortion, after **passage of all the products of conception,** the uterine contractions and bleeding abate, the cervix closes, and the uterus is smaller than the period of amenorrhea would suggest. Ultrasound can be used to assess the presence of retained placental tissue if excessive bleeding continues. In addition, the symptoms of pregnancy are no longer present, and the pregnancy test becomes negative.

Missed Abortion

The term ***missed abortion*** is used when **the fetus has died but is retained in the uterus,** usually for more than 6 weeks. Because **coagulation problems may develop,** fibrinogen levels should be checked weekly until the fetus and placenta are expelled (spontaneously or) removed surgically.

Recurrent Abortion

Three successive spontaneous abortions usually occur before a patient is considered to be a recurrent aborter. Many clinicians feel that two successive first-trimester losses or a single second-trimester spontaneous abortion is justification for an evaluation of a couple for the cause(s) of the pregnancy losses (see genetic evaluation section that follows).

ETIOLOGY OF RECURRENT ABORTION

Although many factors may result in the loss of a single pregnancy, relatively few factors are present consistently in couples who abort recurrently. Cause and effect relationships in individual patients are frequently difficult to determine.

General Maternal Factors

INFECTION. ***Mycoplasma, Listeria,*** **or** ***Toxoplasma*** **should be specifically sought** in women with recurrent abortions because despite being found infrequently, they are all treatable with antibiotics (see Chapter 22).

SMOKING AND ALCOHOL. Maternal smoking and alcohol consumption are associated with an increased incidence of chromosomally abnormal abortions. Women who smoke 20 or more cigarettes daily and consume more than seven standard alcoholic drinks per week have a fourfold increase in their risk of spontaneous abortion. There is a doubling of the risk of spontaneous abortion with as little as two drinks a week.

PSYCHOSOCIAL STRESS. Domestic violence and other forms of stress are associated with a greater risk of pregnancy complications such as spontaneous abortion, preterm birth, and low birth weight.

MEDICAL DISORDERS. Diabetes mellitus, hypothyroidism, and systemic lupus erythematosus (SLE) are

associated with recurrent pregnancy loss. The evidence linking diabetes mellitus with spontaneous abortion is not conclusive, and severe hypothyroidism is more often associated with disordered ovulation than spontaneous abortion. **Up to 40% of clinical pregnancies are lost in women with SLE,** and such patients have an increased risk of pregnancy loss before developing the clinical stigmata of the disease (see Chapter 16).

MATERNAL AGE. If a live fetus is demonstrated by ultrasonography at 8 weeks' gestational age, fewer than 2% of these pregnancies will abort spontaneously when the mother is younger than 30 years of age. If, however, she is older than 40 years, the risk exceeds 10%, and it may be as high as 50% at age 45 years. The probable explanation is the increased incidence of chromosomally abnormal fetuses in older women.

Local Maternal Factors

Uterine abnormalities, including cervical incompetence, congenital abnormalities of the uterine fundus (as may result from gestational exposure to diethylstilbestrol) and acquired abnormalities of the uterine fundus, are known to be associated with pregnancy loss.

Cervical incompetence occurs under a number of circumstances but is usually the result of trauma. This occurs most frequently from mechanical dilation of the cervix at the time of termination of pregnancy, but it may also occur at the time of diagnostic curettage. **The diagnosis of cervical incompetence is usually made when a mid-trimester pregnancy is lost with a clinical picture of sudden unexpected rupture of the membranes, followed by painless expulsion of the products of conception.**

There continues to be controversy surrounding cervical incompetence, with some experts suggesting that cervical incompetence is, in most instances, a variant of preterm delivery, occurring at a time when there is an *associated finding* of asymptomatic ascending infection. The question today in terms of the etiology is what comes first. Is it infection that causes the problem or is it some form of metabolic dysregulation that can be identified early and treated to prevent these changes? Chapter 12 covers newer concepts of the cause(s) of early pregnancy loss and preterm birth.

When cervical incompetence is suspected during pregnancy (e.g., history of cervical incompetence in a previous pregnancy or of cone biopsy of the cervix), sequential ultrasonography of the cervix indicating funneling or shortness of the cervix or widening of the lower uterine segment may identify the problem before a pregnancy loss occurs.

A **congenitally abnormal uterus** may be associated with pregnancy loss in both the first and the second trimesters. Surgical correction of the abnormality, particularly with a history of second trimester loss, is frequently successful. Complete evaluation of the congenitally abnormal uterus usually requires laparoscopic, hysteroscopic, and hysterographic examination before any management plan can be made.

The most commonly acquired abnormalities of the uterus with the potential to affect fecundity are **submucous fibroids.** Although these tend to occur more frequently in women in their late 30s, they should be considered when investigating pregnancy loss in all women. Removal of submucous fibroids and intramural fibroids larger than 6 cm are associated with improved fecundity, especially when there is distortion of the endometrial cavity. Subserous fibroids do not appear to affect fecundity.

Intrauterine adhesions result from trauma to the basal layer of the endometrium from previous surgery or infection. When most of the uterine cavity has been obliterated (Asherman syndrome), amenorrhea results. More frequently, fewer intrauterine adhesions (synechiae) are present, menses are reasonably normal, and the lesions are not even suspected until a pregnancy is attempted and lost. Surgical correction of these intrauterine adhesions is recommended to improve fecundity.

Fetal Factors

The most common cause of spontaneous abortion is a significant genetic abnormality of the conceptus. In spontaneous first-trimester abortions, approximately two-thirds of fetuses have significant chromosomal anomalies, with approximately half of these being autosomal trisomies and the majority of the remainder being triploid, tetraploid, or 45,X monosomies. Fortunately, the majority of these are not inherited from either mother or father and are single nonrecurring events. **When seen on ultrasonography before spontaneous abortion, many such pregnancies appear to consist of an empty gestational sac.** When a fetus is present in many late first-trimester and early second-trimester abortions, it is often significantly abnormal, either genetically or morphologically. It seems that nature has a way of identifying some of its major mistakes and causing them to abort.

Placental Factors

The fetus and placenta interact in terms of genetic and neuroendocrine differences. For example, the placental genetic structure is composed of genes from the mother, the father, and even imprinted genes from the parents of both the mother and father. How these interact and support normal development and specific diseases is the subject of intense investigation. For example **the placenta expresses an enzyme 11β-hydroxylase that converts cortisol to inactive corticosterone, which protects the fetus from excessive cortisol when**

the mother is stressed. This enzyme is not turned on until 22 to 24 weeks, thus leaving the fetus at risk from maternal stress before this gestational age. In addition, genetic polymorphisms have been identified that limit the amount of this enzyme produced, thus rendering the fetus at risk after 22 to 24 weeks.

Women with obesity during pregnancy have a greater risk of developing leptin (a placental peptide) resistance that leads to a greater risk of fetal IUGR, which in turn programs the fetus for obesity during childhood. Thus, it is important for the student to develop a sound understanding of the role of the placenta in fetal and maternal health.

Chromosomal Factors

Occasionally, fetal chromosomal abnormalities occur as a result of a chromosomal rearrangement (balanced translocation or inversion) in either or both parents. Therefore, **karyotyping is important for evaluation of couples suffering from recurrent abortion.**

Immunologic Factors

A successful pregnancy depends on a number of immunologic factors that allow the host (mother) to retain a genetically foreign product (fetus) without rejection taking place (see Chapter 6). The precise mechanism of this immunologic anomaly is not fully understood, but the immunologic functioning of some women as explained in more detail in Chapter 6, particularly those who abort recurrently or those who deliver prematurely, is different from that of women who carry pregnancies to term. Briefly the innate immune system is activated in early pregnancy with the production of specific cytokines that prevent early rejection of the fetus. Subsequently during the second half of pregnancy the adaptive portion of the immune system is activated to downregulate the innate immune system to support the developing fetus.

MANAGEMENT

Threatened Abortion

A threatened abortion is best managed by an ultrasonic examination to determine the viability of the fetus. **Of those in whom a live fetus is present, 94% will produce a live baby,** although the incidence of preterm delivery in these cases may be somewhat higher than in those who do not bleed in the first trimester. **Once a live fetus has been demonstrated to the couple on ultrasonography, management consists essentially of reassurance;** however they should be encouraged to undergo first-trimester screening for chromosomal abnormalities such as trisomy 13, 18, or 21. There is no need for admission to hospital, nor is there any evidence that bed rest improves the prognosis; however, psychosocial support is important. Recently, there has been evidence that women with vitamin D deficiency are at increased risk of spontaneous abortion, preterm birth and stillbirth. The mechanism is thought to be related to abnormal uterine muscle function (see Chapter 11).

Incomplete Abortion

Until bleeding has stopped or is minimal, it is best to insert an intravenous line and take blood for grouping and cross-matching, as shock may occur from hemorrhage or sepsis. **Once the patient's condition is stable, the remaining products of conception should be evacuated from the uterus using appropriate pain control.** These tissues should be sent for pathologic evaluation. An incomplete abortion that is infected must be managed vigorously. Delay in treatment may result in overwhelming sepsis that may lead to excessive hemorrhage, renal and hepatic failure, disseminated intravascular coagulation (DIC), and rarely, death.

Missed Abortion

Suspected missed abortion should be confirmed by ultrasound to minimize the risk of sepsis and DIC, and to reduce the extent of hemorrhage and the degree of pain that accompanies the spontaneous expulsive process. In some studies vitamin D deficiency has been associated with early pregnancy loss. A proposed mechanism is that women with vitamin D deficiency have an altered immune system. Macrophages do not make the antibacterial peptide cathelicidin, which is important in reducing the risk of infection, as well as contributing to abnormal muscular function.

General Management Considerations

When the patient is Rh negative and does not have Rh (anti-D) antibodies, **prophylactic Rh_0-GAM** should be administered (see Chapter 15). All couples that have had a pregnancy loss should be seen and counseled some weeks after the event. At that time, questions that the couple may have can be answered, the findings of any pathologic studies discussed, and reassurance given about their chances of reproductive success in the future.

Recurrent Abortion

As far as the mother is concerned, it is appropriate to rule out the presence of systemic disorders such as **diabetes mellitus, SLE, and thyroid disease,** and it is also necessary to test for the presence of a lupus anticoagulant. **Paternal and maternal chromosomes should be evaluated,** and **hysteroscopy** or hysterography should be performed to evaluate the uterine cavity.

Over half of couples with recurrent losses will have normal findings during the standard evaluation. With the information now available on the role of vitamin D in the health of women, it is recommended that women also be assessed for vitamin D deficiency.

When a specific etiologic factor is found, appropriate management often leads to reproductive success.

Many of the **congenital abnormalities of the uterus** can now be diagnosed using pelvic ultrasonography and may no longer require laparotomy for repair. **Cervical incompetence** is managed by the placement of a cervical suture (cerclage) at the level of the internal os; this suture is best placed in the first trimester, once a live fetus has been demonstrated on ultrasonography. **The effectiveness of prophylactic cervical cerclage in preventing recurrent loss from cervical incompetence has not been conclusively established** (see Chapter 17).

Estimating Gestational Age and Date of Confinement

Gestational age should be determined during the first prenatal visit. Accurate determination of gestational age may become important later in pregnancy for the management of obstetric conditions such as preterm labor, IUGR, and postdate pregnancy. Clinical assessment to determine gestational age is usually appropriate for the woman with regular menstrual cycles and a known last menstrual period that was confirmed by an early examination. Estimated date of confinement (EDC) or "due date" may be determined by adding 9 months and 7 days to the first day of the last menstrual period.

Ultrasonography may also be used to estimate gestational age. Measurement of **fetal crown-rump length between 6 and 11 weeks' gestation** can define gestational age to within 7 days. At 12 to 20 weeks, gestational age can be determined within 10 days by the average of multiple measurements (e.g., biparietal diameter, femur length, abdominal and head circumferences). Thereafter, measurements become less reliable with advancing gestation (±3 weeks in the third trimester).

Patients Who Require Genetic Counseling

Ideally, couples should receive preconception counseling before they decide to have children, so that genetic disease in the couple or their families may be identified. Traditionally, the major reason couples have been referred for prenatal diagnosis is advanced maternal age. However, **current clinical guidelines recommend that genetic counseling and invasive prenatal diagnostic testing for chromosomal abnormalities be offered to all couples regardless of maternal age.** A woman's choice of whether to have a diagnostic test or a screening test is based on many factors, including the risk that the fetus will be affected with a chromosomal abnormality, the risk of miscarriage from an invasive procedure, and the perceived burden of having an affected child. Women's concerns and preferences vary based on their personal beliefs. Therefore, the decision to offer prenatal screening and diagnosis should no longer be based on maternal age alone.

Additional indications for genetic counseling and prenatal diagnosis are listed in Box 7-1.

BOX 7-1

INDICATIONS FOR GENETIC COUNSELING AND PRENATAL DIAGNOSIS OTHER THAN AGE

1. A previous child with or a family history of birth defects, chromosomal abnormality, or known genetic disorder
2. A previous child with undiagnosed mental retardation
3. A previous baby who died in the neonatal period
4. Multiple fetal losses
5. Abnormal serum marker screening results
6. Consanguinity
7. Maternal conditions predisposing the fetus to congenital abnormalities
8. A current pregnancy history of teratogenic exposure
9. A fetus with suspected abnormal ultrasonic findings
10. A parent who is a known carrier of a genetic disorder

CONGENITAL AND HEREDITARY DISORDERS

Chromosomal Disorders

Chromosomal abnormalities occur in 0.5% of live births, but the incidence associated with spontaneous abortions is much higher and is estimated to be approximately 50%. The most common chromosomal abnormalities among live born infants are sex chromosomal aneuploidies (e.g., Turner syndrome [45,X], Klinefelter syndrome [47,XXY]), balanced Robertsonian translocations (translocations within group D or between groups D and G), and autosomal trisomies (e.g., Down syndrome; Figure 7-1).

Women older than 34 years are at increased risk of giving birth to children with autosomal trisomies (e.g., trisomy 21, 13, or 18) or sex chromosomal abnormalities (e.g., triple X syndrome, Klinefelter syndrome). The overall risk of Down syndrome (trisomy 21) is 1 per 800 live births. It increases to about 1 per 300 live births for women who are 35 to 39 years of age and to about 1 in 80 for those 40 to 45 years of age. The incidence of Down syndrome diagnosed at the time of CVS or amniocentesis is considerably higher. In women 35 to 39 years of age, the rate is about 1 in 125; in those 40 to 45, it is about 1 in 20. The discrepancy between the rate of occurrence at delivery and that at prenatal diagnosis is believed to be due in part to fetal loss in the second and third trimester.

Ninety-five percent of cases of Down syndrome are due to meiotic nondisjunctional events leading to 47 chromosomes with an extra copy of chromosome number 21, whereas 4% are due to an unbalanced translocation. Parents of a child with translocation

Med 441 Team:

Leaders:

Leen Alrajhi - Yara Almufleh

Members:

Ftoon Alzahrani

Good Luck!

Med 438 Team:

Leaders:

Ateen Almutairi - Lama ALzamil - Lina Alosaimi

Members:

Leena alnassar - Deana Awartani - Renad AlKanaan

Med 439 Team:

Leader:

Bushra Alotaibi - Renad Alhomaidi

Members:

Raghad alasiri - Yara Alasmari - Alia Zawawi

Reviewed By
RAAOUM M. JABOR

Video Case

Bleeding in Early Pregnancy (Ectopic)

We recommend to study abortion lecture first

Objectives:

- ➔ Define ectopic pregnancy.
- ➔ Identify the morbidity mortality rate of ectopic pregnancy.
- ➔ Mention the risk factors for ectopic pregnancy.
- ➔ describe a diagnostic approach for ectopic pregnancy and highlight the importance of early diagnosis.
- ➔ Discuss the management of ectopic pregnancy.
- ➔ Differentiate between obstetrics and non - obstetrics causes of acute abdomen in pregnancy.
- ➔ Discuss the clinical presentation, diagnostic methods and management of acute abdomen in pregnancy.

→ Slides
→ Important
→ Golden notes
→ Extra
→ 439 Doctor's notes
→ 441 Doctor's notes
→ 441 Female Presentation
→ Reference

Female Presentation

Video Case | Editing File

Ectopic Pregnancy

- Ectopic pregnancy is pregnancy in which implantation has occurred outside of the uterine cavity.
- They account for 1.5% of reported pregnancies in the United States.
- 98% of ectopic pregnancies are in the **oviduct / fallopian tube**, 70 to 80% are located in the ambulate portion of the tube, then isthmic, infundibular or fimbrial, and interstitial or cornual.
    - Less common locations include : the ovary, cervix, abdomen, and a cesarean uterine scar.
- It is one of the leading cause of **maternal morbidity and mortality** ; early diagnosis and management may prevent adverse outcomes and preserve future fertility
- In a reproductive-age woman with abnormal vaginal bleeding, always consider the **possibility of pregnancy or complication of pregnancy.**
- **Natural history:** The trophoblasts of the conceptus implanted in the mucosa of the fallopian tube rapidly erode through that layer and invade into the underlying blood vessels. This induces local bleeding, some of which dissects into the tubal lumen and spills into the endometrial cavity (causing spotting), and some of it passes into the peritoneal cavity (causing a hemoperitoneum).. Occasionally, the local blood supply to the pregnancy is so compromised that the pregnancy is resorbed (spontaneously resolved) or aborted.

Risk Factors :

Risk is increased from any obstruction of normal zygote migration to the uterine cavity from tubal scarring or adhesions from any origin:

- **50%** of patients have no risk factors (**idiopathic**)
- **Personal history of Ectopic pregnancy** would be the highest factor
- History of tubal surgery e.g. Tubal ligation.
- Previous history or Have Pelvic Inflammatory Diseases : if left untreated it will causes tubal, scarring via intraluminal, inflammation and subsequent fibrin deposition.
    - If a patient has had three episodes of pelvic inflammatory disease, her ratio of ectopic pregnancy to intrauterine pregnancy is 1 : 3.
        - Internal inflammation (salpingitis) is the most common cause of tubal abnormality associated with ectopic pregnancy :
            - Gonococcal salpingitis
            - Chlamydial salpingitis
- Smoking : decrease cilia in fallopian tube
- Tubal peristalsis is slowed by progestins, such as those that are released by the hormonal Intrauterine devices IUD and oral contraceptives
- Previous C cesarean
- Diethylstilbestrol [DES] exposure (Congenital).

Can PID be cured?
Yes, if PID is diagnosed early, it can be treated. However, treatment won't undo any damage that has already happened to your reproductive system.

