CHAPTER 1

Physiology of Reproduction

Physiology of Reproduction

The menstrual cycle

- The ovarian menstrual cycle is approximately 28 days.
- It consists of two phases and one event.
- Each of the two phases is about 14 days.
- Variable lengths in the menstrual cycle are usually due to variations in the follicular phase.
- Once ovulation occurs, menstruation occurs almost exactly 14 days later.
- The length of the menstrual cycle in days minus 14 gives a good estimate of the day of ovulation.

A. Follicular Phase (Days 1-14):

- This represents the growth of the dominant follicle within the ovary, driven mainly by FSH.
- It is probably the largest follicle and the one with the greatest number of FSH receptors.
- The main hormonal secretion is estrogen by the granulosa cells.
- One function of the estrogen is to stimulate the replacement of the cells of the functional layer of the endometrium lost in the last menstruation.

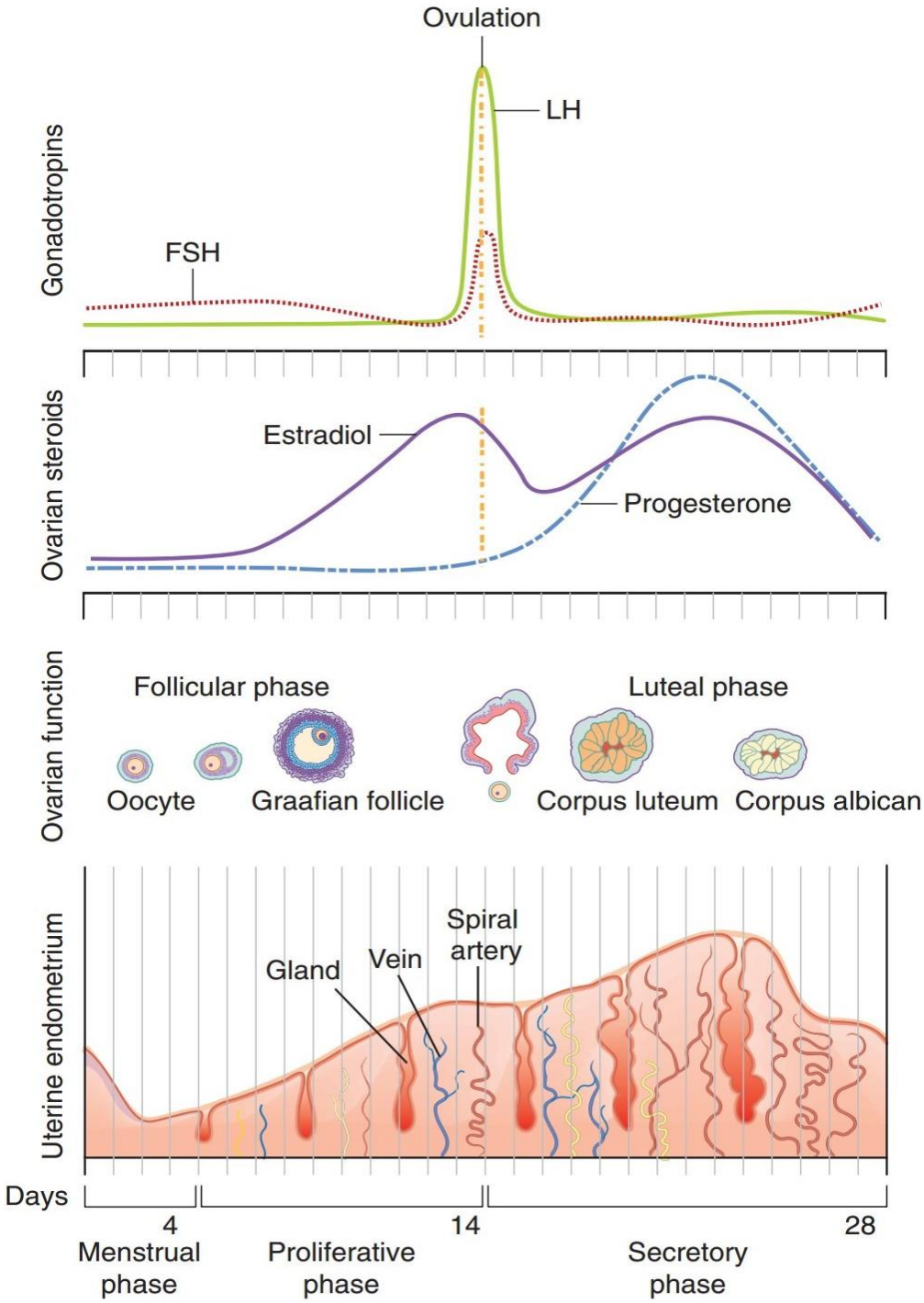
B. Ovulation: Preceded by the LH surge near the end of the follicular phase, which induces ovulation on about Day 14.

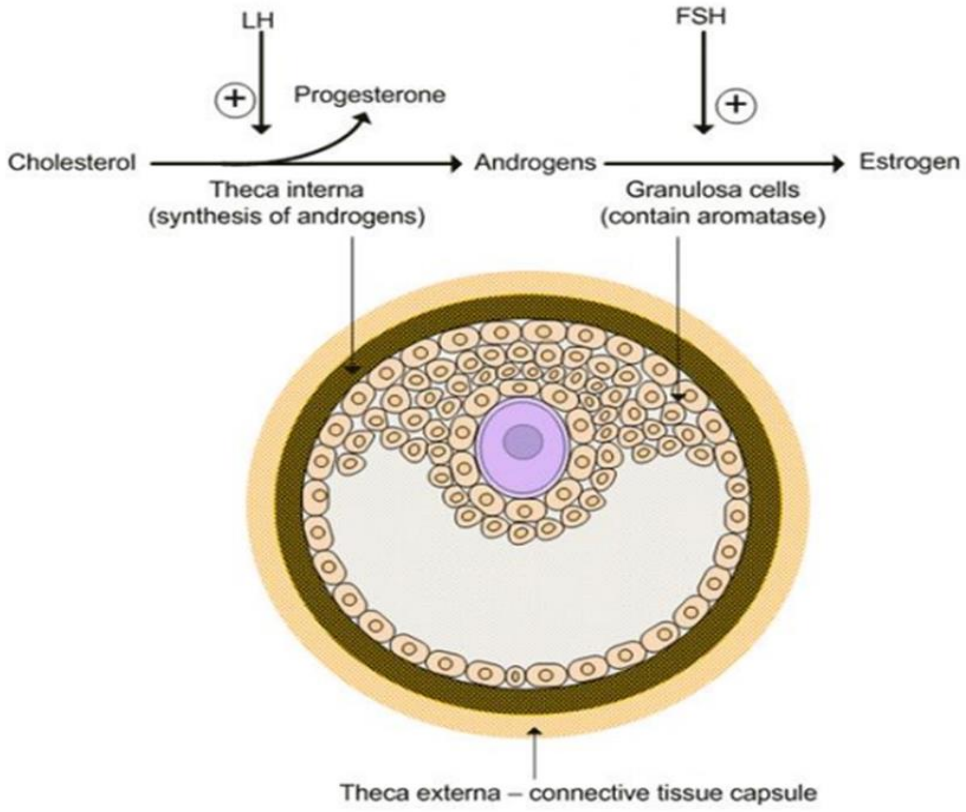
C. Luteal Phase (Days 14-28):

- Formation and functioning of the corpus luteum, driven by LH.
- The main function of the corpus luteum is to secrete progesterone plus some estrogen.
- The estrogen is needed for progesterone to function.
- The progesterone secreted in the first week of this phase creates the thick, secretory endometrium required for implantation.

- Regression of the corpus luteum occurs by day 23 if there is no pregnancy, causing decreased levels of progesterone → Constriction of the spiral arteries occurs 1 day before menstruation, causing endometrial ischemia and release of prostaglandins, followed by leukocyte infiltration. The resulting necrosis leads to painful cramps and menstruation.

- When a pregnancy occurs, the serum β-human chorionic gonadotropin (β-hCG) becomes positive at day 22-23 of the cycle. The β-hCG becomes positive when the zygote implants into the endometrium, usually 7-8 days after ovulation. Therefore, the serum β-hCG becomes positive before the missed period.





- Theca Cells:

- They have LH receptors and stimulation by LH; they produce large amounts of androgen.

- The main androgen synthetized is androstenedione, but some testosterone is also synthetized.

- Some androgen diffuses to the circulation, but most is transferred to the granulosa cells.

- Granulosa Cells:

- Mural granulosa cells are very sensitive to FSH.

- They express aromatase and convert the androgen to estrogen.

- FSH also stimulates the production and secretion of inhibin, Inhibin acting on the pituitary inhibits the secretion of FSH.

- Circulating estrogen acting on the pituitary and the hypothalamus inhibit the secretion of both LH and FSH.

- Estrogen:

- Estrogen has some important peripheral actions during the follicular phase.

- It induces the replacement of the cells of the functional endometrium lost in the last menstruation.

- It also causes the cervical mucus to be thin and watery. This facilitates the transport of Sperm.

Estrogens Throughout a Woman's Life

Estra*di*ol	Nonpregnant reproductive years	**Follicle** Granulosa
Est*ri*ol	Pregnancy	**Placenta** from fetal adrenal DHEAS
Estr*one*	After menopause	**Adipose** from adrenal steroids

- Progesterone:

- Progesterone rises and peaks about the midpoint in the luteal phase.

- During the First week of the luteal phase, the progesterone along with estrogen creates the secretory endometrium. This prepares the uterus for implantation (Progesterone is pro-gestation).

- Progesterone also causes the cervical mucus to become thicker. This makes it more difficult for sperm as well as bacteria to penetrate the uterus.

- Definitions:

- Dysmenorrhea: Pain with menses; often associated with endometriosis.

- Oligomenorrhea: > 35-day cycle.

- Polymenorrhea: < 21-day cycle.

- Metrorrhagia: uterine bleeding at irregular intervals, particularly between the expected menstrual periods.

- Menorrhagia: Heavy menstrual bleeding; > 80 mL blood loss or > 7 days of menses.

- Menometrorrhagia: Heavy, irregular menstruation.

hCG (Human chorionic gonadotropin)

- Source: Syncytiotrophoblast of placenta.

- Function:

- It is responsible for preserving the corpus luteum during early pregnancy in order to maintain progesterone secretion until the placenta is able to produce progesterone on its own.