Signs and symptoms :

The Classic symptoms associated with ectopic pregnancy :

- **Amenorrhea**
- **Vaginal bleeding**
- **Abdominal pain**

	Unruptured ectopic pregnancy	Ruptured ectopic pregnancy
Signs	**Classic findings:** • Unilateral adnexal tenderness • Cervical motion tenderness • Uterine enlargement	• Severe abdominal Pain with shoulder pain • Intraperitoneal bleeding and irritation symptoms: Abdominal guarding and rigidity • Hypovolemia symptoms: hypotension, tachycardia, Dizziness, loss of consciousness

Diagnosis and Investigation : as spontaneous abortion

Management :

In general, Treatment for an ectopic pregnancy is either medical or surgical. **Medical management is preferred for an early ectopic pregnancy**, while **Surgery** is reserved for unstable patients, those whose **diagnosis is uncertain** and those whose **medical therapy has failed.**

Ruptured ectopic :

Stabilize patient and **Immediate surgical intervention** (surgery should not be delayed),

- Medical intervention (Methotrexate) is contraindicated in ruptured ectopic pregnancy!

Unruptured ectopic :

1. **Medical:**

   Methotrexate : This folate antagonist attacks rapidly proliferating tissues including trophoblastic villi. **Criteria for methotrexate include:**

   - Absence of fetal heart motion
   - pregnancy mass <3.5 cm diameter
   - β-hCG level <6,000 mIU

     ^ why not more than that (pregnancy mass or B-hCG) ? Bc there's high risk for rupture and we don't want to wait

MTX absolute contraindication	MTX relative contraindication
• Hemodynamic instability • Liver or kidney abnormalities • Active lung disease • Breast feeding • Inability to comply with β-HCG follow up testing.	• Fetal cardiac activity • High β-hCG level (>5000 mIU) • Large ectopic size (>3.5cm)

Management

2. Surgical :

Laparoscopy or **Laparotomy** with or without conservation of the Fallopian tube :

- Approach :
  - **Laparoscopy** is performed **:**
    - If criteria for methotrexate are not met.
  - **Laparotomy** is the preferred :
    - Whenever it's anticipated that **laparoscopy would not be successful** (e.g., because of extensive intraperitoneal adhesions).
    - **Hemodynamically unstable** , because rapid access to the bleeding site is critical.
    - In **ruptured ectopic pregnancy with large intraperitoneal bleeding,** Otherwise a laparoscopic approach is typically performed.

- Procedure :
  - **Salpingectomy**: involved removal of the entire fallopian tube.
    - It is reserved for the patient with :
      - **Significant damage to the tube (ex. ruptured ectopic pregnancy** bc tubal damage after rupture is so extensive that salpingectomy is required)
      - When there is a **high likelihood of retained products of conception**
      - Those with **no desire for further fertility.**
    - Types of salpingectomy :
      - Total salpingectomy
      - Segmental / partial salpingectomy: removal of a portion of the fallopian tube. It's generally performed only if the ectopic pregnancy is implanted in the mid-ampullary portion.
  - **Salpingotomy** or **Salpingostomy**: incision made through the antimesenteric border of the fallopian tube (Incision is **closed in salpingotomy** whereas it is left **open in a salpingostomy**)
    - **Salpingostomy**: **Preferred for unruptured**. Most studies have shown that salpingostomy results in better long-term tubal function compared with salpingotomy.

Follow-up:

- Patients who are treated with methotrexate, salpingotomy or salpingostomy should be followed up with β-hCG titers to ensure there has been complete destruction of the ectopic trophoblastic villi.
  (no need to follow β-hCG when you do salpingectomy)

- Rh-negative women should be administered RhoGAM

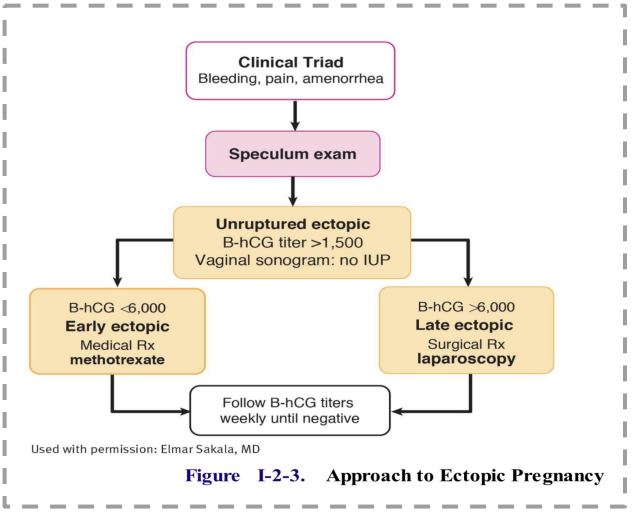


Figure I-2-3. Approach to Ectopic Pregnancy

Teaching case

A 36-year-old G1P0010 woman presents to the office with onset of light vaginal bleeding, which she feels is not her menstrual period, and mild right lower quadrant pain, which she rates as 2/10. The pain is intermittent and crampy, and is not associated with urination. There is no nausea or vomiting . The patient's last bowel movement was yesterday and was normal in consistency without blood or black color.

Her past medical history is notable for no allergies, no medications, and two hospitalizations. The first was eight years ago for lower abdominal pain which was thought to be due to pelvic inflammatory disease and which resolved with antibiotics. The second was for a left ectopic pregnancy that required surgical removal of her left tube.

Review of systems and family history are unremarkable. Social history reveals that she is mutually monogamous with a male partner without contraception.

Physical examination shows an anxious appearing female with a temperature of 99.2 ° F, orally, a BP of 105/62, and a pulse of 95 . Examination of her abdomen reveals normal bowel sounds.

There are no masses, organomegaly, distention, or rebound tenderness. She has mild discomfort in the right lower quadrant. Pelvic examination reveals right adnexal tenderness without adnexal masses. Uterus is of normal size and there is discomfort on cervical motion. The rectal exam is negative with heme negative stool.

Q1 What is the differential diagnosis for this patient? What aspects of her history and physical examination might lead you to be suspicious of an ectopic pregnancy?

Ob DDx	Gyn DDX	Other DDX
• Threatened abortion • Incomplete abortion • Ectopic pregnancy • Hydatidiform mole	• Ovarian cyst • Adnexal torsion • Pelvic inflammatory disease • Endometriosis	• Appendicitis • Inflammatory bowel disease • Urinary tract infection • Bladder stone • pancreatitis.

	Signs	Symptoms
Teaching case	• Normal sized uterus • Adnexal tenderness • Discomfort on cervical motion	• Vaginal bleeding • Mild right lower quadrant pain • Amenorrhea • Hx of pelvic inflammatory disease • Hx of ectopic pregnancY
In general	• Abdominal tenderness (80-90%) • Adnexal tenderness (75-90%) • Normal uterine size (70%) • Adnexal mass (30-50%) • Hypotension and tachycardia. • Abdominal guarding and rigidity.	• Abdominal pain (95-100% • Abnormal uterine bleeding (65-85%) • Amenorrhea (75-95%)

Q2 What are the risk factors for ectopic pregnancy and which of these risk factors does the patient have (* indicate patient risk factors for teaching case)?

- Previous ectopic pregnancy (approx 10 times increase)
- History of pelvic inflammatory disease, gonorrhea, or chlamydia
- History of previous gyn or abdominal surgery
- Sterilization failure
- Endometriosis
- Congenital uterine malformation
- Assisted reproductive technology (IVF); tends more to be a risk factor of heterogeneous pregnancy (2 embryos: one is intrauterine and the other is extrauterine "ectopic")
- Older age (35-44 y/o are 3 times higher risk than younger women)

Q3 Where can ectopic pregnancies occur and how frequently does this happen?

- Fallopian tube (most common location generally)
  - Ampullary, 80% (most common part of fallopian tube; because normally in physiological pregnancy the oocyte meet the sperm and natural fertilization occurs in the ampullary part)
  - Isthmic, 12%
  - Fimbrial, 5%
  - Cornual/Interstitial, 2%
- Abdominal, 1.4%
- Ovarian, 0.2%
- Cervical, 0.2%

Q4 What initial test would you order for this patient to assist you in narrowing down your diagnosis?

- **STAT CBC** (to check for anemia that may indicate intra-abdominal bleeding)
- **Blood group to check if it's positive or negative (in case of bleeding)**
- **Pregnancy test**
- **US**
- Quantitative β -hCG (in order to rule in or rule out an intrauterine pregnancy with transvaginal ultrasound, the β -hCG needs to be greater than 1500 mIU/ml)
- If you had one option in ER presentation (The most important test): beta HCG
- Key Learning Point: Confirming pregnancy is critical in the diagnosis of ectopic pregnancy. If this test is not ordered in a timely manner it can lead to significant morbidity and mortality.

Q5 If this patient's test is positive, what tests could be helpful in making a more definitive diagnosis ?

- **Transvaginal ultrasound** to look for intrauterine pregnancy or extrauterine pregnancy (assuming that the quantitative β - hCG > 1500mIU/ml an ectopic pregnancy can be diagnosed if there is no evidence of an intrauterine pregnancy on transvaginal ultrasound)

- **Serial Quantitative β -hCG levels:** If the level is equivocal and the ultrasound is not helpful, monitoring the β -hCG level rise in **48 hours** can aid in distinguishing between a viable intrauterine pregnancy and non-viable intrauterine pregnancy or ectopic pregnancy.
  In viable early intrauterine pregnancy, hCG levels will usually rise by at least 66% in 48 hours . A β -hCG level less than 66% should cause suspicion of ectopic or non-viable intrauterine pregnancy. Patients who are stable where the diagnosis is unclear can be followed by serial β -hCG levels and, when levels have reached high enough for ultrasound to be effective, can have repeat ultrasounds
- **Serum progesterone** level may be helpful in some situations. (rarely done; not very helpful in ectopic pregnancies cases)

Q6 What options are available for the management of ectopic pregnancy?

- **Medical treatment:** methotrexate
  - Hemodynamically stable patient
  - Quantitative β -hCG (higher failure rate if β -hCG is greater than 5,000 mIU/ml thus multiple doses may be required)
  - No fetal heartbeat seen outside of the uterus
  - Ectopic gestation that is not too big (usually <3.5cm)
  - Cooperative patient who will be sure to return for appropriate follow up and blood work
- **Surgical treatment**
  - Laparoscopy or Laparotomy with or without conservation of the Fallopian tube
    - Salpingostomy: without removing the ipsilateral tube
    - Salpingectomy: Removing the ipsilateral tube
- **Expectant management** is an option if β -hCG is low and decreasing and patient is willing to take the risk of tubal rupture and hemorrhage.
- Check for **Rh status** and give Rh negative women Rho-GAM to prevent isoimmunization

From doctor's slides (441)

Differential diagnosis : imp for OSCE

1- obstetrical :
- Ectopic pregnancy
- Incomplete, completed, or missed abortion
- Threatened abortion

2- gynecological :
- Ovarian cyst
- Adnexal torsion
- PID
- Endometriosis

3- other non ob/gyn :
- Appendicitis
- Inflammatory bowel disease
- UTI
- Bladder stone

The following is/are considered a positive finding in ectopic pregnancy:
A - Cervical Excitation
B - +ve urine test
C - P.V bleeding
D - All of the above
E- None of the above

Ectopic pregnancy can be more reliably diagnosed by:
A - US
B - Labroscoby
C - Pregnancy test
D - HSG / Hysterosalpingography : is an X-ray procedure using dye that is used to view the inside of the uterus and fallopian tubes
E- B-hCG

Which type of the following ectopic pregnancies would rupture earlier?
A - Isthmu **why?** Narrowest
B - Interstitial
C - Ambulla
D - Fimbria
E- No difference

If this patient's pregnancy test is positive, what tests could be helpful in making a more definitive diagnosis ?
US , don't see anything? Do :
B-hCG

IF B-hCG = 800 (you already do US and you didn't see anything), what should you do next ? Repeat B-hCG test after 48 hours

Dr's Notes 441

- PID is a risk of ectopic pregnancy especially **Chlamydia**
- If a patient is unstable, we take her to the OR for diagnostic laparoscopy.
- In diagnostic lap we see enlarged tube and collection of fluids.
- **Contraindications of methotrexate are important and mentioned in the video**, the doctor emphasized on patients unable to come for **follow up** and mental stability.
- If a salpingostomy is done the patient should be aware that the tube we operated on is a site of recurrence of ectopic pregnancy.
- **If the results after measuring β-hCG for the 2nd time haven't changed (increase or decrease)?** also ectopic pregnancy
- When we REMOVE the tube we don't need to keep monitoring β-hCG
- **When we DON'T remove the tube we keep monitoring β-hCG, Why?** because there might be remnant cells
- **You did a surgical removal of an ectopic pregnancy and when you measured β-hCG afterwards you found out it's still increasing! What do you do ?** Use Methotrexate for the remnant
- **A lady comes to you saying " I use IUD does it increase the risk of having ectopic pregnancy?"** The IUD decreases the pregnancy probability in general BUT if you get pregnant while using IUD the risk of Ectopic pregnancy is high, (after removing IUD it has no effects or risks of ectopic pregnancy)
- **Type of IUD ?** copper IUD and the hormonal IUD
- **Should the patient with ectopic pregnancy presents to you with severe pain?** No, and if she has severe pain Rupture should come to your mind
- **MCQ Q: What is the most important risk of ectopic pregnancy?** previous ectopic pregnancy
- **Where can ectopic pregnancy occur most of the time?** Fallopian tube
- Most common site for ectopic pregnancy is **ampullary of Fallopian tube.**
- **Which location is the the most difficult to treat?** interstitial (bc baby can grow)
- If there is ruptured ectopic pregnancy, it not necessary for B-hCG to decrease (the embryo cells are there)

Dr's Notes 438

➔ **Ultrasound findings in ectopic pregnancy:**
1- No intrauterine pregnancy
2- Pseudosac
3- Thickened endothelium
4- Adnexal mass (Enlarged tube)
5- Collection of fluid in pouch of Douglas (Blood)

➔ Any patient who comes with bleeding:
- Take history and examine the patient
- check blood group and beta HCG levels;
  If HCG levels <1500 mIU/ml"negative: we can't see anything
  If > 1500 mIU/ml "positive" we start to see the masses/pregnancy

➔ Example of stable patient:
- beta HCG test results: 700 mIU/ml
- And I perform an ultrasound and i don't see anything
- I ask her to come after 48 hours; Normally the Beta HCG doubles after 48 hours.
- If after 48 hours the beta HCG levels rises >1400 mIU/ml, We perform Ultrasound.
- Ultrasound might reveal either: 1- Intrauterine 2-extrauterine "ectopic" eg. adnexal mass
- If Ultrasound is still unclear I ask her to come after 2 days, the Beta HCG would double again and we repeat the Ultrasound until we see something (pregnancy indicators) and localize it.
- The patient should stay in the hospital until everything is verified, if not, the patient might come back with intra-abdominal bleeding.

➔ Transvaginal US: Normally we can't see the tubes to evaluate them, it reveals the tubes when (ectopic, hydrosalpinx, hematosalpinx) and it's more clear than transabdominal US.
It helps in localising the pregnancy thus, it helps in decision making regarding the management (eg. we can't give methotrexate without seeing an adnexal mass)

➔ If the beta- HCG is not doubling (500-700-1000) and it raises a suspicion of ectopic pregnancy it's very important to perform US to localise it, otherwise you can't treat the patient with methotrexate unless you have an evidence of ectopic pregnancy)
- Patient treated with methotrexate should wait (F/U) to get negative beta HCG results and another 3 months till next pregnancy.
- 1500-5000 mIU/ml is a grey zone; we might repeat it 5-6 times until the US is clear.

➔ If patient presents with heavy bleeding we usually go for abortion

Amboss (EXTRA):

Imp Notes:

- Every woman of reproductive age with abdominal pain should undergo a pregnancy test, regardless of contraception use.
- Up to 20% of patients with ectopic pregnancy can be hemodynamically unstable and require immediate therapy. Do not delay stabilization and definitive treatment to confirm the diagnosis.
- **Right lower quadrant pain may indicate appendicitis. Cervical motion tenderness may be a sign of PID.**
- Do not delay laparoscopy in unstable patients with suspected ectopic pregnancy.
- Do not forget anti-D immunoglobulin in all Rh-negative patients with bleeding.
- Methotrexate therapy is **contraindicated** in ruptured ectopic pregnancy.
- Red flags of indicating rupture: severe worsening pain, shoulder tip pain, dizziness, or heavy bleeding.

Definitions:

- **Ectopic pregnancy:** a pregnancy in which the fertilized egg attaches in a location other than the uterine endometrium.
- **Tubal pregnancy:** a pregnancy that occurs within the fallopian tube.
- **Interstitial pregnancy:** a pregnancy that occurs within the interstitial portion of the fallopian tube (i.e., the segment that connects the tube to the endometrial cavity).
- **Heterotopic pregnancy:** a rare condition involving multiple gestations, in which one is intrauterine and another is ectopic. Occurs more frequently in patients undergoing infertility treatments, e.g., in vitro fertilization.

Approach:

Hemodynamically Unstable Patients	Stable Patients
• Start acute stabilization measures. • If trained, perform a point-of-care ultrasound (POCUS) to identify intraperitoneal free fluid or confirm intrauterine pregnancy (IUP). • If IUP is confirmed, evaluate for alternate causes of hemodynamic instability. • If any of the following are present, refer for **immediate surgical exploration** without awaiting further diagnostic studies: Free intraperitoneal fluid, Findings suggestive of ectopic pregnancy, e.g., adnexal mass, No visible IUP (if there is high clinical suspicion for ectopic pregnancy). • Urgently consult OB/GYN for surgical exploration based on clinical suspicion supplemented by POCUS findings (if performed). • Obtain a formal ultrasound (transvaginal ultrasound) as soon as the patient is stable enough.	• Send serum β-hCG and arrange or perform a pelvic ultrasound (e.g., POCUS or formal ultrasound) regardless of β-hCG level. • Ectopic pregnancy visible on imaging (diagnosis confirmed): Begin treatment. • IUP visible on imaging (ectopic pregnancy unlikely): Consider alternative diagnoses. • Indeterminate ultrasound (pregnancy of unknown location): Arrange follow-up and repeat imaging.

Suspect ruptured ectopic pregnancy in patients in their first trimester with any of the following:

- Clinical features of shock: tachycardia, hypotension, pallor
- Severe abdominal or pelvic pain
- Peritoneal signs on examination
- Significant vaginal bleeding
- POCUS positive for intraperitoneal free fluid
- Clinical deterioration after receiving MTX therapy

Amboss (EXTRA):

Serum β-hCG level:

β-hCG discriminatory level	Serial β-hCG measurements (every 48 hours)
the β-hCG level at which an IUP is typically visible on ultrasound • Cutoff is typically β-hCG > 1,500–2,000 mIU/mL • Inability to visualize pregnancy on ultrasound above the β-hCG discriminatory level may suggest ectopic pregnancy. • Multiple pregnancies may have higher β-hCG levels.	Better diagnostic accuracy than a single β-hCG level in differentiating intrauterine from ectopic pregnancies (Findings after 48 hours) The rate of β-hCG increase in most normal IUPs depends on initial β-hCG level: • < 1500 mIU/mL: > 49% • 1500–3000 mIUm/L: > 40% • > 3000 mIU/mL: > 33% Falling β-hCG levels can indicate a failed IUP (e.g., spontaneous abortion) or an ectopic pregnancy: • A drop of > 21% suggests failed IUP. • A drop of < 21% is more likely to be an ectopic pregnancy. • Ectopic pregnancies: Approx. 70% of patients have an insufficient increase or decrease of β-hCG.

Imaging in ectopic pregnancy:

1-Transvaginal ultrasound (TVUS): Can be performed as a formal ultrasound or POCUS.
- **Indication**: best initial imaging test for determining the location of the pregnancy
- Supportive findings: Empty uterine cavity in combination with a thickened endometrial lining, Possible free fluid within the pouch of Douglas (unspecific), Possible extraovarian adnexal mass, Tubal ring sign (blob sign: an echogenic ring that surrounds an unruptured tubal ectopic pregnancy), Interstitial line sign (an echogenic line that extends from the gestational sac into the upper uterus in interstitial ectopic pregnancy), A thin myometrial layer (< 5 mm) surrounding the gestational sac.
- Additional considerations: Ultrasound findings in normal pregnancy: In an intrauterine pregnancy at 5–6 weeks' gestation, a gestational sac and yolk sac are visible in the uterus. If the gestational sac cannot be seen at all on ultrasound, the patient is diagnosed with pregnancy of unknown location.

2-Transabdominal ultrasound (TAUS):
- **Indication:** Can be used to exclude differential diagnoses (e.g., acute appendicitis).
- Provides a general picture of the pelvic anatomy and upper abdomen but is less sensitive than TVUS in detecting extrauterine pregnancy
- POCUS can be performed using the transabdominal approach to rapidly rule in IUP if present.

3-Exploratory laparoscopy:
- **Indication:** Unstable patients suspected of having an ectopic pregnancy + In pregnancy of unknown location if the location is still uncertain after 7–10 days

4-Endometrial biopsy:
- Indication: Consider only in cases of pregnancy of unknown location where non-viability is certain
- Findings in Ectopic pregnancy: decidualization of the endometrium without chorionic villi or fetal parts.
- Findings in Intrauterine pregnancy loss: Chorionic villi are present, Fetal parts may be present.

Reference

CHAPTER 24

Ectopic Pregnancy

ANITA L. NELSON • JOSEPH C. GAMBONE

CLINICAL KEYS FOR THIS CHAPTER

- *Ectopic pregnancy* refers to those pregnancies that implant outside the uterine cavity. Although more than 95% of ectopic pregnancies implant in the fallopian tube, occasionally they may implant in other sites, such as the ovary, the uterine cervix, or, very rarely, in the abdominal cavity or a cesarean uterine scar. Following the use of assisted reproductive technologies (ARTs), the incidence of ectopic pregnancy has more than doubled to 2-3%, and the likelihood of implantation in more unusual sites has increased.
- The trophoblast of an early ectopic pregnancy that implants in the fallopian tube erodes through the tubal mucosal layer and into the tubal vessels. As the fetus grows, the blood from the eroded vessels dissects along the tubal wall, resulting in any of the following: (1) tubal rupture and intraperitoneal hemorrhage, (2) resorption of the pregnancy because of restricted blood supply, or (3) tubal abortion into the peritoneal cavity, where it may rarely result in an abdominal pregnancy.
- Clinical presentation of ectopic pregnancies may vary, but the classic triad of symptoms is (1) missed menses, (2) vaginal bleeding (usually spotting), and (3) lower abdominal pain. For individual women, there are three possible clinical presentations: (1) an acutely ruptured ectopic pregnancy, (2) a probable ectopic pregnancy with significant pelvic pain and vaginal spotting or bleeding, or (3) a possible ectopic pregnancy.
- Most often, the workup begins with testing to locate a "pregnancy of unknown location" (PUL). Other kinds of abnormal early pregnancies and other illnesses in early pregnancy may account for the signs and symptoms of ectopic pregnancy. The two most important diagnostic tests performed to diagnose an ectopic pregnancy are serial serum human chorionic gonadotropin (hCG) levels in maternal serum and sequential ultrasound imaging.
- The key to proper management of ectopic pregnancy is early diagnosis. Treatment options depend on the clinical situation and, where possible, patient preferences. Surgery is necessary when rupture has occurred or is threatened or if the diagnosis remains uncertain. Medical therapy with methotrexate (MTX) is now widely used for probable and possible ectopic pregnancies. Irrespective of the type of treatment, most patients should be informed that they are at an increased risk of a future ectopic pregnancy.

An ectopic pregnancy is one that implants outside the endometrial cavity. The most common site for an ectopic pregnancy is in the fallopian tube, but a wide range of implantation sites is possible. Some treatments for infertility significantly increase the risk. They may also affect where the implantation occurs (Table 24-1). Although early diagnosis has enabled more effective intervention and lowered maternal mortality caused by ectopic pregnancies, the disorder is still a leading cause of maternal death in the first trimester of pregnancy.

Etiology and Risk Factors

Ectopic pregnancies generally result from abnormalities in the structure or function of the fallopian tube. The role that the conceptus itself may play is not known, but it is clear that chromosomal abnormalities do not cause ectopic pregnancies.

The most common cause of tubal abnormality associated with ectopic pregnancy is internal inflammation (salpingitis). Other causes include external tubal scarring secondary to endometriosis, ruptured

TABLE 24-1
INCIDENCE AND SITES OF ECTOPIC PREGNANCY

	Natural Conception	Assisted Reproductive Technologies
Overall incidence	About 1%	2-3%
Fallopian tube	>95%	<90%
Ovarian and abdominal	1-2%	5%
Cervical	0.15%	1.5%
Cesarean scar	1 in 1800	Unknown
Heterotopic*	1 in 30,000	1 in 100

*More than one site.

appendicitis, or previous surgery. Classically, **gonococcal salpingitis** causes significant symptoms of fever and pelvic pain and results in visible tubal damage. The fallopian tubes become distended with purulent material; the fimbriae can be clubbed; and the passage through the tube becomes tortuous with blind pouches (diverticuli) that physically block the progress of the fertilized egg into the endometrial cavity. **Chlamydial salpingitis** is usually associated with milder symptoms, and the tubal damage is more subtle. The host shock protein released by *Chlamydia trachomatis* destroys the cilia lining the tubal mucosa, which are responsible for sweeping the conceptus through the tube.

Salpingitis isthmica nodosa is another inflammatory process that distorts the portion of the fallopian tube closest to the tubal ostia (opening into the uterine cavity). Thirty percent of all pregnancies that follow **tubal ligation** are ectopic. Other tubal surgeries (e.g., anastomosis, lysis of adhesions) also increase the risk of ectopic pregnancy. **One of the greatest risk factors is a history of a previous ectopic pregnancy. Recurrence rates are about 30%. Uterine fibroids** located near the ostia can distort or block tubal patency and increase the risk of ectopic pregnancy.

Tubal peristalsis is slowed by progestins, such as those that are released by the hormonal contraceptive intrauterine devices (IUDs), contraceptive implants, injections, and oral contraceptives. Although all of these methods of birth control significantly reduce the absolute risk of any pregnancy, when a failure (pregnancy) occurs during their use, the relative risk of an ectopic pregnancy is greatly increased. For example, it is estimated that 40-60% of pregnancies that occur during use of the levonorgestrel IUDs are ectopic (see Chapter 27).

The higher levels of progesterone induced by ovarian hyperstimulation during use of assisted reproductive technologies (ARTs) can also slow tubal motility. When multiple embryos are transferred during in vitro fertilization (IVF), the risk of ectopic pregnancy and the risk of heterotopic pregnancy (simultaneous intrauterine and ectopic) increase from 1:30,000 to 1:100 pregnancies. Other risk factors include a history of **infertility and smoking.**

Incidence and Classification

Now that many cases of ectopic pregnancy are managed medically in ambulatory settings, the incidence of ectopic pregnancy is not as well documented. The latest statistics from the mid-1990s indicated that 1-2% of all pregnancies in the United States were ectopic. Minority women have twice the risk of white women and a fourfold higher risk of ectopic pregnancy–related mortality. Recently, there have been counterbalancing shifts in the prevalence of risk factors for ectopic pregnancy (less pelvic infection but more advanced infertility treatment), so it is reasonable to assume that **about 1 in 80 pregnancies in the United States will be located outside the uterine cavity.**

The fallopian tubes are the site of over 95% of ectopic pregnancies. Those ectopic pregnancies are characterized by the portion of the salpinx in which the pregnancy implants: ampullary (75-80%), isthmic (12%), infundibular or fimbrial (6-10%), and interstitial or cornual (2-4%). Cornual ectopic pregnancies are particularly dangerous, because the pregnancy can continue to expand throughout the first trimester, and its rupture can lead to a sudden and rapid fatal exsanguination in less than 1 hour. Bilateral fallopian tube pregnancies occur in 1 in 200,000 pregnancies. Other sites for ectopic pregnancy include the cervix, the ovary (implantation below the ovarian cortex), the abdomen, and cesarean delivery scars. There has been a distinct increase in the numbers of cesarean scar pregnancies as cesarean delivery has become more common. Heterotopic pregnancies, in which pregnancies simultaneously implant in both the endometrium and in an extrauterine site, may occur as frequently as 1 in 100 IVF pregnancies.

Natural History

The trophoblasts of the conceptus implanted in the mucosa of the fallopian tube rapidly erode through that layer and invade into the underlying blood vessels. This induces local bleeding, some of which dissects into the tubal lumen and spills into the endometrial cavity (causing spotting), and some of it passes into the peritoneal cavity (causing a hemoperitoneum). Most of the blood generally is trapped between the serosal and mucosal layers and distends the tube with clot, which explains the common finding of cervical motion tenderness. If the bleeding is extensive enough, it can cause pressure necrosis of the overlying tubal serosa, resulting in acute rupture and causing a significant hemoperitoneum. Occasionally, the local blood supply to the pregnancy is so compromised that the pregnancy is resorbed (spontaneously resolved) or aborted into the peritoneal cavity, a process that may be asymptomatic.

Clinical Presentation

The clinical presentation of tubal ectopic pregnancies can vary from subtle lower abdominal discomfort and light uterine spotting to symptoms consistent with hypovolemic shock due to massive internal hemorrhage from tubal rupture. Ectopic pregnancies in other sites may have slightly different presentations, but the common finding of all ectopic pregnancies is that the symptoms occur in the setting of a positive pregnancy test. Clinical presentations should be evaluated in terms of three possibilities: (1) an acutely ruptured (or rupturing) ectopic pregnancy, (2) a probable ectopic pregnancy in a symptomatic woman, and (3) a possible ectopic pregnancy in a mildly symptomatic woman with a pregnancy of unknown location (PUL).

BOX 24-1
OTHER PAIN-PRODUCING PROBLEMS THAT MAY OCCUR EARLY IN PREGNANCY

Gynecologic Problems
1. Threatened or incomplete abortion
2. Ruptured corpus luteal cyst
3. Acute pelvic inflammatory disease (rare)
4. Adnexal torsion
5. Degenerating leiomyoma (especially in pregnancy)

Nongynecologic Problems
1. Acute appendicitis
2. Pyelonephritis
3. Pancreatitis

ACUTELY RUPTURED ECTOPIC PREGNANCY

Fortunately, **only a small number of women with fallopian tube pregnancies present with symptoms indicative of massive internal hemorrhage from acute tubal rupture.** This presentation is particularly likely to occur in women with poor access to care and occasionally in those whose medical therapy fails. Women may present with dizziness or loss of consciousness and sudden onset of severe pain. **Some shoulder pain may be present because of irritation of the phrenic nerve by blood and clotting in the abdominal cavity.**

During a physical examination, hemodynamic instability is indicated by tachycardia, diaphoresis, and hypotension. The abdomen may be distended, and both abdominal guarding and rebound tenderness may be present. There may be only minor bleeding from the cervix found by speculum examination, but noticeable cervical motion tenderness and a slightly enlarged, globular uterus may be detected by bimanual examination. A palpable adnexal mass may or may not be present.

An acute rupture of an ectopic pregnancy represents a surgical emergency. Large-bore intravenous lines must be established, and fluid resuscitation must be started immediately. Blood transfusion should follow as soon as possible, but surgery should not be delayed. **In the hemodynamically unstable patient, laparotomy is usually required.** Laparoscopy may be performed in less compromised patients. Generally, tubal damage after rupture is so extensive that salpingectomy is required.

PROBABLE ECTOPIC PREGNANCY

Hemodynamically stable women who have a positive pregnancy test and present with notable pelvic pain and vaginal spotting or bleeding should be classified as having a "probable ectopic pregnancy" after other disease processes that may present with similar symptoms in early pregnancy have been ruled out (Box 24-1). Such patients generally have other clinical signs, such as tenderness of the abdomen with adnexal or cervical motion tenderness. On ultrasound, a variable amount of free fluid may be detected in the cul-de-sac. **Only occasionally will the ectopic pregnancy be seen on ultrasound as a "double-ring" sign in the adnexa, but a corpus luteal cyst is often present.** In such symptomatic women, even though they have stable vital signs, surgical exploration is generally recommended. Conservative surgical procedures that preserve the fallopian tube are generally performed in women desiring future fertility (see Management section below).

POSSIBLE ECTOPIC PREGNANCY

Most ectopic pregnancies fall into the category of possible ectopic pregnancy and are initially diagnosed as PUL. In the face of a positive pregnancy test, all of the differential diagnoses listed in Table 24-2 should be considered and ruled out. For women with possible ectopic pregnancies, the symptoms are more subtle than they are in the other two ectopic categories. Lower abdominal pain is present in most cases, although it is usually mild. Missed menses or an abnormal last menstrual period is seen in 75-90% of cases. More than one-half present with abnormal vaginal bleeding that can range from minor spotting to bleeding consistent with a normal menstrual flow.

A physical examination reveals most patients to be afebrile, and fewer than half are found to have a discernable adnexal mass on pelvic examination. Often, the mass is palpated on the side opposite the ectopic pregnancy and represents a corpus luteum in that ovary. The uterus is soft and is either of normal size or is slightly enlarged. On ultrasound, a thin, triple-layered endometrial stripe (lining) may be seen, or it may be thickened because of human chorionic gonadotropin (hCG) stimulation induced by placental hCG (an Arias-Stella reaction). There may be a small amount of fluid

TABLE 24-2
DIFFERENTIAL DIAGNOSIS FOR PREGNANCY OF UNKNOWN LOCATION

Diagnosis	hCG Levels	Ultrasonic Findings
Intrauterine Pregnancies		
Normal, ongoing pregnancy	Appropriately rising	Yolk sac or embryo in gestational sac in endometrial cavity
Anembryonic gestation	Variable pattern	Empty gestational sac in face of hCG > discriminatory zone or no appearance of embryo at appropriate time
Embryonic demise	Variable pattern	Embryo visualized with no cardiac activity
Incomplete abortion	Variable pattern	Retained placental tissue seen after (presumed) passage of fetus
Pregnancy Loss		
Complete abortion: intrauterine spontaneous or elective	Appropriately falling	Empty uterus, no suspicious adnexal findings
Complete abortion: ectopic	Appropriately falling	Empty uterus, no suspicious adnexal finding
Ectopic pregnancy (or persistent PUL)	Abnormally low increase, stable or abnormally decreasing	Empty uterus (without evacuation or following evacuation with no chorionic villi seen histologically) Possible visualization of extrauterine gestational sac or embryo

hCG, Human chorionic gonadotropin; PUL, pregnancy of unknown location.

seen in the cul-de-sac, representing some intraperitoneal blood. Rarely is the ectopic pregnancy actually visualized. A diagnosis of PUL is made until a longer-term evaluation can be conducted to determine if a more definitive diagnosis can be made. The final diagnosis may be a normal intrauterine pregnancy, an abnormal uterine pregnancy, or an ectopic pregnancy. **In the face of an early failing or failed pregnancy, the location of the implantation may never be determined and the diagnosis of PUL will thus remain.**

Diagnostic Tests for Pregnancies of Unknown Location

Because the consequences of ectopic pregnancy can be so serious, a high index of suspicion for ectopic pregnancy must be maintained until testing can establish the normalcy of the early pregnancy and its implantation site. Ectopic pregnancy must be included in the list of differential diagnoses in women who present with a positive pregnancy test, abnormal bleeding, and/or abdominopelvic pain. Generally, serial testing is needed over the course of several days during which time the patient must be reassessed clinically. **The two most important diagnostic tests are serial quantitative hCG levels in serum and sequential ultrasonic imaging.** The first test establishes the well-being of the pregnancy. The second is used to identify the implantation site and to determine a possible treatment plan. Endometrial evacuation and tissue identification procedures can also provide valuable information.

HUMAN CHORIONIC GONADOTROPIN TESTING

hCG is a glycoprotein consisting of two linked subunits: α and β. The α-subunit consists of 92 amino acids and is the same in luteinizing hormone (LH), follicle-stimulating hormone (FSH), and thyroid-stimulating hormone. The β-subunit is larger, with 145 amino acids; is different for each glycoprotein hormone; and provides for unique biologic activity. Before the development of sensitive and specific assays for the entire hCG molecule, tests for only the β-subunit of hCG were routinely used for assessment in early pregnancy, and especially to rule out ectopic pregnancies. This was because of the increased likelihood of false-positive results due to the cross-reactivity with other glycoprotein hormones (e.g., LH and FSH), which have the same α-subunits. Although the possibility of false-positive results still exists because of circulating factors in the serum that may interact with hCG antibody, **the more common laboratory test performed today is for the entire hCG molecule.** Although results of the more recent specific assay are still frequently referred to as *β-hCG*, we use the designation of *hCG* in this chapter.