- The hCG is composed of two subunits: alpha and beta. The alpha subunit is common to hCG, TSH, LH, and FSH. The beta subunit is specific to hCG and is used as the basis of virtually all pregnancy tests.

- If levels are high: twin pregnancy, hydatidiform mole, choriocarcinoma, embryonal carcinoma.

- If levels are low: ectopic pregnancy, threatened abortion, missed abortion.

hPL (Human Placental Lactogen)

- Also called Human Chorionic Somatomammotropin.

- Produced by the syncytiotrophoblasts.

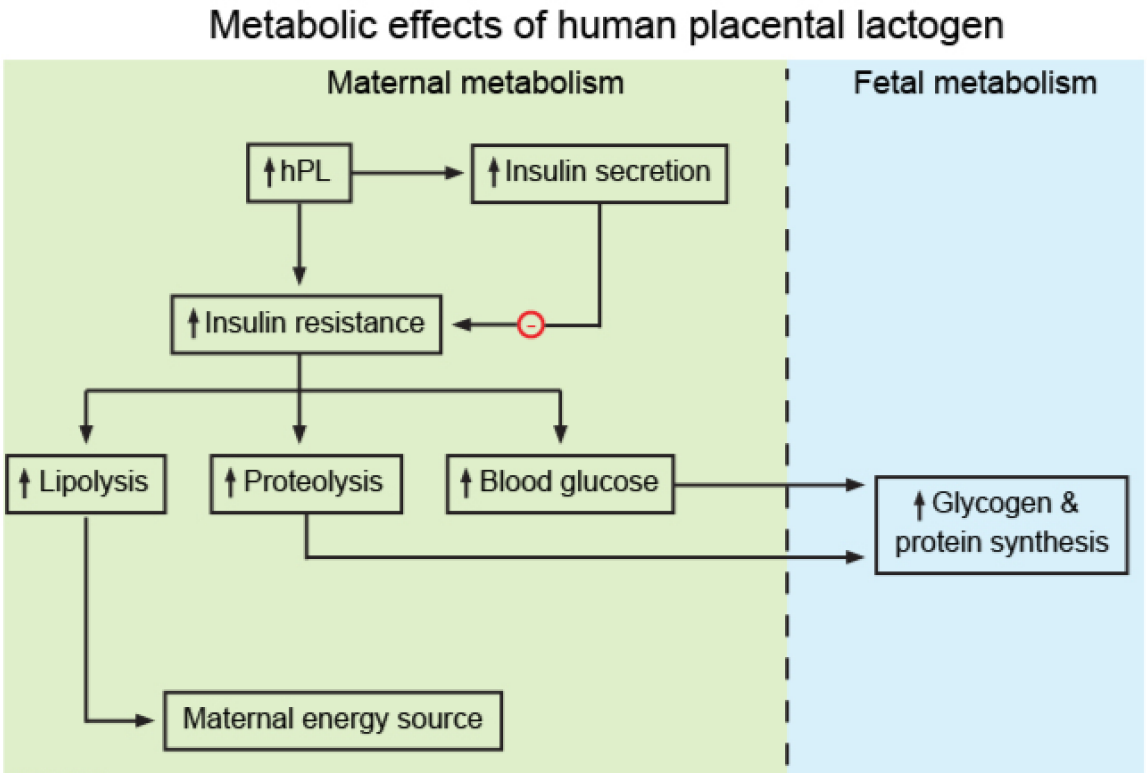
- Pregnancy is associated with profound alterations in maternal metabolism. Carbohydrate metabolism is shunted toward supplying glucose and amino acids to the fetus, while excess free fatty acids, ketones, and glycerol provide energy to the mother. This is accomplished primarily through placental hormones, particularly human placental lactogen.

- It increases maternal insulin resistance, which decreases maternal glucose utilization and increases blood glucose levels, thus allowing glucose to be shunted toward the fetus.

- Maternal lipolysis and proteolysis are also increased by hPL, with the resulting free fatty acids and ketones providing energy to the mother, thus freeing relatively more glucose for fetal use.

- Maternal insulin resistance results from not only increased placental secretion of hPL, but also from placental production of growth hormone, estrogens, progesterone, and glucocorticoids.

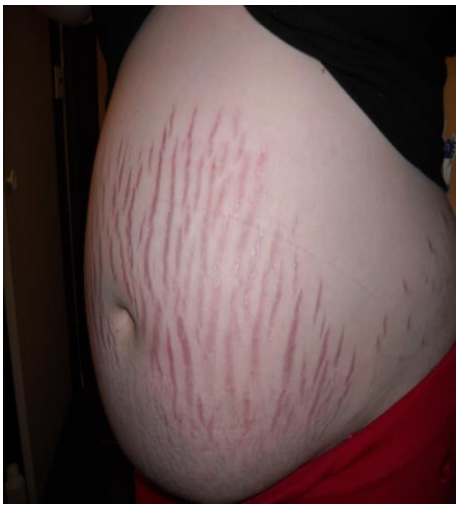
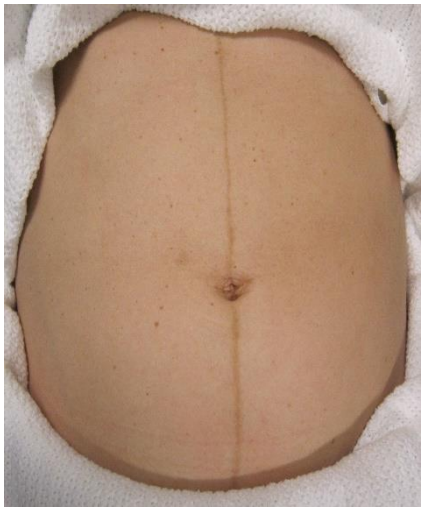
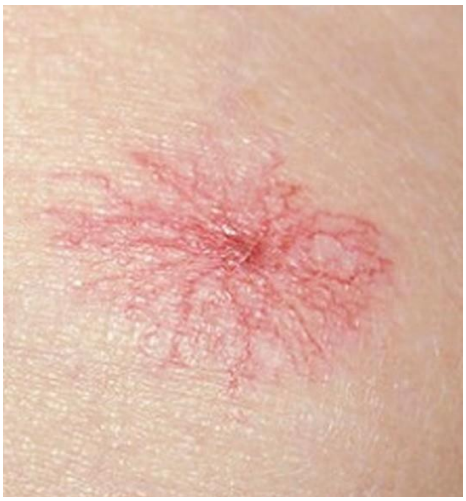
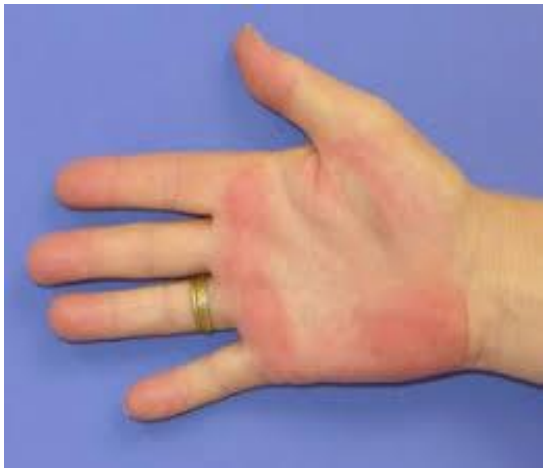
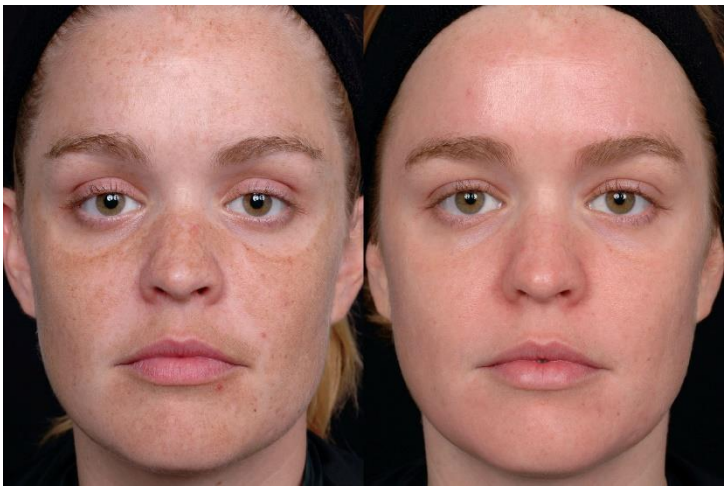
- Gestational diabetes mellitus results when a woman's pancreatic function is not sufficient to overcome this pregnancy-related increase in insulin resistance. If the diabetes resolves upon delivery, it is referred to as gestational diabetes.


Metabolic effects of human placental lactogen
Maternal metabolism
Fetal metabolism
↑hPL
↑Insulin secretion
↑Insulin resistance
↑Lipolysis
↑Proteolysis
↑Blood glucose
↑Glycogen & protein synthesis
Maternal energy source

Physiologic Changes in Pregnancy

A. Skin:

- Striae gravidarum: "Stretch marks" that develop in genetically predisposed women on the abdomen and buttocks.
- Linea nigra: Increased pigmentation of the lower abdominal midline from the pubis to the umbilicus.
- Spider angiomata and palmar erythema: From increased skin vascularity.
- Chadwick sign: Bluish or purplish discoloration of the vagina and cervix as a result of increased vascularity.
- Chloasma: Blotchy pigmentation of the nose and face.

B. Cardiovascular:

- Arterial blood pressure:

- Systolic and diastolic values both decline early in the first trimester, then they gradually rise toward term but never return quite to prepregnancy baseline.
- Diastolic falls more than systolic.
- Arterial blood pressure is never normally elevated in pregnancy.

- Venous blood pressure:

- Central venous pressure (CVP) is unchanged with pregnancy, but femoral venous pressure (FVP) increases two- to threefold by 30 weeks' gestation.

- Plasma volume:

- Plasma volume increases up to 50% with a significant increase by the first trimester.
- This increase is even greater with multiple fetuses.

- Cardiac output (CO):

- CO increases up to 50%.
- CO is the product of heart rate (HR) and stroke volume (SV), and both increase in pregnancy.
- CO is dependent on maternal position: CO is the lowest in the supine position because of inferior vena cava compression resulting in decreased cardiac return. CO is the highest in the left lateral position.