The conceptus produces hCG before implantation, but the hormone does not enter the maternal circulation until after implantation. Sensitive assays for hCG can detect its presence within hours of implantation. The serum levels of hCG increase rapidly in a nonlinear fashion. The doubling time of serum hCG varies from 1.2 days shortly after implantation to 3.5 days at 2 months' gestational age. Healthy, normally developing pregnancies can be detected by a normal increase of

maternal serum hCG levels. **More than 66% of normal pregnancies have a doubling time of 48 hours in the first few weeks of pregnancy.** The expected rise in 48 hours for a viable intrauterine pregnancy is generally acknowledged to be at least 50%, although researchers in one recent, large study suggested that a threshold of 35% should be used to capture all normal intrauterine pregnancies.

Approximately 60% of ectopic pregnancies show an initial increase in hCG levels, and 40% show a decrease. In fact, more than one-fourth of ectopic pregnancies initially show hCG increases consistent with a normal intrauterine pregnancy. Therefore, hCG titers need to be followed over time to document a pattern of sustained normal increase until they reach a threshold, at which time the embryo can be visualized within the endometrial cavity by ultrasound. **This *discriminatory zone* (DZ) is defined as the range of hCG values in which an ultrasonic image can first detect the signs of an intrauterine pregnancy.** Each institution sets its own DZ, depending upon the hCG assay used, the ultrasonic equipment available, and the skill of the ultrasonographers. **Most centers quote a range of 1500 to 2000 mIU/mL of hCG as the DZ.** When the hCG level exceeds the upper limit of the DZ and no signs of an intrauterine pregnancy are seen on ultrasound, suspicion of an ectopic pregnancy increases. The possibility of multiple gestations must also be considered.

In the case of declining hCG levels, the differential diagnosis includes a complete spontaneous abortion and an abnormal PUL. Two days following a complete spontaneous abortion, the hCG levels decrease by 35-52%, and by 7 days, they should be reduced by 66-87%. Levels that fail to decline appropriately are consistent with an ongoing PUL, which could be ectopic.

TRANSVAGINAL ULTRASONOGRAPHY

Ultrasound is used to determine the presence of an intrauterine pregnancy and to check for the presence of free fluid in the peritoneal cavity. **With transvaginal ultrasonography, a gestational sac is usually visible between 4.5 and 5 weeks of gestational age.** The yolk sac can be visualized between 5 and 6 weeks and a fetal pole with cardiac motion appears between 5.5 and 6 weeks.

Early in pregnancy, inaccurate dating based on the last menstrual period can be a problem, so knowing the hCG level and the DZ for the reported level can be very helpful. When the upper level of hCG for the DZ is reached, an intrauterine pregnancy should be seen.

On ultrasound, an early normal intrauterine pregnancy has an eccentrically located echolucent area with a "double-ring" sign representing the decidual lining and the chorion around the early decidual sac. **This early gestational sac can be confused with a centrally located "pseudodecidual sac" that can be seen in ectopic pregnancies.** To confirm the diagnosis of intrauterine pregnancy, the patient is generally followed until a yolk sac or a fetal pole can be seen within the gestational sac.

OTHER TESTS FOR PREGNANCIES OF UNKOWN LOCATION

If the diagnosis of an abnormal pregnancy is made on the basis of a low rate of increase in hCG titers (<35% in 48 hours) or a decrease in hCG titers that is too slow to represent a complete abortion (<30% in 48 hours), or if the pregnancy is unwanted, an endometrial curettage can be performed. The absence of chorionic villi on examination of the biopsy specimen makes the diagnosis of ectopic pregnancy much more likely.

Serum Progesterone

Serum progesterone levels can help distinguish normal from abnormal pregnancies. The levels of progesterone remain relatively constant from 5 to 10 weeks of gestation, so only a single specimen is needed. Levels less than 5 ng/mL are consistent with an abnormal pregnancy with high specificity and a 60% sensitivity. Levels greater than 20 ng/mL indicate a healthy pregnancy with 95% sensitivity and 40% specificity. Unfortunately, most ectopic pregnancies have levels of progesterone in the 6 to 19 ng/mL range, which is not useful for diagnostic purposes.

OTHER IMAGING MODALITIES AND PROCEDURES

Magnetic resonance imaging (MRI) is used to help identify cesarean scar pregnancies and cornual pregnancies, both of which are potentially dangerous. Ultrasound may not be able to identify these ectopic sites because of their proximity to the endometrium.

Culdocentesis (needle aspiration of pelvic peritoneal fluid through the posterior fornix) has largely been replaced by ultrasonic detection of free fluid in the cul-de-sac. However, aspiration of peritoneal fluid can help distinguish nonclotting blood (hemoperitoneum) from clear fluid (ruptured ovarian cyst) and purulent material (acute infection). This information may be useful when the clinical presentation is confusing and the results would influence the choice of therapy.

Laparoscopy can be used as a diagnostic tool for PULs if questions remain about the patient's pathology. It has the advantage of providing treatment if an ectopic gestation is found (see below), but it does entail increased surgical risks and costs. Even with laparoscopy, there is a 2-5% rate of misdiagnosis, either because the ectopic pregnancy was too small to be recognized (false-negative) or because other processes were responsible for the suspicious appearance of the fallopian tube (false-positive).

Differential Diagnosis

A number of other disorders need to be considered in the differential diagnosis of ectopic pregnancy. Although pelvic pain and a positive pregnancy test should strongly suggest ectopic pregnancy, on occasion some other pain-producing disorder may occur in conjunction with an early intrauterine pregnancy and may need to be considered (see Box 24-1). Figure 24-1 presents an algorithm for the workup and

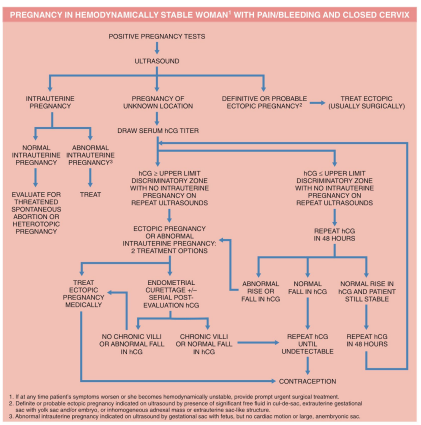


FIGURE 24-1 Algorithm for the workup and management of early pregnancy in a hemodynamically stable woman with pain, bleeding, and a closed uterine cervix. hCG, Human chorionic gonadotropin.

management of a hemodynamically stable woman with a positive pregnancy test, pelvic pain and bleeding, and a closed uterine cervix.

Management

The management of ectopic pregnancy in the fallopian tube depends on the stability of the patient, the availability of resources, and the patient's desire for future fertility. **In general, medical management is preferred for an early ectopic pregnancy, and surgery is reserved for unstable patients, those whose diagnosis is uncertain, and those whose medical therapy has failed.**

SURGERY

Laparotomy is the preferred surgical approach for women who are hemodynamically unstable, because rapid access to the bleeding site is critical. It is also the preferred approach whenever it is anticipated that laparoscopy would not be successful (e.g., because of extensive intraperitoneal adhesions). If it is determined intraoperatively that laparoscopy is not possible, the surgery can always be converted to laparotomy. Laparoscopy is discussed further in Chapter 31. Figure 24-2 shows a tubal ectopic pregnancy viewed through the laparoscope.

The actual surgery performed on the fallopian tube itself depends on the amount of tubal damage and the patient's wishes for future fertility. **Salpingectomy** (removal of the entire fallopian tube) is recommended when there has been significant damage to the tube, when a patient who previously has been sterilized verifies that she still does not desire future fertility, and when there is a high likelihood of retained products of conception. A laparoscopic salpingectomy is illustrated in Figure 24-3, *A*.

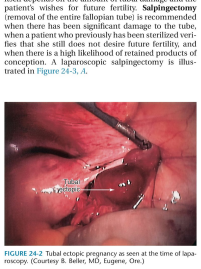


FIGURE 24-2 Tubal ectopic pregnancy as seen at the time of laparoscopy. (Courtesy B. Beller, MD, Eugene, Ore.)

Partial salpingectomy (removal of a portion of the fallopian tube) is generally performed only if the ectopic pregnancy is implanted in the mid-ampullary portion. A laparoscopic Endoloop partial salpingectomy is illustrated in Figure 24-3, *B*. **Salpingotomy** and **salpingostomy** are both procedures in which vasoconstrictive agents are injected beneath the implantation site. An incision is then made through the antimesenteric border of the fallopian tube, the products of conception are removed, and hemostasis is established. With salpingotomy, the incision is closed, whereas it is left open in a salpingostomy. A laparoscopic linear salpingotomy is illustrated in Figure 24-3, *C*. Most studies have shown that **salpingostomy** results in better long-term tubal function compared with **salpingotomy.**

If a patient's contralateral fallopian tube appears to be normal, there does not seem to be any advantage regarding future fertility if salpingectomy is performed instead of salpingostomy. In addition, there is a 10-20% risk of residual trophoblastic tissue whenever the products of conception are dissected from the fallopian tube (i.e., when salpingostomy or salpingotomy is performed). Patients who do not have resection of the affected tubal area should have repeat hCG titers 3 to 7 days postoperatively to confirm that no hCG-producing cells remain to reinvade the tube. When repeat hCG titers fail to decline appropriately, methotrexate (MTX) therapy can be started (see the following section). The risk for incomplete trophoblastic tissue removal is greatest when the ectopic products of conception are "milked" through the tube to extrude through the fimbria. This technique should never be used, even when it appears that the pregnancy is spontaneously aborting through the fimbria.

MEDICAL MANAGEMENT WITH METHOTREXATE

Ambulatory medical management of women with early, unruptured ectopic pregnancies has replaced surgical diagnosis and treatment in most cases. Randomized trials have shown no difference in overall tubal preservation, tubal patency, repeat ectopic pregnancy, or future pregnancy rates in women treated with medical management compared with tube-sparing laparoscopic surgery. The success of MTX diminishes rapidly with higher levels of hCG. Therefore, each institution should have its own criteria for offering MTX. However, in most cases, women treated with medical therapies avoid any surgical risk. The most commonly used agent is MTX, which is a folic acid antagonist that inhibits DNA synthesis and cell replication. Because of the side effects of MTX and the potential for tubal rupture, careful evaluation of the patient for possible contraindications, as shown in Box 24-2, is needed. Before MTX is considered, the woman should demonstrate a normal serum creatinine level, as well as normal liver and blood count studies.

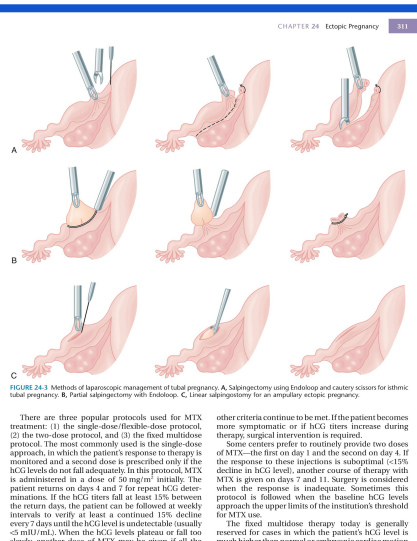


FIGURE 24-3 Methods of laparoscopic management of tubal pregnancy. **A,** Salpingectomy using Endoloop and cautery scissors for isthmic tubal pregnancy. **B,** Partial salpingectomy with Endoloop. **C,** Linear salpingostomy for an ampullary ectopic pregnancy.

There are three popular protocols used for MTX treatment: (1) the single-dose/flexible-dose protocol, (2) the two-dose protocol, and (3) the fixed multidose protocol. The most commonly used is the single-dose approach, in which the patient's response to therapy is monitored and a second dose is prescribed only if the hCG levels do not fall adequately. In this protocol, MTX is administered in a dose of 50 mg/m^2 initially. The patient returns on days 4 and 7 for repeat hCG determinations. If the hCG titers fall at least 15% between the return days, the patient can be followed at weekly intervals to verify at least a continued 15% decline every 7 days until the hCG level is undetectable (usually <5 mIU/mL). When the hCG levels plateau or fall too slowly, another dose of MTX may be given if all the other criteria continue to be met. If the patient becomes more symptomatic or if hCG titers increase during therapy, surgical intervention is required.

Some centers prefer to routinely provide two doses of MTX—the first on day 1 and the second on day 4. If the response to these injections is suboptimal (<15% decline in hCG level), another course of therapy with MTX is given on days 7 and 11. Surgery is considered when the response is inadequate. Sometimes this protocol is followed when the baseline hCG levels approach the upper limits of the institution's threshold for MTX use.

The fixed multidose therapy today is generally reserved for cases in which the patient's hCG level is much higher than normal or embryonic cardiac motion

BOX 24-2
MEDICAL MANAGEMENT OF ECTOPIC PREGNANCY

Contraindications to the Use of Methotrexate (MTX)

Patient-Related
1. Hemodynamic instability
2. Unreliable for return visits
3. Known sensitivity to MTX
4. Overt or laboratory evidence of immunodeficiency
5. Hepatic, renal, or hematologic dysfunction
6. Active pulmonary disease
7. Peptic ulcer disease
8. Breastfeeding

Ectopic Pregnancy–Related
1. Gestational sac ≥ 3.5 cm
2. Embryonic/cardiac motion seen
3. Human chorionic gonadotropin levels > institutionally predetermined value (usually between 6000 and 15,000 mIU/mL)

Modified from American College of Obstetricians and Gynecologists (ACOG): Medical management of tubal pregnancy, *Practice Bulletin No. 94*, Washington, DC, June 2008, ACOG.

is detected. In this 8-day regimen, MTX is administered intramuscularly every other day and folic acid rescue is provided on alternate days.

Patients being treated with MTX should be instructed to avoid folate supplements, nonsteroidal antiinflammatory agents, and alcohol. Pelvic rest (no sexual activity) is required, and women should also avoid sunlight exposure and vigorous physical exercise. Women should be warned about potential side effects of MTX. Gastrointestinal side effects, stomatitis, and hair loss are possible, especially with more prolonged therapy. Women may experience abdominal pain 2 to 3 days after injection, which is potentially caused by continued expansion of the pregnancy mass. They should return immediately if they have any sudden severe abdominal pain, shoulder pain, or dizziness. To avoid confusion about abdominal pain, gas-producing foods should be avoided. Women should be assured that treatment with MTX will not compromise their future fertility.

OTHER THERAPEUTIC INTERVENTIONS

When ectopic pregnancy is diagnosed at the time of laparoscopy, **MTX, prostaglandins, or hyperosmolar glucose can be injected into the amniotic sac to destroy the ectopic pregnancy without the need for any other procedure.** This technique can also be performed transvaginally using ultrasonographic guidance without laparoscopy. The potential advantage of this technique is that it is a one-time injection that reduces systemic side effects. However, the success of this approach has had mixed results, and therefore **its use should be considered experimental.**

EXPECTANT MANAGEMENT

Selected patients may qualify for expectant management (watchful waiting) if they are stable and the diagnosis of ectopic pregnancy is not yet certain or if their symptoms are resolving. **Patients managed expectantly should be reliable and relatively asymptomatic with hCG titers low enough that rupture is unlikely** (<200 mIU/mL and declining). When hCG levels are less than 200 mIU/mL, 85% of ectopic pregnancies resolve spontaneously. These women should be carefully followed with serial hCG testing and monitoring.

IMPORTANT THERAPEUTIC CONSIDERATIONS

All Rh-negative, unsensitized women who have ectopic pregnancies should receive anti–Rh immunoglobulin (RhoGAM). After an ectopic gestation, pregnancy should be avoided for at least 3 months to permit the fallopian tube to normalize and to allow complete elimination of MTX if that agent has been given. Highly effective contraception should be provided as soon as the ectopic pregnancy starts to resolve.

TREATMENT OF UNCOMMON TYPES OF ECTOPIC PREGNANCIES

An **ovarian ectopic pregnancy** produces the same symptoms as a tubal pregnancy. The treatment is aimed at removing the pregnancy and preserving as much normal ovarian tissue as possible. When ovarian preservation is not possible, usually because of profuse bleeding, oophorectomy is indicated. If identified early enough, ovarian ectopic pregnancies may be treated successfully with MTX.

Cervical ectopic pregnancy usually presents with profuse vaginal bleeding, and attempts at removal of the pregnancy are often unsuccessful. MTX and arterial embolization are used to manage cervical pregnancy if the patient is not actively bleeding. An alternative is to aspirate the cervical ectopic using an oocyte aspiration needle, transcervical to the cervical stroma. **Hysterectomy is reserved for large cervical ectopic pregnancies not amenable to nonsurgical intervention and for actively bleeding cervical pregnancies that cannot be controlled conservatively.**

Pregnancies rarely implant in the abdominal cavity (e.g., on the omentum, bowel, or parietal or visceral peritoneum), **but when they do, the pregnancy may proceed to near or full term.** At the time of laparotomy in advanced gestations, the placenta presents a major technical difficulty. Vital organs may be entirely or partially covered by the firmly attached placenta, and any attempt at removal may cause massive bleeding. Partial bowel resection may be required if the bowel is involved. **In most cases, it is best to leave the placenta attached,** especially if the pregnancy is in the second or third trimester. Expectant management, allowing spontaneous reabsorption of placental tissue,

Reference

and treatment with MTX to enhance placental reabsorption have both been reported to be successful.

The presence of an ectopic pregnancy in an old cesarean scar is reported with increasing frequency. Contrast-enhanced MRI may be needed to distinguish this from an intrauterine implantation. MTX given systemically combined with uterine artery embolization and curettage have been successful, but more extensive surgery is required in some cases.

Implications for Future Fertility

Patients who have had an ectopic pregnancy are at a 7- to 13-fold increased risk for another ectopic pregnancy and ongoing problems with infertility. In one encouraging study, researchers reported that the pregnancy rate is just over 80% after either medical or surgical treatment for ectopic pregnancy, with a mean time to conception of 9 to 12 months. Fertility rates are similar after expectant management or surgical intervention. All patients who have had an ectopic pregnancy should receive counseling about the increased risk of having another ectopic pregnancy before attempting pregnancy.

Med 441 Team:

Leaders:

Leen Alrajhi - Yara Almufleh

Members:

Fay Alluhaydan

Good Luck!