- Systemic vascular resistance (SVR):

- SVR declines by 30% due to VD of blood vessels by the effect of progesterone on smooth muscles. This enhances uteroplacental perfusion.

- Murmurs:

- A systolic ejection murmur along the left sternal border is normal in pregnancy owing to increased CO passing through the aortic and pulmonary valves.
- Diastolic murmurs are never normal in pregnancy and must be investigated.

C. Pulmonary:

- Tidal volume (V_T):

- Vt is volume of air that moves in and out of the lungs at rest.
  Vt increases with pregnancy to 40% because progesterone directly stimulates central respiratory center.

- It is the only lung volume that does not decrease with pregnancy.

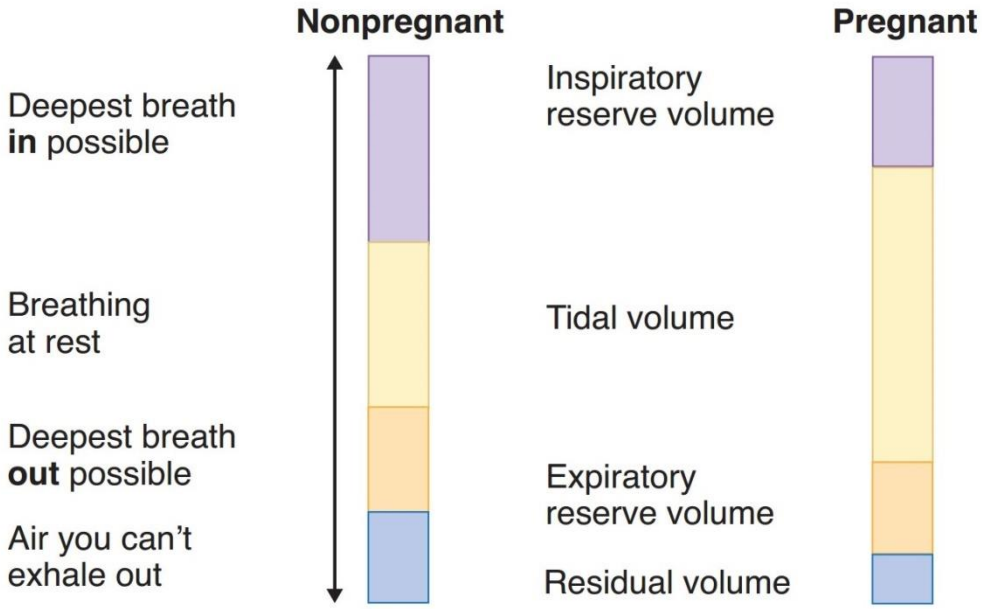
- Lung volumes decrease because of the upward displacement of intraabdominal contents against the diaphragm by the gravid uterus.

- Minute ventilation (V_E):

- Increases up to 40%.
- V_E is the product of respiratory rate (RR) and tidal volume V_T.
- RR remains unchanged with V_T increasing steadily throughout the pregnancy into the third trimester.

- Blood gases:

- The rise in V_T produces a respiratory alkalosis with a decrease in PCo_2 from 40 to 30 mm Hg and an increase in pH from 7.40 to 7.45.
- An increased renal loss of bicarbonate helps compensate, resulting in an alkalotic urine.



Maternal cardiopulmonary adaptations to pregnancy	
Maternal adaptations	• Cardiac ◦ ↑ Cardiac output ◦ ↑ Plasma volume ◦ ↓ Systemic vascular resistance • Respiratory ◦ ↑ Tidal volume ◦ ↓ Functional residual capacity (elevation of diaphragm)
Clinical manifestations	• Peripheral edema • ↓ Blood pressure • ↑ Heart rate • Systolic ejection murmur • Dyspnea

❖ N.B:

- Maternal adaptations to pregnancy include increases in cardiac output, plasma volume, and tidal volume.
- A systolic ejection murmur, peripheral edema, and dyspnea are common but benign symptoms that result from these changes.
- Nocturnal leg pain is also common due to muscle cramping from lactic and pyruvic acid accumulation.
- Reassurance and routine prenatal care are indicated for this patient, who is experiencing normal manifestations of physiologic adaptations to pregnancy.

D. Hematologic:

- Red blood cells (RBC):

- RBC mass increases by 30% in pregnancy; thus, oxygen-carrying capacity increases.
- However, because plasma volume increases by 50%, the calculated hemoglobin and hematocrit values decrease by 15%.
- This is a physiologic dilutional effect, not a manifestation of anemia.

- White blood cells (WBC):

- WBC count increases progressively during pregnancy with a mean value of up to 16,000/mm^3 in the third trimester.

- Erythrocyte sedimentation rate (ESR):

- ESR increases in pregnancy because of the increase in gamma globulins.

- Platelet count: Platelet count normal reference range is unchanged in pregnancy.

- Coagulation factors:

- Factors V, VII, VIII, IX, XII, and von Willebrand factor increase progressively in pregnancy, leading to a hypercoagulable state.
- A hypercoagulable state serves to minimize bleeding during delivery.

E. Gastrointestinal:

- Stomach:

- Gastric motility decreases and emptying time increases from the progesterone effect on smooth muscle.

- This increase in stomach residual volume, along with upward displacement of intraabdominal contents by the gravid uterus, predisposes to aspiration pneumonia with general anesthesia at delivery.

- Large bowel:

- Colonic motility decreases and transit time increases from the progesterone effect on smooth muscle.

- This predisposes to increased colonic fluid absorption resulting in constipation.

- Morning sickness:
- Nausea and vomiting occur anytime throughout the day and are caused by an increase in estrogen, progesterone, and HCG made by the placenta.

- Gastroesophageal reflux: Lower esophageal sphincter has decreased tone.

F. Renal:

- Glomerular filtration rate (GFR):
- Renal plasma flow, GFR, and creatinine clearance all increase by 50% (secondary to a 50% increase in plasma volume).
- This results in a 25% decrease in serum blood urea nitrogen (BUN), creatinine, and uric acid.

- Kidneys:
- The kidneys increase in size because of the increase in renal blood flow.
- This hypertrophy doesn't reverse until 3 months postpartum.

- Ureters:
- Ureteral diameter increases owing to the progesterone effect on smooth muscle.
- Hydronephrosis in pregnancy occurs due to ureteral compression from uterine enlargement and decreased ureteral peristalsis due to increased progesterone. Ultrasound findings include bilateral renal enlargement (right > left due to dextrorotation of the uterus) with dilated renal pelvises and proximal ureters. Physiologic hydronephrosis of pregnancy requires no additional management.
- This increases the risk of pyelonephritis from compression of the ureters by the uterus.

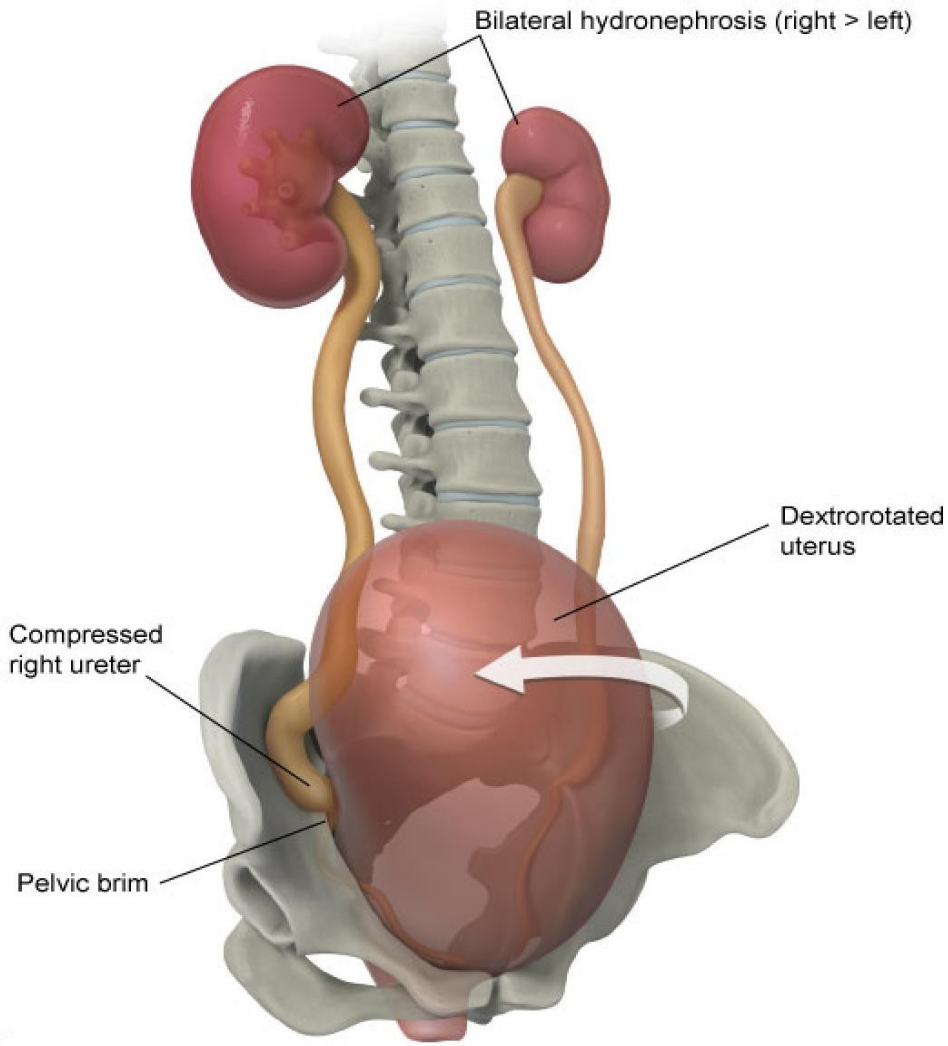
- Glucosuria:
- Urine glucose normally increases.
- Glucose is freely filtered and actively reabsorbed. However, the tubal reabsorption threshold falls from 195 to 155 mg/dL.

- Proteinuria:
- ↑ basement membrane permeability, resulting in increased urinary protein excretion.

- Due to the increase in renal function during pregnancy, patients on medications that are renally excreted require close monitoring and dose adjustments as necessary. In addition, a serum creatinine of 1.2 mg/dL may be the upper limit of normal in a nonpregnant woman but is considered renal insufficiency in a pregnant woman.

- Patients with diabetic nephropathy are at risk for acceleration of their renal disease during pregnancy (worsening albuminuria, elevated creatinine) due to the combined effects on the kidney. This risk is particularly high in those with an elevated creatinine at baseline.

Physiologic hydronephrosis of pregnancy



G. Endocrine:

- Pituitary:

- Pituitary size increases up to 3-fold due to lactotroph hyperplasia and hypertrophy.

- This makes it susceptible to ischemic injury (Sheehan syndrome) from postpartum hypotension.

- Adrenals:

- Adrenal gland size is unchanged, but production of cortisol increases two- to threefold.

- Thyroid:

- Thyroid size remains unchanged.
- Thyroid binding globulin (TBG) increases, resulting in increased total T3 and T4, although free T3 and free T4 remain unchanged.
- Levothyroxine requirements increase during pregnancy. Patients with hypothyroidism should increase their levothyroxine dose at the time pregnancy is detected, with subsequent dose adjustments based on TSH and total T4

❖ N.B:

1. Low back pain is a common benign condition, often seen in the third trimester of pregnancy.

- Patients with low back pain typically have pain that radiates down the thighs, worsens with activity, and improves with rest.
- This mechanical issue arises from a combination of exaggerated lordosis due to the enlarging uterus, weakened abdominal muscles, and joint/ligament laxity.
- Risk factors include multiparity, a history of back pain, and excessive weight gain.
  Pregnancy-related causes of acute low back pain (preterm labor, pyelonephritis) should be evaluated and ruled out.
- Patients can then receive reassurance that the back pain is normal and will resolve postpartum. Conservative management is typically with behavioral modifications (wearing supportive shoes, massage, using a firm mattress, and analgesics are also beneficial).

2. Intrahepatic Cholestasis of Pregnancy (ICP) typically occurs in the third trimester, as increased estrogen and progesterone levels cause hepatobiliary tract stasis and decreased bile excretion.

- This results in elevated total bile acids, which accumulate in the liver (resulting in elevated aminotransferases and bilirubin levels) and skin (resulting in pruritus that is worse on the hands and feet).
- Risk factors include prior ICP maternal age >35, and multiple gestation.
- Although ICP does not cause maternal complications, bile acids can cross the placenta and cause fetal complications. The maternal serum bile acid level is directly proportional to the risk of complications, as bile acids accumulate in the fetal circulation and become increasingly toxic.
- Because of the risk of IUFD, management of ICP includes ursodeoxycholic acid (which may decrease bile acid levels), frequent antepartum monitoring (nonstress test), and delivery by 37 weeks gestation.

Diagnosis of pregnancy

Signs of Pregnancy

Presumptive	Unrelated to uterus or fetus	Amenorrhea
Probable	Related to uterus or mother's feelings	↑ uterine size β-hCG
Definitive	Related to the fetus	Sonogram of fetus Heard FHT

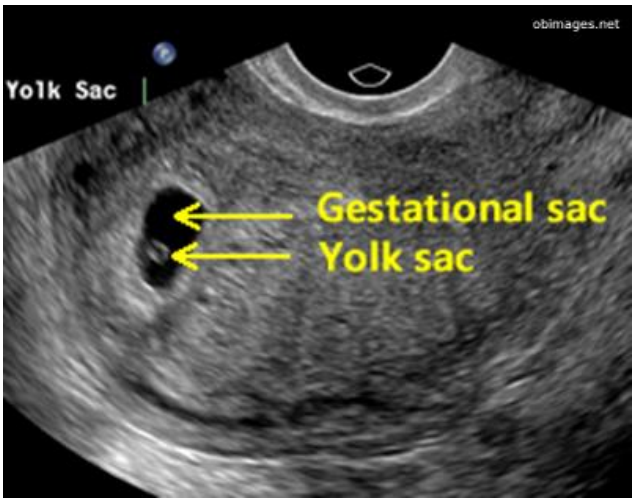
- Pregnancy is suggested in a patient with amenorrhea, enlargement of the uterus, and a (+) urinary β-hCG.

- <u>Pregnancy is confirmed with the following:</u>

- Presence of a gestational sac with yolk sac: This is seen by transvaginal ultrasound at 4 to 5 weeks. This corresponds to a serum β-hCG level of about 1,500 mIU/mL.
- Presence of yolk sac: Visualized within the gestational sac at 4 to 6 weeks.
- Fetal heart motion: Seen by ultrasound at 5 to 6 weeks.
- Fetal heart sounds: Heard with Doppler ultrasonography at 8 to 10 weeks.
- Fetal movements: Felt by the examining physician after 20 weeks.

- <u>Intrauterine pregnancy is normally seen on the following:</u>

- Vaginal sonogram at 5 weeks gestation when serum β-hCG > 1,500 mIU.
- Abdominal sonogram at 6 weeks gestation when β-hCG > 6,500 mIU.



Establishing gestational age

A. **Conception Dating:**

- Normal pregnancy duration postconception is 266 days or 38 weeks. However, most women can't identify conception date accurately.

B. **Menstrual Dating:**

- Because the last menstrual period (LMP) is more easily identified than conception, pregnancy duration in most cases is determined to be 280 days or 40 weeks from the LMP.

- We assume a 28-day menstrual cycle in which ovulation occurs on day 14 after the beginning of the LMP. Yet only 10% of women have a 28-day cycle. A normal cycle length can vary from 21 to 35 days.

C. **Ultrasound Dating:**

- The accuracy of ultrasound dating is gestational-age-dependent.

- Earlier sonograms are more accurate than later ones.

- If the difference between menstrual dates and ultrasound dates is within the normal range of variation, use the menstrual dates.

- If the difference between menstrual dates and ultrasound dates is outside the normal range of variation, use the ultrasound dates.

D. **Naegele's Rule:**

- Assuming 28-day cycles, estimation of the day of delivery by taking the last menstrual period, subtracting 3 months, and adding 7 days.

E. **Basal Body Temperature (BBT):**

- The rise in BBT is assumed to be caused by the thermogenic effect of progesterone produced by the corpus luteum that formed after ovulation. The accuracy of BBT is ±1 week.

Pregnancy Dating

Duration of pregnancy using:	Conceptional dating	266 days or 38 weeks
Duration of pregnancy using:	Menstrual dating	280 days or 40 weeks
Assumed cycle length		28 days
Calculate due date	Naegele's rule	LMP–3 months + 7 days

Definition of abbreviations: LMP, last menstrual period.

Menstrual History

- Menstrual dating assumes ovulation occurred on day 14 after the first day of the LMP. However, normal menstrual cycles can vary from 21 to 35 days, making ovulation possible on day 7 to day 21.

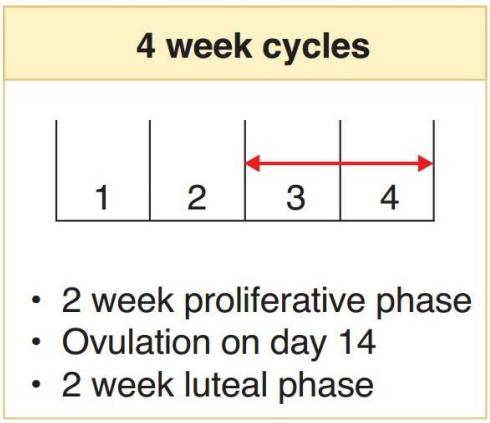
- Because most women's cycles are more or less than 28 days, adjustment of the due date may be necessary. Accuracy of menstrual dating is variable depending on the patient's memory and record keeping. The accuracy of menstrual history is ±1 week.

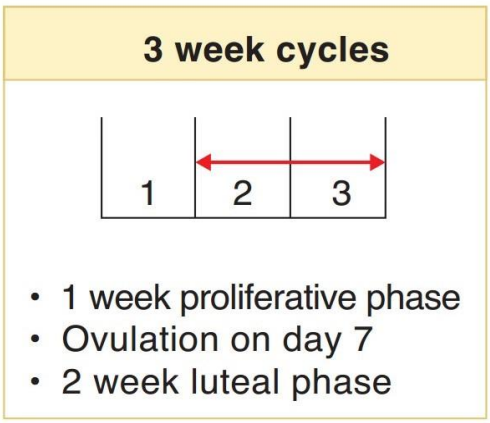
- <u>Precise Day of Ovulation:</u>

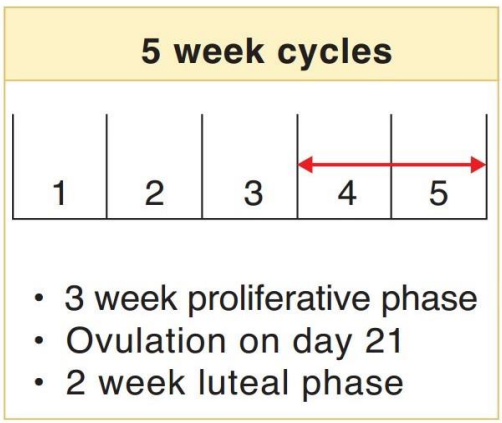
- 21-day cycle: day 7.

- 28-day cycle: day 14.

- 35-day cycle: day 21.