Med 438 Team:

Leaders:

Ateen Almutairi - Lama ALzamil - Lina Alosaimi

Members:

Renad AlKanaan - Ajeed Al Rashoud - Sedra elsirawani - Ateen Almutairi - Lina Alosaimi

Med 439 Team:

Leader:

Bushra Alotaibi - Renad Alhomaidi

Members:

Banan Alqady - Norah Alasheikh

Video Case

Antepartum Hemorrhage

Objectives:

- ➔ Mention the definition of antepartum hemorrhage.
- ➔ List the predisposing factors to antepartum hemorrhage.
- ➔ Compare the clinical presentation of different maternal and fetal causes of antepartum hemorrhage.
- ➔ Define morbidly adherent placenta and its predisposing factors.
- ➔ Compare and list the risk factors for different types of antepartum hemorrhage.
- ➔ Develop an evaluation and management plan for patient with antepartum hemorrhage including consideration of various resource settings
- ➔ Discuss maternal and fetal morbidity and mortality from antepartum hemorrhage.

- → Slides
- → Important
- → Golden notes
- → Extra
- → 439 Doctor's notes
- → 441 Doctor's notes
- → 441 Female Presentation
- → Reference

Female Presentation

Video Case | Editing File

Obstetric hemorrhage

- The most common causes of maternal death are hemorrhage, embolism, hypertensive disease, and infection.
- Obstetric haemorrhage is the most commonly documented cause of maternal death. **This can take the form of antepartum, intrapartum and postpartum hemorrhage** " not abortion ".

Initial Evaluation

The initial evaluation must be carefully performed to first stabilize the patient, and determine the cause while establishing a plan of management.
Make sure that you have **adequate nursing and physician support.**

- **ABBC :**

1- we are all familiar with the ABC's of cardiopulmonary resuscitation don't forget in a pregnant third trimester women (antepartum and intrapartum hemorrhage) there is another **B** for baby

- So, **always assess ;**
  - **Patient's overall status** including vital signs, patient start to show signs of shock like hypotension, tachycardia and pale
  - **Fetal heart rate status** in antepartum and intrapartum hemorrhage

2- Think right away about adequacy of : **IV access** and **blood availability**

- It is important for anesthesia colleague to aggressively give IV fluid during hemorrhage in order to maintain the intravascular volume (If intravascular volume is maintained during bleeding and cardiovascular status is not impaired, then oxygen delivery can be maintained until bleeding become too excessive)
- Obstetric hemorrhage is one of the leading causes of massive blood transfusion (along with trauma, liver transplant and abdominal aortic aneurysm).
  - Massive blood transfusion defines as : **≥10 units PRBCs/12-24h** or **4 units PRBCs/1h** (Packed Red Blood Cell is the mainstay of Blood replacement therapy)
    - In massive transfusion, we give : **1 unit of platelets with every 1 unit of Fresh frozen plasma + 1 unit of PRBC** (1:1:1 ratio). Because giving only PRBC and crystalloid volume lead to Dilution of plasma clotting proteins.
    - Remember **:**
      - 1 PRBC unit = 200 cc of RBC → ↑ hematocrit by 3-4%.
      - O2 delivery is ≥ 4 x O2 consumption, so there is always enormous reserve

Indications of blood product transfusion:

- **in cases of massive / Severe hemorrhage** (30%-40%) → transfuse blood
- **Less severe cases,** check overall health status + blood count, Hb levels:
  - **6-7** → transfuse blood
  - **7-8** → considered
  - **8-10** → transfuse if symptomatic anemia or acute coronary syndrome

Obstetric hemorrhage

Complications of blood product transfusion:

- Infection: (HIV, HepB, HepC, etc).
- Allergy or immune reaction: Transfusion-related acute lung injury, hemolytic transfusion reaction, graft vs host disease , Delayed hemolytic transfusion reaction, Febrile non-hemolytic and chill-rigor reactions.
- Volume overload

• Investigation :

- **Rh(D) negative mothers :** Obtain a Kleihauer-Betke test and administer anti-D immunoglobulin
- **Lab test :**
  - **CBC,** although acute blood loss may not be reflected in the hemoglobin level until homeostasis has been reestablished.
  - **Coagulation profile** (platelet count , serum fibrinogen level, PT,PTT.)
  - **Typed and crossmatched** for at least 4 units of blood.
  - **Test for DIC and Coagulopathy** → partially fill a "red-top" tube with blood. If a clot does not form, or once formed does not stay clotted, the patient most likely has (DIC).
    - Placental abruption is the most common cause of DIC in pregnancy.

Complications of obstetric hemorrhage :

- **Hypovolemic shock and acute renal failure** as a result of massive hemorrhage may be seen if hypovolemia is left uncorrected.
- **Disseminated intravascular coagulation** / DIC / consumption coagulopathy : a situation when **coagulation** or **clotting, starts to run out of control** (It's rare but life-threatening disease)
  - When this happens, a **lots of blood clots start to form in blood vessels** serving various organs, **leading to organ ischemia**.
  - In addition, **Without enough platelets circulating in the blood, other parts of the body begin to bleed with even the slightest damage** to the blood vessel walls.

Etiology

- Sepsis
- Trauma
- Obstetric complication
  - Abruptio placenta
  - Amniotic fluid embolism : A small amount of amniotic fluid may leak into the vascular system, and the thromboplastin in the amniotic fluid may trigger a consumption coagulopathy (the patient will collapse suddenly)
  - Retained products of conception
  - Preeclampsia
- Malignancy

Diagnosis

- Bleeding
- combination of laboratory findings.
  - Thrombocytopenia
  - increased PT
  - increased aPTT
  - low fibrinogen

should immediately raise suspicion for DIC.

Antepartum hemorrhage

- **Antepartum hemorrhage** is vaginal bleeding that occurs **after 20 weeks' gestation** / in the late 2nd trimester and the 3rd trimester
- It most commonly occurs during 3rd trimester.
- Bleeding in the third trimester of pregnancy can range from spotting to life-threatening hemorrhage

Remember that :
At term two important changes occur:
1- Blood volume ↑ 40%
- BV in pregnant = 7-8 L.
- BV in non pregnant = 5L.

2- Cardiac output ↑ 30%
- 20% of the total cardiac output goes to gravid uterus (thus bleeding of the gravid uterus could lead to a catastrophe).

Causes of 3rd trimester bleeding:

Placental / fetus

- **Abruptio placenta**
- **Placenta previa**
- **Vasa previa**
- **Preterm labor**

They will cause serious neonatal and maternal mortality and morbidity along with uterine rupture

Uterus / cervical /vaginal

- **Uterine rupture**
- Benign causes:
  - Vaginal or Cervical tear
  - Cervical polyp
  - Severe Cervicitis
- Cervical or vaginal cancer
- Cervical erosion
- Vaginal varicosities

Other

- Congenital bleeding disorder
- Unknown (by exclusion everything)

Initial evaluation and management of antepartum hemorrhage :

1- Initiate immediate management of obstetric hemorrhage

Unstable pregnant woman:

If a patient is bleeding profusely, a team approach to the assessment and management should be instituted to establish hemodynamic stability

- Hemodynamic instability and fetal distress are indications for urgent delivery

Stable pregnant woman:

- **Careful History**
- **Physical examination**

Initial Evaluation and management cont.

Stable pregnant woman:

- **Careful History :**

  Once you insured the pt is stable and reassuring of FHR patterns. careful history should be obtained. (PPQRST) is mnemonic is helpful to frame your **QUESTION** :

  - **P**ain with bleeding.
  - **P**lacental location (previous U/S that assessed the location?).
  - **Q**uantity of bleeding.
  - Recreational **drugs** : should be checked for known bleeding disorders or liver disease
  - **S**ex recently.
  - **T**iming of bleeding.

- **Physical examination :**

An important and accurate method of determining the cause of bleeding in the late second trimester and the third trimester is ultrasonography.

- **Inspection** of skin for **petechiae**.
- **Palpation of uterus**: soft, hard or Tender?
- **Confirm placenta location** by US (# Pelvic examination in placenta previa bc it will cause bleeding)
- Once placenta previa has been excluded by abdominal US :
  - **Sterile Speculum exam** can be performed to visually assess the cervix to rule out genital tears or lesions (e.g.cervical cancer) that may be responsible for the bleeding.
    - you can do speculum examination in cause of placenta previa bcs it won't enter or penetrate the internal os of cervix (expert physician)
  - If none are identified, **digital examination** or **pelvic ultrasound** may be performed to determine whether cervical dilation is present.

Take a break

Placenta Previa

- The uterus has two segments:
  - Upper segment: more muscular and more vascularized
  - lower segment: like a stretch muscle, which doesn't contract during labor
- When the placenta is implanted entirely or partially in the lower uterine segment **placenta previa occurs**. Normally, placenta is implanted in the upper uterine segment (not in the lower).

- Approximately 20% of all cases of antepartum hemorrhage are due to placenta previa.

- Between 4-6% of patients have some degree of placenta previa before 20 weeks' gestation. With the development of the lower uterine segment, a relative upward placental migration occurs, with 90% of these resolving by the third trimester.
  - Complete placenta previa is the least likely to resolve, with only 10% of cases resolving by the third trimester.

Risk factors:

The risk factors are anything that may affect the uterus **blood flow at the upper segment** or any **change in the shape** of the uterus and the **size** = placenta previa.

- **Prior placenta previa**
- **Multiparity** which is associated with changes in the size and shape of the uterus, providing more space in the lower uterine segment for implantation.
- Multiple gestation.
- **Cesarean delivery:** which also changes the shape of the lower uterine segment.
- **Increased maternal age.**

Classification:

Placenta previa is classified according to the relationship of the placenta to the internal cervical os.

Complete previa — The Placenta completely covers the internal cervical os. This is the most dangerous location because of its potential for hemorrhage.

Partial previa — Partially covers the internal os.

Marginal previa — One in which the edge of the placenta extends to the margin of the internal cervical os.

low lying placenta — Placenta lies in the lower uterine segment but its lower edge does not abut the internal os (within 2.0 cm of the endocervical os).

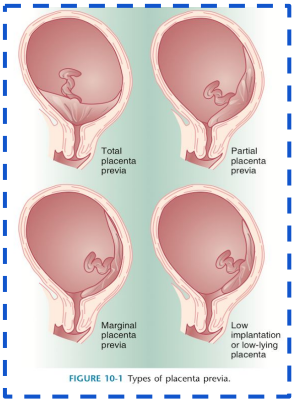


FIGURE 10-1 Types of placenta previa.

Clinical Presentation:

- The classic picture is **sudden painless late-pregnancy vaginal bleeding**, which can occur during rest or activity and without warning. .
- The **uterus** is **non tender** and **non irritable**.
- It may be preceded by trauma, coitus, or pelvic examination

Placenta Previa

Diagnosis:

- Placenta previa is almost exclusively diagnosed on the basis of **ultrasonography:**
  - Transabdominal ultrasonography has an accuracy of 95% for placenta previa detection
  - Transvaginal ultrasonography can accurately diagnose placenta previa in virtually 100% of cases.
- Routine prenatal care typically uses ultrasound early in pregnancy to detect placenta previa and assess placental location.
  - When placenta previa is diagnosed in the 2nd trimester, a repeat sonogram is indicated at 30-32w for follow-up evaluation.

Management:

1- Initiate immediate management of antepartum hemorrhage when placenta previa presenting as antepartum hemorrhage

- Management decisions depend on the gestational age of the fetus and the extent of the vaginal bleeding and It should balance between prematurity risk and heavy bleeding risk.

- **Delivery with placenta previa** should be performed **via cesarean.** As spontaneous labor places the mother at greater risk for hemorrhage and the fetus at risk for hypovolemia and anemia.
  - ≥ 37 weeks: immediate delivery
  - < 37 weeks :
    - If Severe, active bleeding or fetal distress: emergency cesarean delivery
      - If there is heavy bleeding, volume resuscitation and possibly betamethasone for fetal lung maturity
    - If **bleeding not profuse or repetitive**: the patient is managed expectantly in the **hospital on bed rest** until the baby gets a reasonable maturity, then we deliver her.

- **Vaginal delivery is not contraindicated in low lying placenta,** because during labor the fetal head compresses the edge of the placenta, decreasing the risk of bleeding. The same level of monitoring should be maintained for maternal hemodynamic stability and fetal well-being.

Complications :

- **Preterm delivery**.
- **Antepartum** or **intrapartum hemorrhage**, or both. The Bleeding is coming from lower uterine segment with a placenta was abnormally attached. In addition, there can be **abnormal extension of placenta tissue.**
  - Bleeding may be exacerbated by an associated placenta accreta or uterine atony.

OB Triad: Placenta Previa

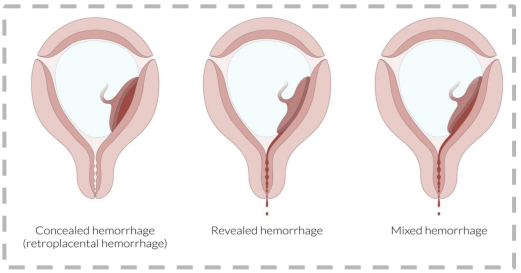
- Late trimester **painless bleeding.**
- **In US: Lower segment placental implantation**

Abruptio Placentae

- This is premature / abnormal separation of normally implanted placenta from the uterine wall before delivery of the fetus leading to hemorrhage.

1. When **Placenta edge are separated Blood may dissect extend downward toward the dilated cervix** (sometimes placenta edges separation cause cervix to dilate) resulting in an external or **revealed hemorrhage** = **Visible bleeding**

2. When **Blood may dissect** upward toward the fundus and **behind placenta and cannot exit** (also **cervix is closed**) resulting in a **Retroplacental** / **concealed hemorrhage** which lead to **couvelaire uterus** = **no vaginal bleeding** are seen, look for Hypovolemic symptoms



3. Sometimes both of them can occur at the same time

Etiology :

Failure of adequate placental implantation

Clinical presentation :

- **Painful vaginal bleeding** in association with abdominal and **uterine tenderness**, hyperactivity, and increased tone.
- Sometimes fetal distress or fetal death may present in 60% and 15% of cases respectively
  - If FHR is abnormal → placental abruption
  - If FHR is normal → placenta previa

Diagnosis :

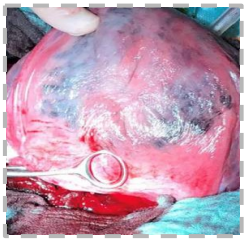
- Clinical presentation
- Ultrasonography may detect only 2% of abruptions.

Risk factor :

- **Maternal hypertension**
  - The most common risk factor is maternal HTN either chronic or as a result of preeclampsia (any type of HTN)
  - It is contraindicated to do ECV "external cephalic version"
- **Maternal Trauma**
  - Ex. MVA, Domestic violence, fall or ECV
- Maternal Substance abuse (e.g., cocaine, amphetamines, tobacco)
- Multiple gestation
- Previous Hx of abruption
- Pregnancy after in vitro fertilization (IVF)
- Polyhydramnios with rapid decompression
- Premature rupture of membranes
- Short umbilical cord
- Folate deficiency

Complication:

- Abruption places the fetus at significant risk of **hypoxia** and, ultimately, **death.**
- **Couvelaire uterus :** extravasation of blood into uterine musculature which causes uterus to appear purple or blue and sensation is hard like stone.
- The most common cause of **coagulopathy / DIC** in pregnancy.



Abruptio Placentae

Management:

1- Initiate immediate management of antepartum hemorrhage

- **Hemodynamically unstable or severe hemorrhage: emergency cesarean delivery unless vaginal delivery is imminent.**

- **Hemodynamically stable :**
  - **> 36 weeks:** Deliver.
  - **34–36 weeks :**
    - **Active uterine contractions:**
      - vaginal delivery
    - **No active uterine contractions:**
      - expectant management and observation
  - **< 34 weeks :** Expectant management and Observation

OB Triad: Abruptio placenta

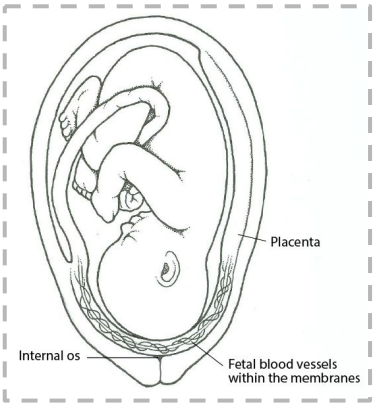
- Late trimester **painful bleeding.**
- **Fetal distress**
- **Normal placental implantation.**
- Associated with **DIC**

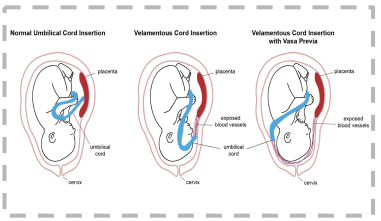
- In the setting of placental abruption, the use of tocolytics or uterine relaxants is not advisable, because the uterine tone must be maintained to control the bleeding

If the mother or the baby are unstable, deliver !! Both vaginal or CS are possible, unlike placenta previa which is always CS.

Other causes of Antepartum Hemorrhage

Vasa Previa : very rare





Vasa previa is a condition in which the unprotected fetal vessels are located in the membranes near / pass over the internal OS of the cervix

Risk factors:

- Placental anomalies, such as:
  - Velamentous umbilical cord insertion : the vessels of the cord insert between the amnion and chorion, If the unprotected vessels pass over the cervical os, this is termed a velamentous cord insertion with vasa previa
  - Accessory placenta lobe
  - Placenta previa or Low-lying placenta
- Multiparity

Clinical presentation:

Vasa previa can be **asymptomatic**

- BUT can also present with sudden onset of The classic triad is **Rupture of membranes** + **Painless vaginal bleeding (fetal blood)**, followed by **Fetal distress** (e.g., fetal bradycardia; decelerations or sinusoidal pattern on fetal heart tracings)

Diagnosis :

- Transabdominal or transvaginal **ultrasound with color Doppler** : it shows fetal vessels overlying the internal os
  - You can differentiate between fetal and mother blood by Apt test

OB Triad: vasa Previa

- **Asymptomatic**

Or

- **Painless vaginal bleeding**
- **Fetal distress**
- **Rupture of membranes**

Management :

Immediate cesarean delivery of the fetus is essential or the fetus will die from hypovolemia.

Uterine rupture:

Uterine rupture implies complete separation of the uterine musculature through all of its layers, ultimately with all or a part of the fetus being extruded from the uterine cavity.

- It may occur before labor or at the time of delivery.