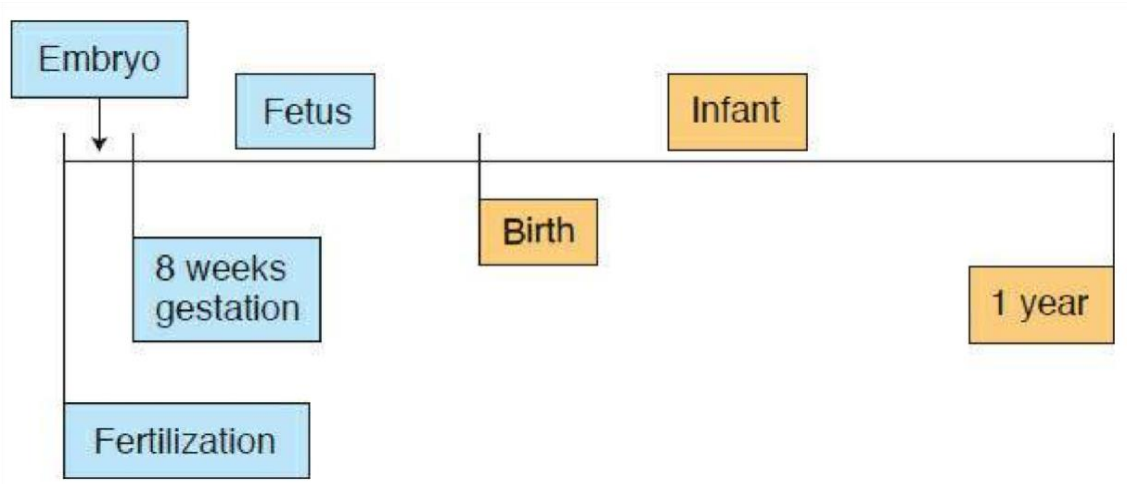




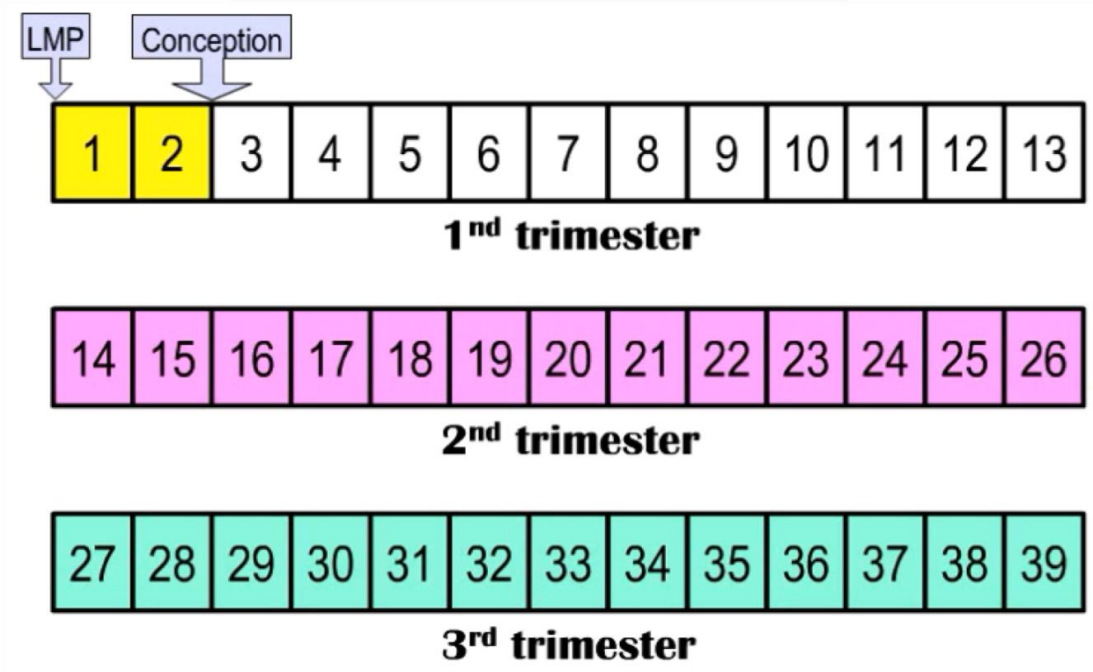


Definitions

- Embryo: fertilization to 8 weeks.
- Fetus: 8 weeks to birth.
- Infant: birth to 1 year old.

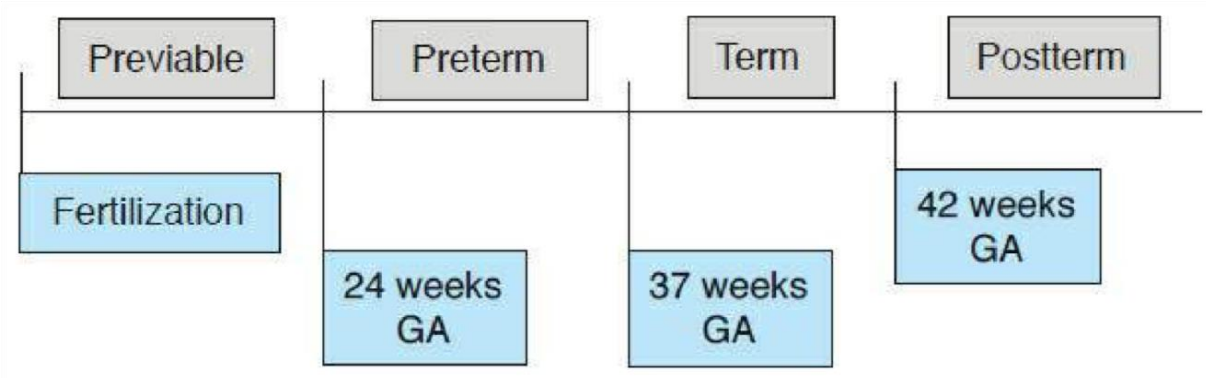


Trimester Breakdown



Term Lengths

- Previable: fetus born before 24 weeks (Respiration impossible, incompatible with life).
- Preterm: fetus born between 25 and 37 weeks.

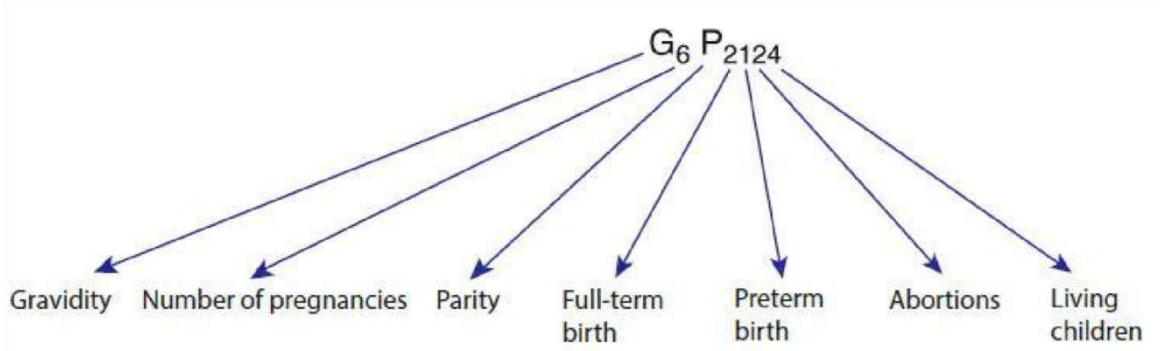


Gravidity/Parity

- Gravidity is the number of times a patient has been pregnant.
- Parity is what happens to the pregnancy.
- This is broken down into 4 numbers (TPAL):

- T: number of Full-Term births.
- P: number of Preterm births.
- A: number of Abortions (both spontaneous and induced).
- L: number of Living children (if a patient has a multiple gestation pregnancy, one birth results in 2 living children).

- For example, a 35-year-old woman presents to the office for her sixth pregnancy. She has had 2 abortions, 2 children born at term, and a set of twins born preterm. This patient's gravidity and parity are: G6 P2124.



G = Gravidity, or the number of pregnancies (in this example, G = 6).
P = Parity, which is made up of four numbers:

- the number of full-term births (e.g., 2)
- the number of preterm births (e.g., 1)
- the number of abortions (e.g., 2)
- the number of living children (e.g., 4)

❖ N.B:

- A pregnancy test should be administered to any woman of childbearing age before performing any diagnostic tests such as x-rays or CT scans that involve ionizing radiation.

CHAPTER 2

Normal Pregnancy Events

Normal Pregnancy Events

A. First Trimester:

- Assuming a 40 menstrual week pregnancy, the first trimester is assumed to extend from conception through to 13 weeks.

- Symptoms: Normal symptoms seen in the majority of pregnancies include nausea, vomiting, fatigue, breast tenderness, and frequent urination.

- Signs: Spotting and bleeding occur in 20% of pregnancies, 50% of which will continue successfully.

- Weight gain: Average weight gain is 5-8 pounds.

- Complications: spontaneous abortion.

B. Second Trimester:

- Assuming a 40 menstrual week pregnancy, the second trimester is assumed to extend from 13 to 26 weeks.

- Symptoms:

- Normal symptoms are an improved feeling of general well-being.

- Quickening (maternal awareness of fetal movement) is detected at 18-20 weeks by primigravidas and 16-20 weeks by multigravidas.

- Signs:

- Braxton-Hicks contractions are painless, low-intensity, long-duration uterine contractions that can be palpated as early as 14 weeks.

- Weight gain: Average weight gain is 1 pound per week.

- Complications:

- Incompetent cervix (painless cervical dilation leading to delivery of a nonviable fetus); premature membrane rupture, and premature labor.

C. Third Trimester:

- Assuming a 40 menstrual week pregnancy, the third trimester is assumed to extend from 26 to 40 weeks.

- Symptoms:

- Normal symptoms include decreased libido, lower back and leg pain, urinary frequency, and Braxton-Hicks contractions.

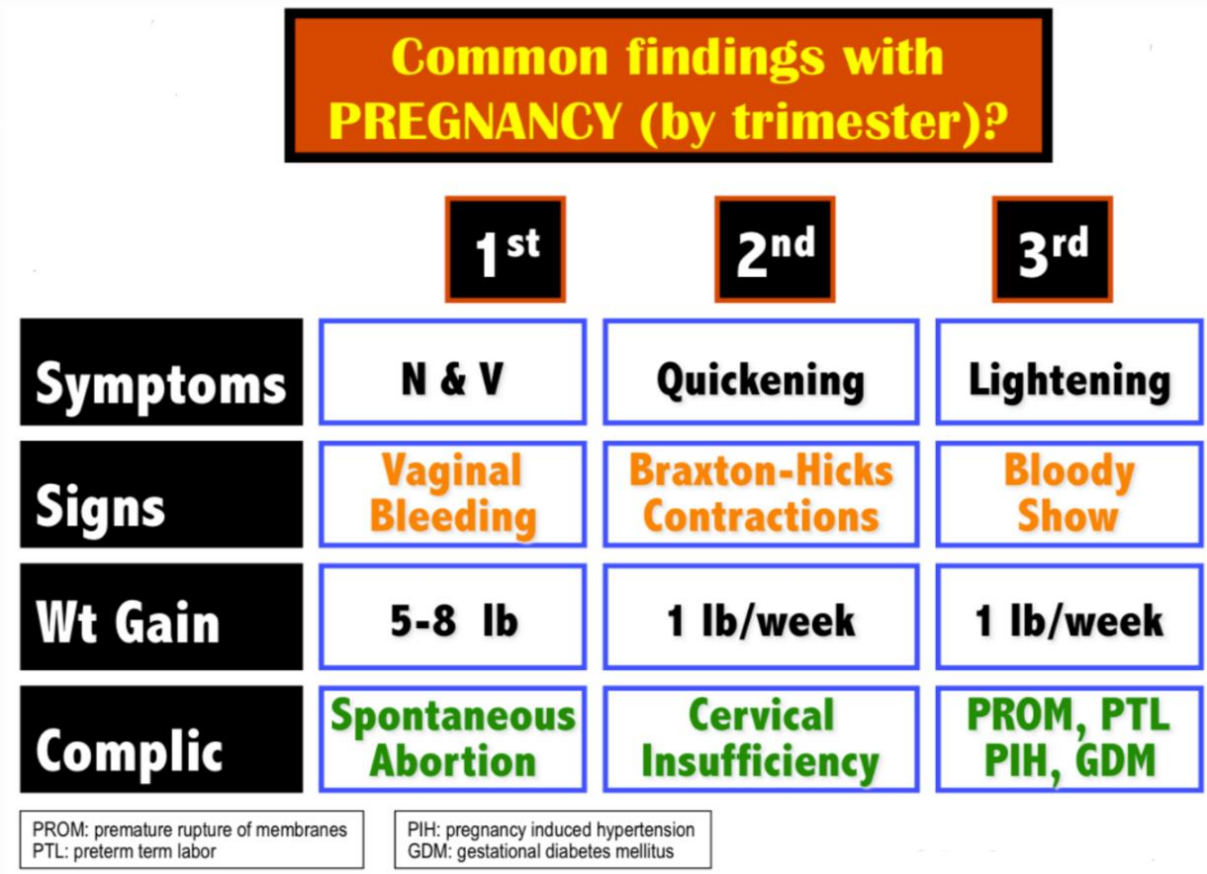
- Lightening describes descent of the fetal head into the pelvis resulting in easier maternal breathing, pelvic pressure.

- Signs:

- Bloody show describes vaginal passage of bloody endocervical mucus, the result of cervical dilation before labor.

- Weight gain: Average weight gain is 1 pound per week.

- Complications: premature membrane rupture, premature labor, preeclampsia, urinary tract infection, anemia, and gestational diabetes.



Hyperemesis Gravidarum (HG)

- Nausea and vomiting are common during the first trimester of pregnancy.
- Hyperemesis gravidarum is characterized by severe vomiting during the first to early second trimesters.
- Hyperemesis Gravidarum can be differentiated from typical nausea and vomiting of pregnancy by the presence of ketones on urinalysis, laboratory abnormalities and changes in volume status (dehydration).
- Risk factors for HG include multiple gestation, hydatidiform mole (HM), and a history of esophageal reflux.
- HG is typically unresponsive to oral antiemetics.
- Weight loss is typically >5% of prepregnancy weight.
- Ketonuria, which occurs due to prolonged hypoglycemia, resultant ketoacidosis, and elevated serum aminotransferases suggests more severe disease.
- Metabolic alkalosis is often present due to loss of gastric acid. Volume depletion also causes a contraction metabolic alkalosis with activation of the renin- angiotensin-aldosterone system.
- Serum chemistries can evaluate for a hypochloremic metabolic alkalosis, and hypokalemia, all of which can result from persistent vomiting.
- Severe HG (dehydration, ketonuria, laboratory abnormalities) is an indication for hospital admission for intravenous antiemetics, rehydration, and electrolyte repletion.
- Wernicke encephalopathy is a complication of hyperemesis gravidarum that results from thiamine deficiency due to sever vomiting. Classic presenting symptoms include encephalopathy, oculomotor dysfunction, and gait ataxia.
- Patients with HG often require glucose infusions due to prolonged hypoglycemia. However, glucose infusion prior to thiamine supplementation can exacerbate WE and should be delayed until the patient has received thiamine.

CHAPTER 3

Prenatal Laboratory Testing

Prenatal Laboratory Testing

First Trimester

- In the first trimester, patients should be seen every 4 to 6 weeks.
- Between 11 and 14 weeks, ultrasound can be done to confirm gestational age and check for nuchal translucency.
- Fetal heart sounds can be heard at the end of the first trimester.

1. Complete Blood Count:

A. Hemoglobin and hematocrit:

- Normal pregnancy hemoglobin reference range is 10–12 g/dL.
- Although nonpregnant female hemoglobin reference range is 12–14 g/dL, normal values in pregnancy will reflect the dilutional effect of greater plasma volume increase than red blood cell (RBC) mass.

B. Mean corpuscular volume (MCV):

- Because hemoglobin and hematocrit reflect pregnancy dilution, MCV may be the most reliable predictor of true anemia.
- A low hemoglobin and low MCV (<80µm3) most commonly suggests iron deficiency but may also be caused by thalassemia.
- A low hemoglobin and high MCV (>100) suggest folate deficiency or, rarely, vitamin B12 deficiency.

2. Rubella IgG Antibody:

A. Immunity:

- The presence of rubella antibodies rules out a primary infection during the pregnancy.

B. Susceptibility:

- An absence of antibodies leaves the woman at risk for a primary rubella infection in pregnancy that can have devastating fetal effects, particularly in the first trimester.
- Rubella immunization is contraindicated in pregnancy because it is made from a live virus but is recommended after delivery.

3. Hepatitis B Virus (HBV):

A. Surface antibody:

- HBV surface antibodies are expected from a successful vaccination.

B. Surface antigen:

- HBV surface antigen indicates high risk for vertical transmission of HBV from the mother to the fetus or neonate. This is the only specific hepatitis test obtained routinely on the prenatal laboratory panel.

C. E antigen:

- The presence of HBV E antigen signifies a highly infectious state.

4. Type, Rh, and Antibody Screening:

- The patient's blood type and Rh is determined with the direct Coombs test. If the patient is Rh negative, she is at risk for anti-D isoimmunization.

5. STD Screening:

A. Cervical cultures:

- Screening cultures for chlamydia and gonorrhea will identify whether the fetus is at risk from delivery through an infected birth canal.

B. Syphilis:

- Nonspecific screening tests (veneral disease research laboratory [VDRL] or rapid plasma reagin [RPR]) are performed on all pregnant women.

- Positive screening tests must be followed up with treponema-specific tests (microhemagglutination assay for antibodies to T. pallidum [MHA-TP] or fluorescent treponema antibody absorption [FTA]).

- Treatment of syphilis in pregnancy requires penicillin to ensure adequate fetal treatment. Patients with penicillin allergy should receive skin testing to confirm an IgE-mediated reaction. If the test is positive, patients are desensitized to penicillin prior to receiving treatment with intramuscular penicillin G benzathine.

6. Urine Screening:

A. Urinalysis:

- Assessment of proteinuria, ketones, glucose, leukocytes, and bacteria is important to screen for underlying renal disease, diabetes, and infection.

B. Culture:

- Screening for asymptomatic bacteriuria (ASB) is essential.

- Eight percent of pregnant women have ASB.

- Left untreated, 30% of ASB progresses to pyelonephritis, which is associated with septic shock, pulmonary edema, and adult respiratory distress syndrome.

7. Tuberculosis (TB) Screening:

A. PPD:

- TB screening is not done routinely and performed only on high-risk populations.
- This screening skin test determines previous exposure to TB. A positive test is induration, not erythema.
- If the screening test is negative, no further follow-up is necessary.

B. Chest x-ray:

- A chest x-ray is performed to rule out active disease only if the screening skin test is positive.
- If the chest x-ray is negative, isoniazid (INH) (and vitamin B6) is given for 9 months.
- If the chest x-ray is positive, induced sputum is cultured and triple medications begun until cultures define the organisms involved.
- Antituberculosis drugs are not contraindicated in pregnancy.

8. HIV Screening:

- HIV screening is recommended for all pregnant women as part of the initial lab testing.
- The CDC recommends Informed Refusal (or "Opt Out," where a patient is tested unless she refuses).

Second Trimester

- Visits in the second trimester are used to screen for genetic and congenital problems.
- At 15 to 20 weeks, perform a "triple" or a "quad."
- A triple screen includes maternal serum alpha fetoprotein (MSAFP), beta- HCG, and estriol.
- The quad screen adds inhibin A to the triple screen. The addition of beta-HCG, estriol, and inhibin A helps increase the sensitivity of the MSAFP test.

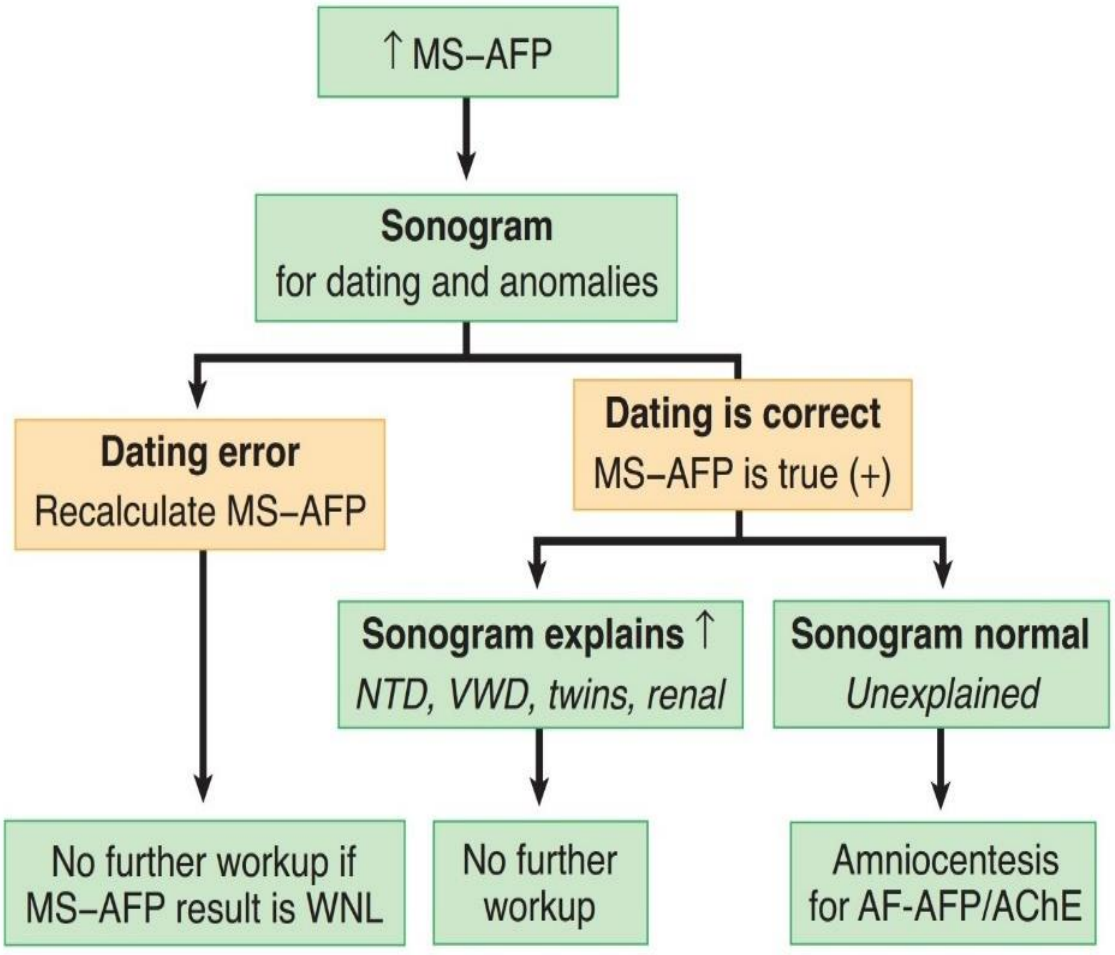
❖ Maternal Serum α-Fetoprotein (MS-AFP):