Other causes of Antepartum Hemorrhage

Risk factor:

Uterine rupture is primarily caused by uterine distention.

- Prior uterine scar (It is associated with 40% of cases)
  - A high-vertical / classical incision does carry a higher risk for uterine rupture in subsequent pregnancies compared to a prior low-transverse incision.
- Uterine distention
  - Fetal macrosomia
  - Multiple gestations
- Induction of labor
- Traumatic rupture

Clinical presentation:

- Typically, rupture is characterized by the **sudden onset of intense abdominal pain +/- vaginal bleeding + abnormal fetal heart rate pattern (fetal distress)**
  - After the rupture has occurred, the patient may be free of pain momentarily and then complain of diffuse pain thereafter.
  - Abnormal contouring of the abdomen may be seen.
  - The presenting part of the baby may be found to have retracted on pelvic examination, and fetal parts may be more easily palpable abdominally.

Diagnosis:

A high index of suspicion is required, and **immediate laparotomy is essential.** There isn't time to make the diagnosis so there are NO TESTS. Go to crash section.

OB Triad: uterine rupture

- **Sudden onset of intense abdominal pain > then free > then diffuse pain**
- **Fetal distress**
- **+/- vaginal bleeding**

Dr's note 441

- Scenario: **a pt came on week 20, on US the placenta appeared on the lower segment, do I diagnose as previa?**
  NO! As the placenta starts in early gestation in the lower segment.

- Scenario: **a pt came on week 33, on US the placenta appeared on the lower segment, do I diagnose as previa?**
  YES!
  - **Management?**
    Inform pt that we'll induce labor around 36-37 weeks and if contractions are present before then, she must come to the ER! As we don't want the placenta to start bleeding from the contractions.

- Scenario: **a pt came on week 34, complaining of bleeding and she had placenta previa. Management?**
  Keep for observation and give dexa, if she was under 32 weeks give MgSO4.

- Scenario: **a 30 week GA lady comes into the ER after a MVA complaining of severe abdominal pain and tenderness described as "stone-like' ?**
  Placenta abruptio

- **Which one (abruption-previa) can deliver vaginally?**
  Placenta Abruptio
  - **why?**
    Because they go through labor very fast.

Summary

Differential diagnosis of antepartum bleeding					
condition	**pain**	**Vaginal bleeding**	**Additional symptoms**	**The most important Risk factors**	**Can be deliver by vaginal ?**
Placenta previa	Painless	+		Previous placenta previa\cesarean delivery.	**No**
Vasa previa		+ (fetal blood)	**Fetal distress**	Placenta anomalies	
Uterine rupture	Severe abdominal pain	+/-	• **Fetal distress** • The presenting part of the baby may be found to have retracted on pelvic examination and may be more easily palpable abdominally.	Uterine scar	
Placental abruption	mild to moderate abdominal pain	+	• **Fetal distress.** • Uterine tenderness • Hypertonic contractions (rigid uterus).	Maternal Hypertension.	**Yes**
Stillbirth	Cramping abdominal pain	+	Features of labor (e.g., uterine contractions).		
Cervical trauma	Mild to moderate pelvic pain “depending on the extent of damage”	Bruised and tender cervix without evidence of active bleeding.			

Teaching Case

CASE: A 25-year-old G2P1 woman at 32 weeks gestation is brought to labor and delivery by her husband. About an hour before, she was watching television when **she noted a sudden gush of bright red blood vaginally** hint for placenta previa. The bleeding was heavy and soaked through her clothes, and she has continued to bleed since then. She denies any cramps or abdominal pain. She says that her last sexual intercourse was a week ago. A review of her prenatal chart finds nothing remarkable other than a borderline high blood pressure from her first prenatal visit that has not required medication. There is no mention of bleeding prior to this episode. She had an ultrasound to confirm pregnancy at 14 weeks it is extremely difficult to make diagnosis of placenta previa here(to localize the Placenta it has to be in the 2nd trimester), but none since.

Physical examination reveals an extremely pale woman whose blood pressure is 98/60, pulse 130, respirations 30, temperature 99° F. **Her abdomen is soft without guarding or rebound to palpation**, and the uterus is **nontender** (characteristic for Placenta Previa) and firm, but not rigid. Fundal height is 33cm. **Fetal heart tones are in the 140s with good variability** normal, hint for placenta previa**.** The external monitor reveals uterine irritability, but no discrete contractions are seen. There is a steady stream of bright red blood coming from her vagina.

1. What is your differential diagnosis for potential causes of bleeding for this patient?

- Placental abruption.
- Placenta Previa (the most likely diagnosis, painless & normal fetal HR).
- Vasa Previa.
- Genital lacerations/trauma (e.g. labial, vaginal or cervical).
- Foreign body.
- Cervical/vaginal cancer.
- Cervicitis.
- Bloody show. (Cervical mucus blood that passed when the cervix started to dilated during labor and it heavier than usual)
- Unexplained Antepartum Haemorrhage

2. What steps would you take to evaluate this patient?

- Identifying the etiology of the bleeding, also evaluation of both the maternal and fetal status.
- Assess maternal hemodynamic status:
  - Serial vital signs.
  - Hematologic studies to assess for acute anemia and DIC.(CBC, Coagulation profile, grouping and cross matching)
  - Confirm placental location.
  - Avoid digital cervical exam.
  - Sonographic evaluation of placental location.
- Assess fetal status:
  - Continuous external heart rate monitor or sonographic biophysical assessment
  - Kleihauer-Betke test for maternal-fetal hemorrhage.

■ To detect fetal blood cells in maternal circulation. We take blood from the mother and then we look at it after adding acid or alkali , the fetal blood usually resist denaturation by alkali and acid, while maternal RBC will fade while the fetal RBC will be maintained . Then we calculate the amount of fetal blood entered the circulation , to know the amount of Anti-D to give according to the amount of fetal blood in the maternal circulation.(it can help to know that cause of Antepartum Haemorrhage could be Vasa Previa)

Teaching Case

3. What signs and symptoms would help you differentiate the potential causes of the bleeding?

Placental abruption

Epidemiology	Risk factors	Clinical presentation
- Occurs in 1 in 100 births. - Accounts for approximately 30% of cases of third trimester bleeding . - 25% recurrence risk in a subsequent pregnancy - Management: if the patient hemodynamically unstable stabilize her and then delivered by cesarean section - We can deliver vaginally	- Hypertension (chronic or gestational). - Cocaine use/smoking and Abdominal trauma. - Sudden uterine decompression (as with rupture of membranes) Preterm premature rupture of membranes.	- Frequent uterine contractions or hypertonicity. - Vaginal bleeding (sometimes catastrophic). - Non-reassuring fetal heart rate tracing. - Hypofibrinogenemia supports the diagnosis. - Disseminated intravascular coagulation occurs in 10% to 20% of severe abruption.

Placenta previa

Situated in the lower segment . If a patient present at 24 weeks and you did US and anatomy scan and found low line placenta , what do we do ? we wait, because the placenta might migrate up.

Epidemiology It has 4 grades	Risk factors	Clinical presentation
1-Central or total placenta previa: placenta completely covers the os. 2-Partial placenta previa: placenta partially covers the os (os must be partially dilated). 3 -Marginal previa: the placental edge is adjacent to the os but does not cover it. 4-Low-lying placenta: the placenta approaches the os, but is not at its edge. -At 24 weeks, about 1 pregnancy in 20 will demonstrate ultrasound evidence of a placenta previa. -At 40 weeks, the incidence decreases to 1 in 200. -Accounts for approximately 20% of cases of third trimester bleeding Placental abruption is more common than placenta previa	- Prior cesarean delivery. - History of myomectomy & Increasing number of uterine curettages. - Increased parity. - Multiple gestation. - Advanced maternal age. - Smoking.	- Bleeding is usually painless and may occur after intercourse. - Patients may also present with contractions, thus ultrasonography is critical to differentiating from abruption - Management of placenta previa : Cesarean section - Management of placenta previa accreta or morbidly adherent : Cesarean hysterectomy

Teaching Case

Vasa previa

it is not placenta tissue, it is blood vessels from the baby circulation (placenta) covering the os and it ruptures
In The MCQ (VERY IMP !) : It is NOT a cord prolapse, it is only a blood vessel covering the os

Definition	Risk factors	Clinical presentation
- Fetal vessels of a velamentous cord insertion cover the cervical os (Incidence is less than 1% of all pregnancies). - In vasa previa the bleeding is from the fetus, thus it is associated with fetal distress.	- Common Multiple gestations: up to 11% in twins and up to 95% in triplets (which is associated with IVF). - Should be delivered by cesarean section	- suggested by painless vaginal bleeding in the absence of evidence of placenta previa or abruption. - It give us a very characteristic feature on CTG called sinusoidal pattern. - Kleihauer-Betke test Can help you in the diagnosis

Other causes:

- causes of 3rd trimester bleeding such as cervicitis, cervical erosions, trauma, cervical cancer, foreign body or even bloody show can usually be differentiated on physical exam once the preceding etiologies are ruled out

4. What steps would you take to manage the low blood pressure and tachycardia that the patient is displaying?

- Ensure adequate airway and assess vitals:
  - Serial blood pressure, heart rate, and respirations.
  - Continuous oxygen saturation monitor.
- Establish adequate IV access (2 large bore IVs or central venous line).
- Monitor blood and coagulation profiles:
  - Serial CBC and platelet counts.
  - Serial prothrombin time, partial thromboplastin time, and fibrinogen.
- Volume resuscitation: Crystalloid, Packed red blood cells (Platelets, fresh frozen plasma and cryoprecipitate as indicated).
- Monitor vitals and response to therapy:
  - Serial blood pressure, heart rate, and respirations.
  - Continuous oxygen saturation monitor.
  - Continuous urine output assessment via indwelling Foley catheter.
- Management of the patient with significant 3rd trimester hemorrhage, when the fetus is mature, is hemodynamic stabilization and delivery.
- Vaginal delivery is generally precluded in the setting of abruption with persistent hemodynamic instability.
- Cesarean delivery is required for all cases of previa and vasa previa.
- If the CTG show abnormal signs that fetus is suffering whatever the GA I have to delivery immediately by cesarean

5. Under what circumstances would you consider blood product transfusion?

- Acute blood loss of 30-40% blood volume.
- Chronic blood loss with hemoglobin < 6 g/dL (or <10g/dL + cardiopulmonary problems)
- Coagulation problems:
    - Fibrinogen < 150 mg/DL
    - Prolongation of PTT.
    - Platelets < 20,000.
    - Platelets < 50,000 + cesarean delivery.
- Complications:
    - Febrile non-hemolytic and chill-rigor reactions.
    - Acute hemolytic reaction due to ABO incompatible transfusion.
    - Delayed hemolytic transfusion reaction.
    - Transfusion-related acute lung injury by heavy blood transfusion because of WBC have deleterious effect on the lung and can injure the lung tissue .
    - Allergic reactions to unknown blood components.
    - Volume overload.
    - Graft vs. Host Disease (GVHD).
    - Infectious complications (HIV, HepB, HepC, etc).
- Blood products :

Product (mL)	Contents	Uses and effects
Whole Blood (1 unit = 500mL)	All components	Rarely used. Only in the setting of massive bleeding
Packed RBC (1 unit = 350 mL)	RBC only	One unit increased hematocrit by 3 percentage points
Frozen plasma (1 unit = 200–300 mL)	All clotting factors, no platelets	Use for deficiencies in multiple clotting factors. One unit of FFP increased fibrinogen by 7-10 mg/dL
Cryoprecipitate (1 bag = 10-15 mL)	Fibrinogen, factors VIII, XIII, vWF	Ten bags of cryoprecipitate will raise plasma fibrinogen by 70 mg/dL in a 70 kg recipient
Platelets (1 unit = 50mL)	Platelets	Six units of whole blood-derived or one unit of apheresis-derived platelets will raise the platelet count by approximately 30,000/μL

Med 441 Team:

Leaders:

Leen Alrajhi - Yara Almufleh

Members:

Noyer Alshaibany

Good Luck!

Med 438 Team:

Leaders:

Ateen Almutairi - Lama ALzamil - Lina Alosaimi

Members:

Reem Aljabr - Taif Alshammari - Njoud Bin Dakhil - Lina Alosaimi

Med 439 Team:

Leader:

Bushra Alotaibi - Renad Alhomaidi

Members:

Reem Alqahtani - Yara Alasmari

Video Case

Postpartum hemorrhage

Objectives:

- → Mention the definition of postpartum hemorrhage (early and late)
- → List the risk factors for postpartum hemorrhage
- → Construct a differential diagnosis for immediate and delayed postpartum hemorrhage
- → Develop an evaluation and management plan for the patient with postpartum hemorrhage including consideration of various resource settings
- → Discuss maternal and fetal complications from postpartum hemorrhage.

- → Slides
- → Important
- → Golden notes
- → Extra
- → 439 Doctor's notes
- → 441 Doctor's notes
- → 441 Female Presentation
- → Reference

Female Presentation

Video Case | Editing File

Postpartum Hemorrhage (PPH)

Definition

- It is blood loss >500 cc after vaginal delivery or >1000 cc after cesarean section. In case of multiple gestation it will be >750cc after vaginal delivery and cesarean section usually will be the same.
- Severe PPH : ≥ 1000 cc
- It is one of the top three causes of maternal mortality in both high and low income countries.
- It is an emergency so we should recognise it early to act act quickly

Classification

Primary / early PPH: (99% of cases)

it occurs within the first 24 h after delivery and it's caused by:

- **Uterine atony** (80% / the most common)
- **Laceration** (the 2nd most common)
- **Retained placenta** especially placenta accreta
- **Uterine inversion**
- **Defect in coagulation**

Secondary / delayed PPH:

it occurs between 24 h and 6-12 week postpartum and it caused by:

- **Infection**
- **Retained products of conception** : fetal or placental tissue remains in the uterus after a pregnancy ends bc they won't let the uterus to contract
- **Subinvolution of placental site:** is delayed closure and sloughing of spiral arteries at the placental attachment site especially placenta accreta spectrum.
- Inherited **coagulation defect**

General management

Active management of the third stage of labor (which is a timer to the delivery of the fetus and placenta) can reduce the incidence of postpartum hemorrhage (**prevention**) and it will Done for all women after delivery . It Includes :

1. initial step : IV or IM **oxytocin +/- ergometrine** , use misoprostol if oxytocin is not available
2. **Gentle core traction** with suprapubic support to hold the uterus in place,
    - Placenta separation signs:
        - Fresh show of blood from the vagina
        - Elongation of the cord
        - The fundus rise up
        - The uterus becomes firm and globular / Uterus contraction.
3. **Fundal** / uterine **massage** : involves placing a hand on the woman's lower abdomen and stimulating the uterus by repetitive massaging or squeezing movements. Massage is thought to stimulate uterine contraction through stimulation of local prostaglandin release. **not done any more**

Postpartum Hemorrhage (PPH)

it's important to note that postpartum hemorrhage can often occur without any warning as well, sometimes young healthy women may tolerate and mask hypovolemia well. The sensitivity and specificity of the vital signs are not absolute,and it should be replaced by quantitated blood loss, where sponges and pads are weighed and measured.

General measures upon recognizing excessive blood loss :

1. Initiate immediate management of obstetric hemorrhage
2. A careful **inspection** performed **of the perineum, vulvar, vagina and cervix**
3. **Bimanual examination** : if there is uterine atony or retained placenta fragments - assess the uterine wall for rupture
4. Then **Targeted intervention depending on the etiology.**

General management cont.

Unexplained Postpartum Hemorrhage

★ If despite careful searching no correctable cause of continuing hemorrhage is found, it may be necessary to perform a laparotomy and bilateral surgically ligate the uterine or internal iliac arteries.

★ Hysterectomy would be the last resort.

Table 1. Complications of Postpartum Hemorrhage

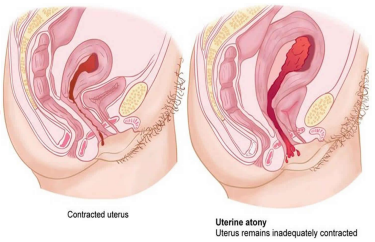
Anemia	Death
Anterior pituitary ischemia with delay or failure of lactation (i.e., Sheehan syndrome or postpartum pituitary necrosis)	Dilutional coagulopathy
Blood transfusion	Fatigue
	Myocardial ischemia
	Orthostatic hypotension
	Postpartum depression

Information from references 3, 6, and 7.

- **Sheehan syndrome** appear as result from excessive blood loss during childbirth which lead those cells without adequate blood flow leading to hypopituitarism
  - Will cause Amenorrhea

Uterine Atony

1 Uterine Atony



Definition

- Uterine atony is failure of the uterus to contract after placental separation leads to excessive placental site bleeding.
- It is the most common cause of excessive postpartum bleeding.
- Usually the uterus contracts after delivery (like a **stone**).
- When uterus is not contracted, blood vessels won't contract too which will lead to bleeding.

Clinical findings

- A soft and baggy uterus (feels like dough) palpable above the umbilicus.
- After delivery, the uterine fundus must be just below the level of the umbilicus.

Risk factors

1. Hx of PPH
2. Overdistended uterus (As in multiple gestations, polyhydramnios, macrosomia baby)
3. **Chorioamnionitis** (if the patient developed chorioamnionitis, the muscle will not work) they present with uterine tenderness ,foul smelling discharge, fever)
4. Grand multiparity : a parity of 5 or more because it's already distended so it's weak
5. Prolonged labor and/or Augmented labor with oxytocin because of fatigue
6. Fast labor : the uterus can sometimes react by acting surprised and it's already all done and does not clampdown
7. Asian/hispanic ethnicity
8. Medications ($MgSO_4$, β-adrenergic agonists,halothane)
9. Uterine leiomyomata
10. Full Bladder **(Extended)** because the bladder is compressing the uterus
11. Coagulopathy

Recently, several new factors have been identified as potential causes of uterine atony, including vitamin D deficiency and maternal and fetal genetic factors.