- AFP is the major serum glycoprotein of the embryo.
- The concentration peaks at 12 weeks in the fetus and amniotic fluid (AF), then rises until 30 weeks in the maternal serum.
- Fetal structural defects (open neural tube defect [NTD] and ventral wall defects) result in increased spillage into the amniotic fluid and maternal serum. Other causes include twin pregnancy, placental bleeding, fetal renal disease, and sacrococcygeal teratoma.

- Maternal serum testing is performed within a gestational window of 15-20 weeks. Because reference ranges are specific to gestational age, accurate pregnancy dating is mandatory.

A. Elevated MS-AFP:

- The next step in management is to obtain an obstetric ultrasound to confirm gestational dating.
- The most common cause of an elevated MS-AFP is dating error.
- If the true gestational age is more advanced than the assumed gestational age, it would explain the positive high value.
- In cases of dating error, repeat the MS-AFP if the pregnancy is still within the 15- to 20-week window. A normal MS-AFP will be reassuring.
- If the dates are correct and no explanation is seen on sonogram, perform amniocentesis for AF-AFP determination and acetylcholinesterase activity. Elevated levels of AF acetylcholinesterase activity are specific to open NTD.



B. Low MS-AFP:

- The sensitivity of MS-AFP alone for trisomy 21 is only 20%.
- The sensitivity for trisomy 21 detection can be increased to 80% by performing maternal serum screen for not only MS-AFP, but also hCG, estriol, and inhibin-A.
- The most common cause of a low MS-AFP is dating error. The next step in management is to obtain an obstetric ultrasound to confirm gestational dating.
- If the true gestational age is less than the assumed gestational age, it would explain the positive low value.
- In cases of dating error, repeat the MS-AFP if the pregnancy is still within the window. A normal MS-AFP will be reassuring.
- If the dates are correct and no explanation is seen on sonogram, perform amniocentesis for karyotype.

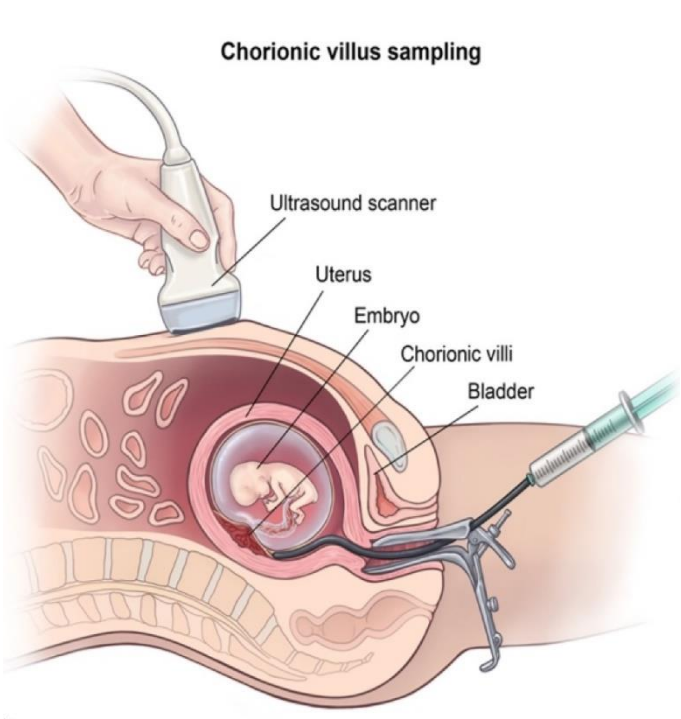
Second-trimester quadruple screening				
Diagnosis	**MSAFP**	**β-hCG**	**Estriol**	**Inhibin A**
Trisomy 18	↓	↓	↓	Normal
Trisomy 21	↓	↑	↓	↑
Neural tube or abdominal wall defect	↑	Normal	Normal	Normal

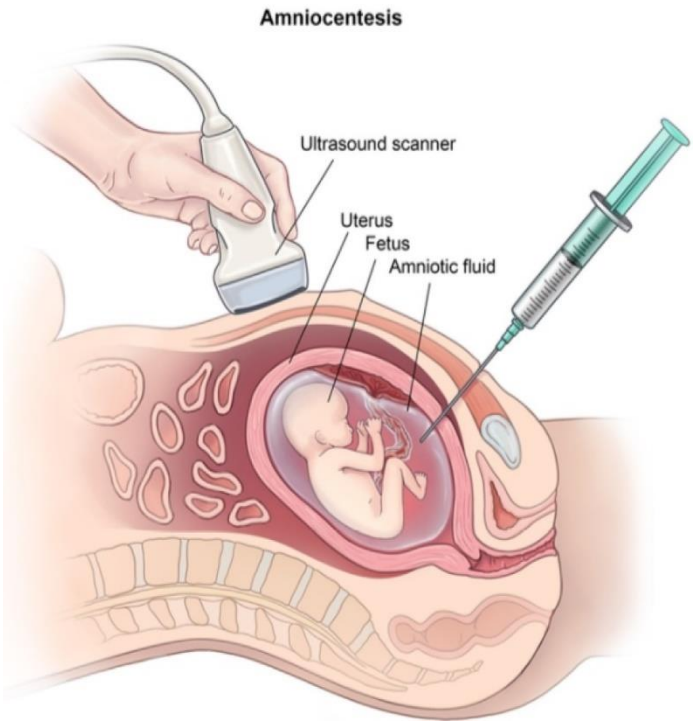
MSAFP = maternal serum α-fetoprotein.

❖ N.B:

- Patients with abnormal quadruple screening results can be offered cell-free fetal DNA testing, which measures circulating, free maternal and fetal DNA in maternal plasma and has a sensitivity and specificity of up to 99%.
- Cell-free fetal DNA testing (cffDNA) of maternal plasma is noninvasive test can be performed at >10 weeks gestation and has 99% sensitivity and specificity for detecting trisomy 21 (Down syndrome), >92% sensitive for trisomy 18 (Edward syndrome), and >80% sensitive for trisomy 13 (Patau syndrome).
- It can also identify the fetal sex and detect some sex chromosomal disorders.
- Normal results are generally reassuring and reduce the rate of invasive diagnostic procedures.
- Abnormal cffDNA results can be confirmed by fetal karyotyping via chorionic villus sampling in the first trimester or amniocentesis in the second trimester.

Cell-free fetal DNA testing	
Indications	• Maternal age ≥35 • Abnormal maternal serum screening test • Sonographic findings associated with fetal aneuploidy • Previous pregnancy with fetal aneuploidy • Parental-balanced Robertsonian translocation
Applications	• Screening for trisomy 21, 18, 13 & sex-chromosome aneuploidies • Fetal sex determination





Third Trimester

- In the third trimester, visits are every 2 to 3 weeks until 36 weeks.
- After 36 weeks, there is a visit every week.

1. Diabetic Testing:

A. 1-h 50-g oral glucose tolerance test (OGTT):

- This screening test is administered to all pregnant women between 24- and 28-weeks' gestation.
- No fasting state is needed.
- A 50-g glucose load is given, and serum glucose is measured 1 h later.
- A normal value is <140 mg/dL.
- Fifteen percent of pregnant women will have an abnormal screening test, which is >140 mg/dL.
- Management is a 3-h 100-g OGTT.

B. 3-h 100-g OGTT:

- This is the definitive test for glucose intolerance in pregnancy.
- Fifteen percent of women with an abnormal screening test will be found to have gestational diabetes mellitus.
- After an overnight fast, a fasting blood sugar (FBS) is drawn.
- An FBS >125 mg/dL indicates overt diabetes mellitus, and no further testing is performed.
- If the FBS is <126 mg/dL, administer a 100-g glucose load, followed by glucose levels at 1, 2, and 3 h.
- Normal values are FBS <95 mg/dL, 1 h <180 mg/dL, 2 h <155 mg/dL, and 3 h <140 mg/dL.
- Gestational diabetes is diagnosed if ≥2 values are abnormal.
- Impaired glucose intolerance is diagnosed if only 1 value is abnormal.

2. Complete Blood Count:

- A complete blood count (CBC) should be performed between 24- and 28-weeks' gestation in all women.

- With the increasing diversion of iron to the fetus in the second and third trimester, iron deficiency, which was not present early in pregnancy, may develop.

- A hemoglobin <10 g/dL is considered anemia. The most common cause is iron deficiency, which occurs only after bone marrow iron stores are completely depleted.

3. Atypical Antibody Screen:

- Before giving prophylactic RhoGAM to an Rh-negative woman, an indirect Coombs test is performed at 28 weeks.

- This is obtained to ensure she has not become isoimmunized since her previous negative AAT earlier in pregnancy.

- Two-tenths of a percent of Rh-negative women will become isoimmunized from spontaneous feto-maternal bleeding before 28 weeks.

- If it is discovered that the patient already has anti-D antibodies, administration of RhoGAM is futile.