Take a deep breath

Uterine Atony

Management

Start with **Drain the bladder** because it is difficult to the uterus to contract if there is full bladder

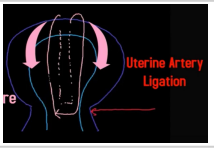
Medical management (Uterotonic agents: type of medication used to induce contraction or greater tonicity of the uterus**):**

Oxytocin	Usually start with it It's given IV
Methylergonovine maleate (methergine)	It's given IM **# contraindication in hypertension** and arterial disease because the smooth muscle constriction effects of these drugs may also increase vascular tone and thus increase blood pressure to dangerous levels.
15-methyl prostaglandin F2α (Carboprost/Hemabat)	It's given IM **#contraindication in asthma** for can theoretically constrict the bronchioles
Prostaglandins such as : **misoprostol** (Cytotec)	It's given orally or rectally

Uterine tamponade: it used when medical management fails , these methods work by applying pressure internally to stoan the flow a blood

Bakri balloon	Inserted through a catheter with normal saline to apply a pressure
Uterine packing	With gauze but usually we don't do it to avoid the infections

Surgical : it used when uterine tamponade fails

B lynch suture	One of the first step can by B lynch suture. Suture placed in anterior surface of uterus and travels posteriorly, on the poster aspect of the uterus stitches placed and suture travels anteriorly and a suture is tied this manually compresses the uterus
Uterine artery ligation	It can be performed for the uterine arteries in certain here on the uterus at the level of the internal IS 
Uterine artery embolization	By interventional radiology. The patient has to be stable however in order to be able to transport her to the interventional radiology location.

If all these steps failed **Hysterectomy** should be performed.

Postpartum Hemorrhage

2 Lacerations

Vaginal lacerations are tears in the vagina or in the skin and muscle around its opening. Tears are most common in the space between the opening of the vagina and the rectum (perineum)

Risk factors

During vaginal delivery, lacerations of the cervix and vagina may occur spontaneously, but they are more common following the use of forceps or a vacuum extractor

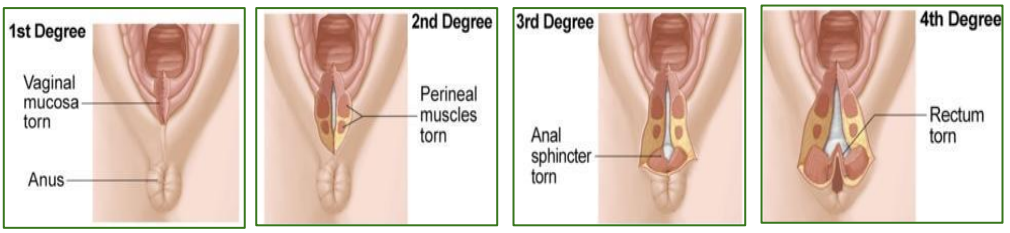
Clinical findings

Identifiable lacerations (cervix, vagina, perineum) in the presence of contracted uterus.

Management

Surgical repair (suture). A running locked suture technique provides the best hemostasis

Lacerations degree:



3 Retained Placenta

Retained placenta is when the placenta doesn't completely come out of the uterus after the baby is born that getting uterus does not well contracted because of the remnant placental tissue inside. usually we wait 30 min after the baby delivery if it didn't come out we remove it manually in the OR.

***Retained placenta can occur in the setting of significant as with placenta accreta spectrum (PAS).**

Risk factors

1. Accessory placental lobe **(most common)**
2. Abnormal trophoblastic uterine invasion
3. Previous C-section

Clinical findings

Diagnosed by US

missing placental cotyledons in the presence of a contracted uterus.

Management

Manual exploration or uterine curettage under ultrasound guidance.

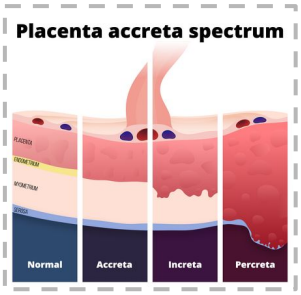
Placenta accreta spectrum

- Placenta accreta spectrum / PAS is a general term used to describe abnormal attachment / invasion of trophoblast / the placenta villi through the uterine myometrium and sometimes to or beyond the serosa
    - It results from a defect in decidual formation (absent Nitabuch layer).

- It associated with significant Morbidity is approximately 27%.

Classification :

Depending on the depth of implantation of the trophoblast in the uterine wall.



1. **Placenta Accreta (A > Attached** to the myometrium**):** Involves extension of placenta tissue into the wall of the endometrium and superficial layer of myometrium. (most common type)
2. **Placenta Increta (I> Invade** the myometrium**) :** Involves extension of placenta tissue into further myometrium
3. **Placenta Percreta (P > Perforates** the myometrium**) :** Involves extension of placenta tissue completely through myometrium to serosa and sometimes into adjacent viscera. (The highest complication rate.)

Risk factors :

Any prior damage to the endometrium

- History of uterine surgery
    - cesarean delivery : those with prior cesarean delivery have a 10-50% risk of abnormal implantation.
- Placenta previa
- Multiparity
- Advanced maternal age

Clinical Presentation:

- Significant **uterine bleeding** causing intrapartum and postpartum hemorrhage " bleeding at the time of attempted manual separation of the placenta"
    - it cause primary and secondary postpartum hemorrhage but usually cause primary

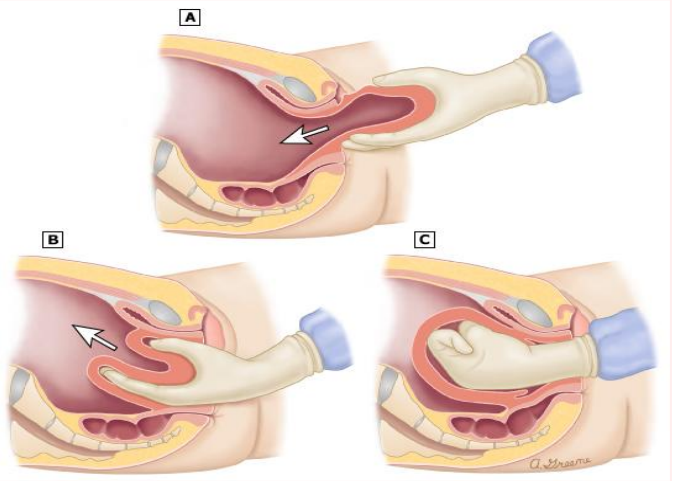
Diagnosis and intervention :

- It diagnosed by clinical features + US
- It managed by Cesarean hysterectomy.
    - The placenta is left in place after delivery and complete hysterectomy is performed.

Postpartum Hemorrhage

4 Uterine Inversion

"turning inside-out"
Uterine inversion occurs when the uterine fundus collapses into the endometrial cavity, turning the uterus partially or Completely



Risk factors

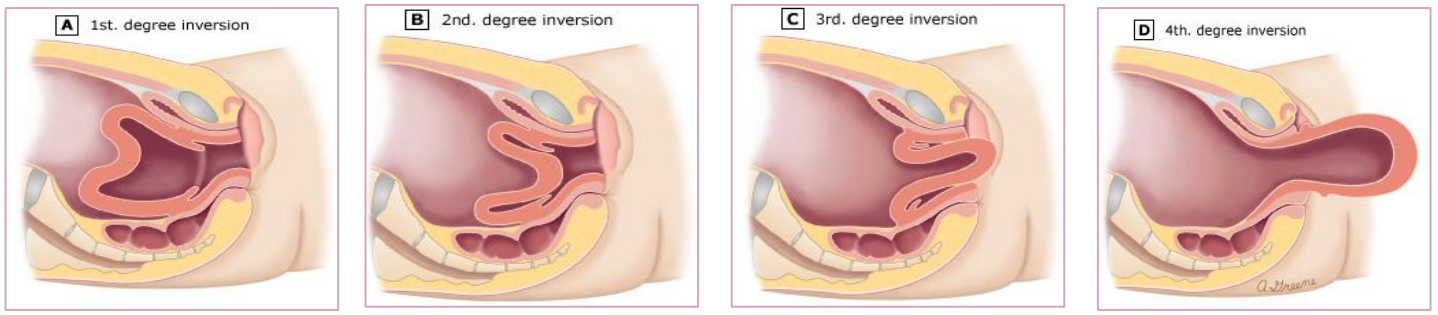
- Improper management of the 3rd stage of labor can cause an iatrogenic uterine inversion. If the inexperienced physician exerts fundal pressure while pulling on the umbilical cord before complete placental separation uterine inversion may occur
- Myometrial weakness
- Previous uterine inversion

Clinical findings

Beefy-appearing bleeding mass in the vagina and failure to palpate the uterus abdominally.

Management

Uterine replacement by placing a cupped hand into inverted fundus from below and elevating it in the long axis of the vagina once replaced followed by IV oxytocin.



Online MedEd notes

	Uterine inversion	Uterine atony	Retained placenta	Vaginal laceration
Presentation	PPH+Absent uterus	PPH+Boggy uterus	PPH+Firm uterus (bc something still in it)	PPH+Normal uterus
Pathology	"Uterus births itself" Due to: - delivery with oxytocin (excess power) - Traction of the placenta	**Most common cause of PPH.** Due to: -Prolonged labour - prolonged oxytocin treatment leads to OXTR desensitization, thereby limiting further oxytocin-mediated contraction responses. - Tocolytics	Happens when placenta go deep (as in placenta accreta, increta, percreta) or wide (as in placenta previa), it become more difficult to get it out, leading to placenta tear and accessory lobe is left behind.	Causes: - tear in cervix and vagina - Precipitous delivery - Macrosomic baby - Episiotomy
Diagnosis	Clinically: - Speculum: appear as uterus inverted to the vagina	clinical	Inspection of placenta. Normally placental blood vessel never reach the edge, if you inspect blood vessels reaching the edge it most probably placenta tear and they is retained placenta.	Clinically: - Speculum: shows laceration in the cervix and vagina "if laceration cannot be found, think about DIC".
Treatment	a. Manually: First use **Tocolytic** to cool it down and to put it back in place, than use uterine tonic (**oxytocin**) to get it contract down where it supposed to be. b. Surgery	a. Uterine massage b. Medication: 1. Oxytocin 2. Methergine 3. Hemabate (PGF2α) c. Surgery	a. D&C (dilation and curettage) b. Hysterectomy Follow up: - tract β-hCG serum level to reach zero = to know you got all placenta out,.	a. Pressure (if small bleeding) B. Suture: use anesthesia first (if severe bleeding)

Summary

Clinical	Diagnosis	Management
Uterus not palpable	**Inversion (rare)**	Elective vaginal fornices, IV oxytocin
Uterus like dough	**Atony (80%)**	Uterine massage, oxytocin, ergot, PG E2α
Tears vagina, cervix	**Lacerations (15%)**	Suture & repair
Placenta incomplete	**Retained placenta (5%)**	Manual removal or uterine curettage
Diffuse oozing	**DIC (rare)**	Remove POC, ICU care, blood products prn
Persistent bleeding	**Unexplained (rare)**	Ligate vessels or hysterectomy

Teaching case

Tracy is a 33 year-old G1 woman who underwent induction of labor for a post-dates pregnancy at 41 weeks and 3 days gestation. Prostaglandins were used to accomplish cervical ripening and an oxytocin infusion was used to induce labor.The patient had a lengthy first and second stage. Ultimately, the fetus was delivered with vacuum assistance. The baby weighed 9 pounds 3 oz at birth. The third stage of labor was uncomplicated. Thirty minutes later you are called to the recovery room because Tracy has experienced brisk vaginal bleeding that did not respond to uterine massage by her Nurse.

Q1: What is the definition of postpartum hemorrhage?

Blood loss >500 cc after vaginal delivery or >1000 cc after cesarean section.
Or decline in hematocrit more than 10%
Why is the blood loss in CS is more than vaginal delivery ? In CS you are cutting tissues other than the uterus. In vaginal delivery the bleeding comes from the uterus itself.

Q2: What elements of this case present risk factors for a postpartum hemorrhage?

- Induced labor
- Prolonged labor it causes exhaustion to the uterine muscle
- Operative vaginal delivery it can cause laceration and injury
- Fetal macrosomia

Q3:What are other risk factors for postpartum hemorrhage?

- Grand Multiparity
- Over-distended uterus (multiples, hydramnios, fetal macrosomia,multiple fibroids)
- Augmented labor
- Prolonged labor
- Operative delivery
- Previous history of postpartum hemorrhage
- Chorioamnionitis

Teaching case

Q4:What are the causes of postpartum hemorrhage?

1. Uterine atony (most common)
2. Retained placental tissue
3. Maternal trauma/obstetric lacerations Uterine inversions
4. Maternal coagulopathy (pre-existing or acquired)

It easy to remember the causes of PPH by 4 Ts:
1. Tone (uterine atony)
2. Tissue (Retained placental tissue)
3. Truma (laceration)
4. Thrombosis (coagulopathies)

Q5:What is the management for postpartum hemorrhage?

- ABC and call for help
- Bimanual examination to identify the cause

1. **Prevention** (for those risk factors):
    a. Active Management of the third stage of labor
    b. Oxytocin (IV or IM) with delivery of anterior shoulder or delivery of the fetus
    c. Gentle cord traction following delivery of fetus
    d. Suprapubic support of the uterus to prevent inversion while providing cord traction.

2. **Diagnosis of PPH and Management** : ABC, Assess tone of uterus and management will be based on etiology

3. **Bimanual massage**
    a. **If atony most likely** : Employ uterotonics (oxytocin, ergonovine/methylergonovine, 15-methyl prostaglandin F2α, misoprostol)
    b. **Lacerations** : suturing
    c. **Retained placenta** : Manual removal or uterine curettage

4. Empty bladder, insert foley catheter for fluid monitoring

5. If uterus does not respond to these methods consider alternatives measures (intrauterine compression by Bakri balloon or Uterine packing, surgery with compression sutures, arterial ligation, hysterectomy)

6. Also, blood should be transfused for any patient with PPH with 1:1:1 ratio (PRBC : FFP : Platelets) .

In Management of PPH always start with **ABC** then check the **4 Ts**:
1. Tone (uterine atony_ uterotonic medication)
2. Tissue (Retained placental tissue- check the placenta then remove the placental tissue)
3. Truma (laceration- suturing)
4. Thrombosis (coagulopathies- check blood work if she has DIC then you should transfuse blood with1:1:1 ratio)

Reference

Postpartum Hemorrhage

***Postpartum hemorrhage (PPH)*, the leading cause of maternal mortality, is defined as blood loss in excess of 500 mL at the time of vaginal delivery or blood loss in excess of 1000 mL following cesarean delivery.** The excessive blood loss usually occurs in the immediate postpartum period, but it can occur slowly over the first 24 hours. **Delayed PPH can occasionally occur, with the excessive bleeding commencing more than 24 hours after delivery.** This is usually due to subinvolution of the uterus and disruption of the placental site "scab" several weeks postpartum or to the retention of placental fragments that separate several days after delivery. The causes of PPH are listed in Box 10-3.

Since 1996, there has been a gradual increase in the incidence of PPH in the United States and other developed countries. This increase has been related to uterine atony. The cause of this increase is not known and is currently under intense investigation.

UTERINE ATONY

The majority of PPH cases (75-80%) are due to uterine atony. The factors predisposing to postpartum uterine

BOX 10-3
CAUSES OF POSTPARTUM HEMORRHAGE

- Uterine atony*
- Retained placental tissue*
- Genital tract trauma
- Low placental implantation
- Uterine inversion
- Coagulation disorders
- Amniotic fluid embolism
- Retained dead fetus
- Inherited coagulopathy
- Abruptio placentae (usually ante- or intrapartum)

*Both of these conditions result in retained blood clots and placental fragments, causing uterine stretching and prevention of uterine contractions.

BOX 10-4
FACTORS PREDISPOSING TO POSTPARTUM UTERINE ATONY

- History of postpartum hemorrhage*
- Prolonged labor*
- Grand multiparity (a parity of 5 or more)*
- Overdistention of the uterus*
  - Multiple gestations
  - Polyhydramnios
  - Fetal macrosomia
- Oxytocic augmentation of labor*
- Precipitous labor (one lasting <3 hr)
- Magnesium sulfate treatment of preeclampsia†
- Chorioamnionitis†
- Halogenated anesthetics
- Uterine leiomyomata†
- Vitamin D deficiency
- Genetic and epigenetic factors (maternal, environmental, and fetal)

*High-risk patients (one or more factors).
†Medium-risk patients (one or more factors).

atony are listed in Box 10-4. Recently, several new factors have been identified as potential causes of uterine atony, including **vitamin D deficiency and maternal and fetal genetic factors.** Vitamin D is known to play an important role in muscle function, and muscle is a component of both the uterine and vascular system. Studies have suggested that among patients having a vaginal delivery, 18% of the variation in excessive postpartum bleeding may be attributable to maternal genetic factors, 11% to maternal environmental factors, and 11% to fetal genetic effects.

Most of the blood loss due to uterine atony occurs from the myometrial spiral arterioles and decidual veins that previously supplied and drained the intervillous spaces of the placenta. As the contractions of the partially empty uterus cause placental separation, bleeding occurs and continues until the uterine musculature contracts around the blood vessels and acts as a physiologic-anatomic ligature. **Failure of the uterus to contract after placental separation (uterine atony) leads to excessive placental site bleeding.**

During pregnancy, uterine relaxation is facilitated by progesterone and parathyroid hormone–related peptide (PTHrP). The latter plays an important role in maintaining uterine relaxation during pregnancy (see Chapter 5); however, as soon as the uterus is emptied (delivery of the fetus and placenta), the gene controlling this hormone is turned off and the uterus is allowed to contract more completely. If there is a failure of complete expulsion of the placenta or poor uterine contractility leading to excessive bleeding, the uterus will fill with blood. The distention is thought to reactivate the expression of PTHrP and cause uterine relaxation, thereby leading to excessive hemorrhage.

Management of Patients at Risk for Postpartum Hemorrhage

Because the major cause of PPH is uterine atony, the initial focus should be on prevention of uterine atony by considering the following steps:

1. All women in early labor who have risk factors for PPH should be identified (see Box 10-4) and their hemoglobin checked. For **medium-risk women,** their blood should be typed and screened for irregular antibodies such as Rh and Kell. For **high-risk women,** 2 units of blood should be typed and crossmatched (refer to Stage 0 in Table 10-1).
2. As soon as the fetus has been delivered, an infusion of oxytocin (Pitocin) 10 to 40 U/L IV should be started and maintained during the first 6 hours postpartum.
3. The vagina and perineum should be inspected to rule out any lacerations that could cause excessive bleeding.
4. The placenta should be carefully assessed at delivery to make certain there are no missing cotyledons (lobules of placenta).
5. The uterus should be evaluated by abdominal palpation during the first 1 to 2 hours before transfer to the postpartum unit. The nurses on the postpartum unit should frequently assess the status of uterine contractility, instructing the patient on how to assess uterine firmness and reporting any excessive bleeding. For high-risk patients, continuation of the oxytocin IV infusion during the early postpartum hours should be considered.

DIFFERENTIAL DIAGNOSIS: OTHER LESS COMMON CAUSES OF POSTPARTUM HEMORRHAGE

If the cause of bleeding has not been identified, the management of PPH requires a systematic approach. The fundus of the uterus should be palpated through the abdominal wall to determine the presence or

TABLE 10-1
POSTPARTUM OBSTETRIC HEMORRHAGE CARE SUMMARY

Stage 0 All women in labor or giving birth	Assess for Risk Factors (see Box 10-4) 1. Active management: IV infusion of oxytocin after delivery of the fetus and fundal uterine massage after delivery of the placenta 2. Complete evaluation for missing placental cotyledons and examination of vagina and cervix for lacerations with repair when needed to control bleeding 3. If high risk (history of postpartum hemorrhage plus 1 or more risk factors), consider typing and crossmatching 2 U of PRBCs
Stage 1 Blood loss >500 mL (vaginal delivery) >1000 mL (cesarean delivery)	Begin Hemorrhage Protocol 1. Alert charge nurse and anesthesia staff 2. Type and crossmatch 2 U of PRBCs (if not already done) 3. Increase infusion rate of oxytocin, give methergine and repeat fundal massage 4. Measure blood loss
Stage 2 Total blood loss between 1000 and 1500 mL	Call for Help (Rapid Response Team) 1. Consider complete reexamination of vagina, cervix, and uterine cavity for source of bleeding; if the patient is in the postpartum unit, consider moving her to labor and delivery or the operating room 2. Consider the next level of drugs (carboprost 250 µg IM or misoprostol 800 to 1000 µg per rectum) and request additional laboratory testing (e.g., a coagulation panel) 3. Consider blood transfusion (have 2 U of PRBCs plus 2 U of fresh frozen plasma at the bedside) 4. Consider placement of intrauterine balloon or involve interventional radiology when available for embolization
Stage 3 Total blood loss >1500 mL	Mobilize Surgical Team 1. Consider repeat laboratory tests, including coagulation studies and acid-base gas assessment 2. Transfuse appropriately with PRBCs and platelets 3. Consider B-Lynch suture, uterine artery ligation, or hysterectomy

Modified from the California Maternal Quality Care Collaborative. Available at www.CMQCC.org. Accessed May 10, 2015.
IM, Intramuscular; IV, intravenous; PRBC, packed red blood cells.

absence of **uterine atony.** Next, a quick but thorough inspection of the vagina and cervix should be performed to ascertain whether any **lacerations** may be compounding the bleeding problem. Any **uterine inversion** or **pelvic hematoma** should be excluded during the pelvic examination. (See Table 10-1, Stages 1 and 2; begin hemorrhage protocol.)

GENITAL TRACT TRAUMA

Trauma during delivery is the second most common cause of PPH. During vaginal delivery, lacerations of the cervix and vagina may occur spontaneously, but they are more common following the use of forceps or a vacuum extractor. The vascular beds in the genital tract are engorged during pregnancy, and bleeding can be profuse. Lacerations are particularly prone to occur over the perineal body, in the periurethral area, and over the ischial spines along the posterolateral aspects of the vagina. The cervix may lacerate at the two lateral angles while rapidly dilating in the first stage of labor. **Uterine rupture may occasionally occur.** At the time of delivery by low transverse cesarean, an inadvertent lateral extension of the incision can damage the ascending branches of the uterine arteries; an extension inferiorly can damage the cervical branches of the uterine artery.

RETAINED PLACENTAL TISSUE

In about one-half of the patients with delayed PPH, placental fragments are present. The uterus is unable to maintain a contraction and involute normally around a retained placental tissue mass. **If retained placental fragments are suspected, ultrasonic assessment of the uterus should be performed. If placental fragments are identified, manual exploration of the uterine cavity** should be performed, with the patient under general anesthesia if necessary. With fingertips together, a gloved hand may be slipped through the open cervix and the hand inserted into the uterus. The endometrial surface should be palpated carefully to identify any retained products of conception, uterine wall lacerations, or partial uterine inversion. If no cause for the bleeding is found, **coagulopathy** must be considered.

LOW PLACENTAL IMPLANTATION

Low implantation of the placenta can predispose the patient to PPH because the relative content of musculature decreases in the lower uterine segment, which may result in insufficient muscular control of placental site bleeding. Verifying a fully drained bladder and the use of uterotonic agents such as oxytocin, methylergonovine, or prostaglandin is usually sufficient. If

bleeding continues, surgical management must be considered.

COAGULATION DISORDERS

Peripartum coagulation disorders are high-risk factors for PPH, but fortunately they are quite rare.

Patients with **thrombotic thrombocytopenia** have a rare syndrome of unknown etiology characterized by thrombocytopenic purpura, microangiopathic hemolytic anemia, transient and fluctuating neurologic signs, renal dysfunction, and a febrile course. In pregnancy, the disease is usually fatal.

An **amniotic fluid embolus** is also rare and is associated with an 80% mortality rate. This syndrome is characterized by a fulminating consumption coagulopathy, intense bronchospasm, and vasomotor collapse. It is triggered by an intravascular infusion of a significant quantity of amniotic fluid during a tumultuous or rapid labor in the presence of ruptured membranes. During the process of **placental abruption,** a small amount of amniotic fluid may leak into the vascular system, and the thromboplastin in the amniotic fluid may trigger a consumption coagulopathy.

Patients with **idiopathic thrombocytopenic purpura** have platelets with abnormal function or a shortened lifespan. This causes thrombocytopenia and a tendency to bleed. Circulating antiplatelet antibodies of the immunoglobulin G type may occasionally cross the placenta and result in fetal and neonatal thrombocytopenia as well.

von Willebrand disease is an inherited coagulopathy characterized by a prolonged bleeding time due to factor VIII deficiency. During pregnancy, these patients are likely to have a decreased bleeding diathesis because pregnancy elevates factor VIII levels. In the postpartum period, they are susceptible to delayed bleeding as factor VIII levels fall.

UTERINE INVERSION

Uterine inversion is the "turning inside out" of the uterus in the third stage of labor. It is quite rare, occurring in only about 1 in 20,000 pregnancies. Just after the second stage of labor, the uterus is somewhat atonic, the cervix open, and the placenta attached. **Improper management of the third stage of labor can cause an iatrogenic uterine inversion.** If the inexperienced physician exerts fundal pressure while pulling on the umbilical cord before complete placental separation (particularly with a fundal implantation of the placenta), uterine inversion may occur. As the fundus of the uterus moves through the vagina, the inversion exerts traction on peritoneal structures, which can elicit a profound vasovagal response. The resulting vasodilation increases bleeding and the risk of hypovolemic shock. **If the placenta is completely or partially separated, the uterine atony may cause profuse bleeding, which compounds the vasovagal shock.**

Obstetric Shock and External Bleeding

Hypotension without significant external bleeding may occasionally develop in an obstetric patient. This condition is called obstetric shock. **The causes of obstetric shock include concealed hemorrhage within the uterus, uterine inversion, and amniotic fluid embolism.**

An improperly sutured episiotomy can lead to a concealed PPH. If the first suture at the vaginal apex of the episiotomy incision does not incorporate the cut and retracted arterioles, these can continue to bleed, creating a hematoma that can dissect cephalad into the retroperitoneal space. This may cause shock without external evidence of blood loss. **A soft tissue hematoma, usually of the vulva, may occur following delivery in the absence of any laceration. Uterine rupture** can also occur secondary to blunt abdominal trauma at the time of an automobile accident.

Management of Established Postpartum Hemorrhage and Obstetric Shock

During the diagnostic workup of an established hemorrhage, the patient's vital signs must be monitored closely. However, **young healthy women may tolerate and mask hypovolemia well.** The sensitivity and specificity of the vital signs are not absolute. The estimated blood loss is commonly underestimated, and it should be replaced by quantitated blood loss, where sponges and pads are weighed and measured. Multiple units of packed red blood cells must be typed and crossmatched, and IV crystalloids (such as normal saline or lactated Ringer solution) infused to restore intravascular volume. **Resuscitation with normal saline usually requires a volume of three times the estimated blood loss to replace the intravascular volume. During a massive hemorrhage, morbidity and/or mortality are reduced with an emphasis on early blood product replacement rather than crystalloid-based resuscitation.**

UTERINE ATONY

When uterine atony is determined to be the cause of the PPH, a rapid, continuous IV infusion of dilute oxytocin (40 to 80 U in 1 L of normal saline) **should be given to increase uterine tone.** If the uterus remains atonic and the placental site bleeding continues, 0.2 mg of **ergonovine maleate or methylergonovine** may be given intramuscularly. The ergot drugs are relatively contraindicated in patients with hypertension because the smooth muscle–constricting effects of these drugs may also increase vascular tone and thus increase blood pressure to dangerous levels.

Analogues of prostaglandin $F_{2\alpha}$ given intramuscularly are quite effective in controlling PPH caused by uterine atony. The 15-methyl analogue carboprost (Hemabate) has a more potent uterotonic effect and longer duration of action than the parent compound. The expected time of onset of the uterotonic effect when the 15-methyl analogue is given intramuscularly (0.25 mg) is 5 minutes, with a peak effect around 15 to 20 minutes. When injected into the myometrium, its effect may be more rapid. An alternative next-level drug is misoprostol 800 to 1000 µg per rectum (Table 10-1, Stage 2).

If these pharmacologic treatments fail, **a bimanual compression and massage of the uterine corpus may control the bleeding and cause the uterus to contract.** This was the only method available before the use of uterotonic drugs. Although **packing the uterine cavity is no longer widely practiced,** it may occasionally control PPH and obviate the need for surgical intervention. Alternatively, **a large-volume balloon catheter** has been developed that performs a similar function while maintaining a channel into the uterine cavity, allowing further bleeding to be monitored. If uterine bleeding persists in an otherwise stable patient, an interventional radiologist may be able to **place a percutaneous catheter into the uterine arteries for injection of thrombogenic material to control blood flow and hemorrhaging (see Table 10-1, Stage 2).**

Hysterectomy is a treatment of last resort. If the patient has completed her childbearing, a **supracervical or total abdominal hysterectomy** is the definitive therapy for intractable PPH caused by uterine atony. When reproductive potential is important to the patient, **ligation of the uterine arteries** adjacent to the uterus will lower the pulse pressure. This procedure is more successful in controlling placental site hemorrhage and is easier to perform than bilateral hypogastric artery ligation (see Table 10-1, Stage 3).

GENITAL TRACT TRAUMA

When PPH is related to genital tract trauma, surgical intervention is necessary. When repairing genital tract lacerations, **the first suture must be placed well above the apex of the laceration to incorporate any retracted bleeding arterioles into the ligature.** Repair of vaginal lacerations requires good light and good exposure, and the tissues should be approximated without dead space. A running locked suture technique provides the best hemostasis (Figure 10-2). **Cervical lacerations need not be sutured unless they are actively bleeding.** Large, expanding hematomas of the genital tract require surgical evacuation of clots and a search for bleeding vessels that can be ligated. **Stable hematomas can be observed and treated conservatively.** A retroperitoneal hematoma generally begins in the pelvis. If the bleeding cannot be controlled using a vaginal approach, a laparotomy may be necessary.

An **intraoperative laceration of the ascending branch of the uterine artery** during delivery through a low transverse incision can easily be controlled by the placement of a large suture ligature through the myometrium and broad ligament below the level of the laceration. A **uterine rupture** usually necessitates subtotal or total abdominal hysterectomy, although small defects may be repaired.

RETAINED PRODUCTS OF CONCEPTION

When the placenta cannot be delivered in the usual manner, **manual removal** is necessary (Figure 10-3). This should be performed urgently if bleeding is profuse. Otherwise, it is reasonable to delay for 30 minutes to await spontaneous separation. General anesthesia may be required. Following manual removal of the placenta or placental remnants, the uterus should be scraped with a large curette.

UTERINE INVERSION

The management of a uterine inversion requires quick thinking. The patient rapidly goes into shock, and **immediate intravascular volume expansion with IV crystalloids is required.** An anesthesiologist should be present. When the patient's condition is stable, the partially separated placenta should be completely removed and an attempt made to replace the uterus by placing a cupped hand into the inverted fundus from below

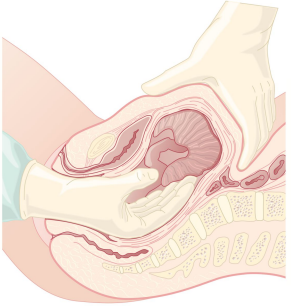


FIGURE 10-3 Manual removal of the placenta. The abdominal hand provides counterpressure on the uterine fundus against the shearing force of the fingers in the uterus.

and elevating it in the long axis of the vagina. If this is unsuccessful, a further attempt should be made using **IV nitroglycerin** (100 µg) **or general anesthesia to relax the uterine muscle.** Once replaced, a dilute infusion of oxytocin should be started to cause the uterus to contract before removing the intrauterine hand. **Rarely, the uterus cannot be replaced from below, and a surgical procedure may be required.** At laparotomy, a vertical incision should be made through the posterior portion of the cervix to incise the constriction ring and allow the fundus to be replaced into the peritoneal cavity. Suturing of the cervical incision completes this procedure.

AMNIOTIC FLUID EMBOLUS

The principal objectives of treatment for amniotic fluid embolism are to support the respiratory system, correct the shock, and replace the coagulation factors. This type of embolism requires immediate cardiopulmonary resuscitation, usually with mechanical ventilation; rapid volume expansion with an electrolyte solution; positive inotropic cardiac support; placement of a bladder catheter to monitor urine output; correction of the red cell deficit by transfusion with packed red blood cells; and reversal of the coagulopathy with the use of platelets, fibrinogen, and other blood components.

MANAGEMENT OF COAGULOPATHY

When PPH is associated with coagulopathy, the specific defect should be corrected by the infusion of blood products, as outlined in Box 10-5 and Table 10-2. **Patients with thrombocytopenia require platelet concentrate infusions; those with von Willebrand disease require factor VIII concentrate or cryoprecipitate.**

A packed red cell infusion is given to a patient who has bled sufficiently to compromise the delivery of oxygen to the tissues. Therefore, institution of blood transfusion is best judged by symptoms of oxygen deprivation rather than by some empirical hemoglobin

BOX 10-5
LABORATORY EVALUATION OF DISSEMINATED INTRAVASCULAR COAGULATION

- **Platelet count** (normal range 150-450 × 10^9/L): 1 U of platelets will raise the platelet count by 5-10 × 10^9/L.
- **Plasma fibrinogen** (normal range 175-600 mg/dL): fresh frozen plasma (FFP): 1 U = 1 g of fibrinogen; 4 U of FFP will raise the plasma fibrinogen by 5-10 mg/dL.
- **Cryoprecipitate:** 1 bag = 0.25 g of fibrinogen; 16 bags raises the plasma fibrinogen by 5-10 mg/dL.
- **Fibrin split products:** Normal range: <0.05 µg/mL (D-dimer method)

level. No important physiologic impairment has been noted at hemoglobin levels as low as 6 to 8 g/dL (hematocrit of 18-24%). **In general, a 1-U transfusion of packed red blood cells will increase the hemoglobin level by 1 g/dL (and the hematocrit by 3-4%).**

Massive blood replacement (when total blood volume is replaced in a 24-hour period) may be associated with thrombocytopenia, prolonged PT, and hypofibrinogenemia. Thrombocytopenia is the most common abnormality, so platelet transfusion following determination of a low platelet count is not an uncommon scenario. Fresh frozen plasma may be transfused for prolonged PT or hypofibrinogenemia.

TABLE 10-2
BLOOD PRODUCTS USED TO CORRECT COAGULATION DEFECTS

Blood Product	Volume (mL) in 1 U*	Effect of Transfusion
Platelet concentrate	30-40	Increases platelet count by about 5000-10,000
Cryoprecipitate	15-25	Supplies fibrinogen, factor VIII, von Willebrand factor, and fibronectin
Fresh frozen plasma	200	Supplies all factors except platelets (1 g of fibrinogen)
Packed red blood cells	200	Raises hematocrit 3-4%

*Quantity obtained from 1 U (500 mL) of fresh whole blood.

In the setting of active bleeding greater than 1000 mL, the hemorrhage care protocol (see Table 10-1) should be activated. Maternal mortality and morbidity have been reduced when a protocol of packed red blood cells, fresh frozen plasma, and platelets, given in a ratio of 6:4:1, is implemented. Treatment should not be delayed while awaiting laboratory results or blood product crossmatching.

DELIVERY OF THE PLACENTA. Separation of the placenta generally occurs within 2 to 10 minutes of the end of the second stage of labor (delivery of the baby). Squeezing the fundus to hasten placental separation is not recommended, because it may increase the likelihood of passage of fetal cells into the maternal circulation. **The initial step in the management of the third stage of labor for prevention of postpartum hemorrhage** is to begin an IV infusion of 40 U of Pitocin in 500 mL of saline at a rate of 10 mL/min for 5 minutes, followed by 1 to 2 mL/min until the patient is transferred to the postpartum unit.

Signs of placental separation are as follows: (1) a **fresh show of blood** from the vagina, (2) **the umbilical cord lengthens** outside the vagina, (3) **the fundus rises up**, and (4) the **uterus becomes firm and globular.** Only when these signs have appeared should the assistant attempt traction on the cord. With gentle traction and counterpressure between the symphysis and fundus to prevent descent of the uterus into the pelvis, the placenta is delivered.

The next appropriate step (after Pitocin infusion is started as mentioned above) is the application of uterine massage by either the physician or the nurse in attendance. If the patient is at risk for postpartum hemorrhage (e.g., because of anemia, prolonged oxytocic augmentation of labor, multiple gestation, macrosomia, or polyhydramnios), manual removal of the placenta and manual exploration of the uterus may be necessary.

Finally, the placenta should be examined to ensure its complete removal (no missing cotyledons) and to detect placental abnormalities. Dilation and curettage may be necessary to evacuate retained placental tissue that is causing hemorrhaging.

Med 441 Team:

Leaders:

Leen Alrajhi - Yara Almufleh

Members:

Lama Aleyadhy

Good Luck!

Med 438 Team:

Leaders:

Ateen Almutairi - Lama ALzamil - Lina Alosaimi

Members:

NOUF ALShammari - Sarah Maghrabi

Med 439 Team:

Leader:

Bushra Alotaibi - Renad Alhomaidi

Members:

Sumo Alzeer