❖ N.B:

- Screening by vaginal and rectal culture for group B Streptococcus (GBS) colonization and penicillin prophylaxis have drastically reduced the incidence of neonatal GBS infection. Patients with a penicillin allergy that is low risk for anaphylaxis receive cefazolin.
- Universal screening occurs at 35-37 weeks gestation as the result is most accurate within 5 weeks of the anticipated delivery date.

Preventing neonatal group B *Streptococcus* infection	
Antenatal screening	• Rectovaginal culture at 35-37 weeks gestation
Indications for intrapartum prophylaxis	• GBS bacteriuria or GBS urinary tract infection in current pregnancy (regardless of treatment) • GBS-positive rectovaginal culture in current pregnancy • Unknown GBS status PLUS any of the following: ◦ <37 weeks gestation ◦ Intrapartum fever ◦ Rupture of membranes for ≥18 hours • Prior infant with early-onset neonatal GBS infection
Intrapartum prophylaxis	• Intravenous penicillin

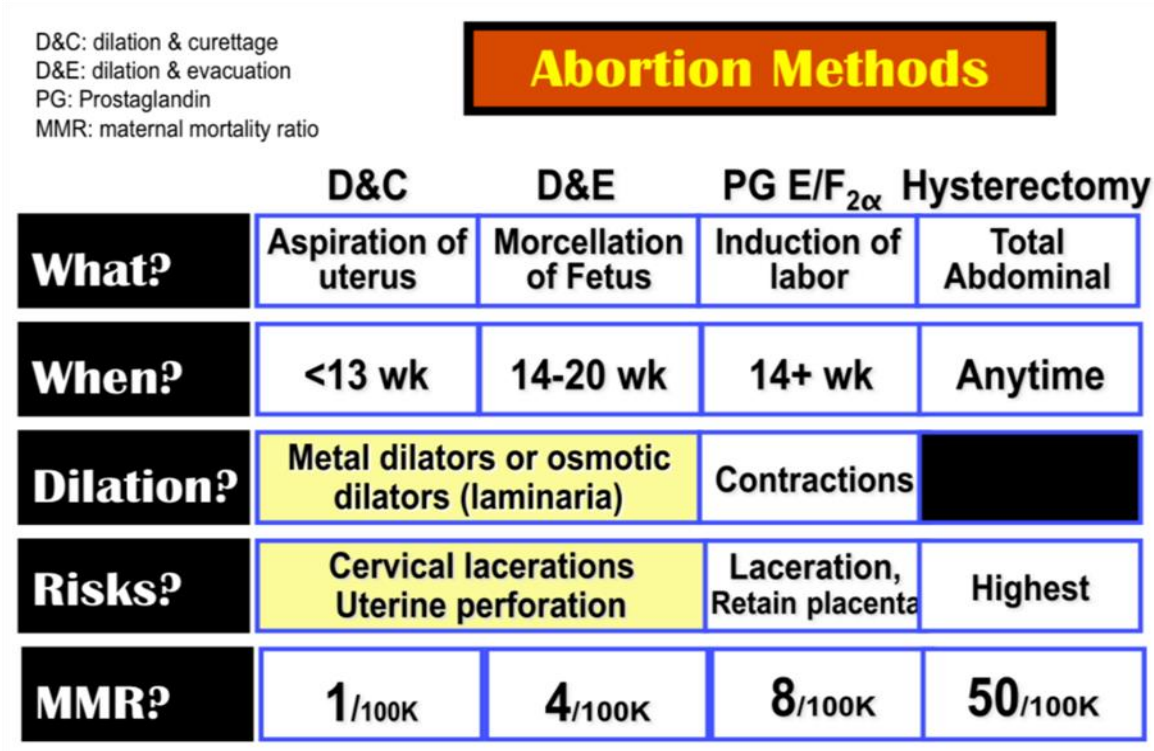
GBS = group B *Streptococcus*.

CHAPTER 4

Induced abortion

Induced abortion

- Nearly half of all pregnancies among American women are unintended, and 4 in 10 of these are terminated by abortion. A quarter of all pregnancies (excluding miscarriages) end in abortion.



First-Trimester Methods

1. Dilation and curettage (D&C):

- This is the most common abortion procedure in the United States (90%), and is performed before 13 weeks' gestation.
- The cervical canal is dilated with tapered metal cervical dilators or hygroscopic/osmotic dilators such as laminaria.
- Prophylactic antibiotics are given to reduce the infection rate.
- Complications are rare but include endometritis, treated with outpatient antibiotics; and retained products of conception (POC), treated by repeat curettage.
- Maternal mortality ratio: 1 per 100,000 women.

2. Medical abortion:

- Mifepristone has been marketed over the past decade as an alternative to surgical abortion.
- Medical induction of abortion can be induced using oral mifepristone (a progesterone antagonist) and oral misoprostol (prostaglandin E1).
- Use is limited to the first 63 days of amenorrhea.
- Approximately 85% of patients will abort within 3 days.
- The earlier the gestational age, the higher the success rate. About 2% of patients abort incompletely and require D & C.

Second-Trimester Methods

- The more advanced the gestation, the higher the rate of complications.

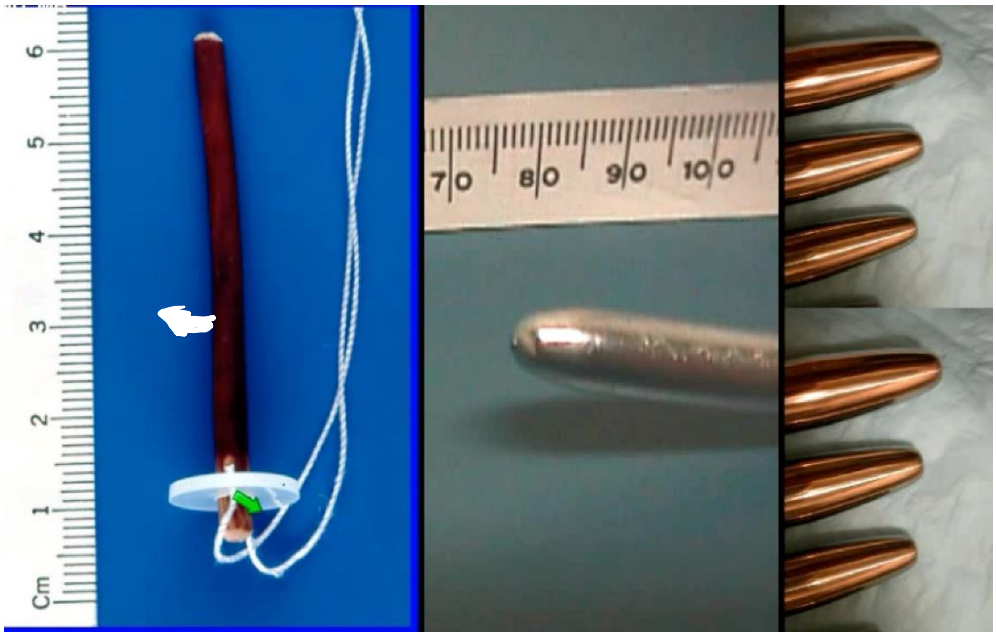
1. Dilation and evacuation (D&E):

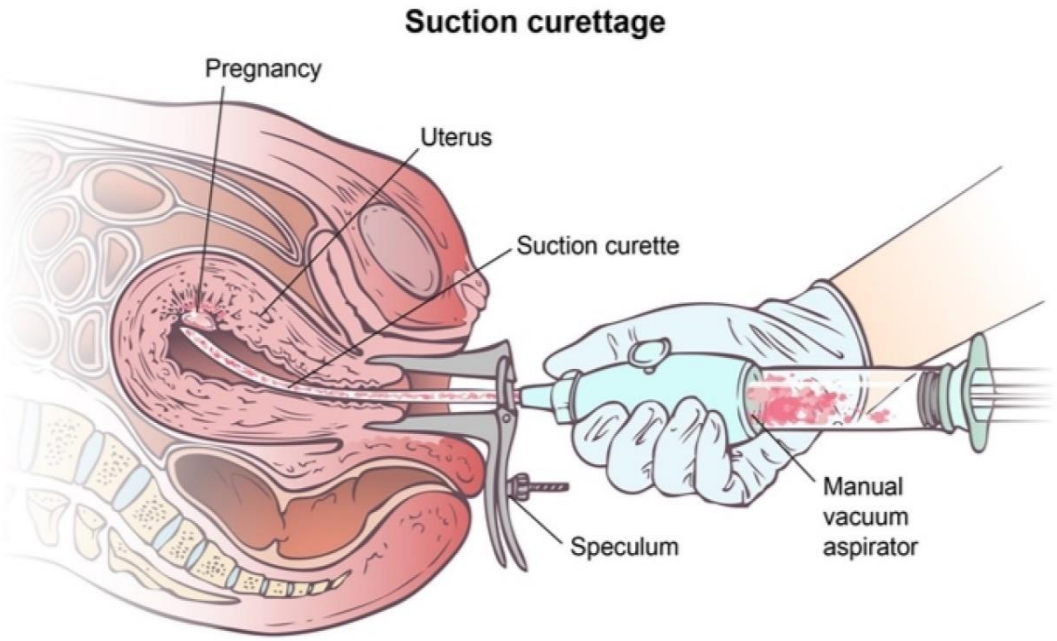
- This is the most common second-trimester abortion procedure.
- Cervical dilation is performed by inserting osmotic laminaria dilators 24 hours prior to the procedure.
- After 14 weeks, the fetus is morcellated and removed in pieces.
- Ultrasound guidance can ensure complete evacuation of pregnancy tissues.
- A D&E is difficult to perform after 20 weeks due to toughness of fetal tissues.
- Immediate complications may include uterine perforation, retained tissue, hemorrhage, and infection.
- Delayed complications may include cervical trauma with resulting cervical insufficiency.
- Maternal mortality ratio: 4 per 100,000 women.

2. Labor induction methods:

- Stimulation of uterine contractions to dilate the cervix can be achieved with prostaglandins.
- Interval from induction to delivery may be up to 24 hours.
- Delivery of a live fetus may occur with use of prostaglandin (PG) analogs; feticidal agents used include intracardiac injection of KCl or digoxin.
- Immediate complications include retained placenta (the most common problem with all PG abortions), hemorrhage, and infection.

- Delayed complications include cervical trauma with resulting cervical insufficiency.
- Maternal mortality ratio: 8 per 100,000 women.

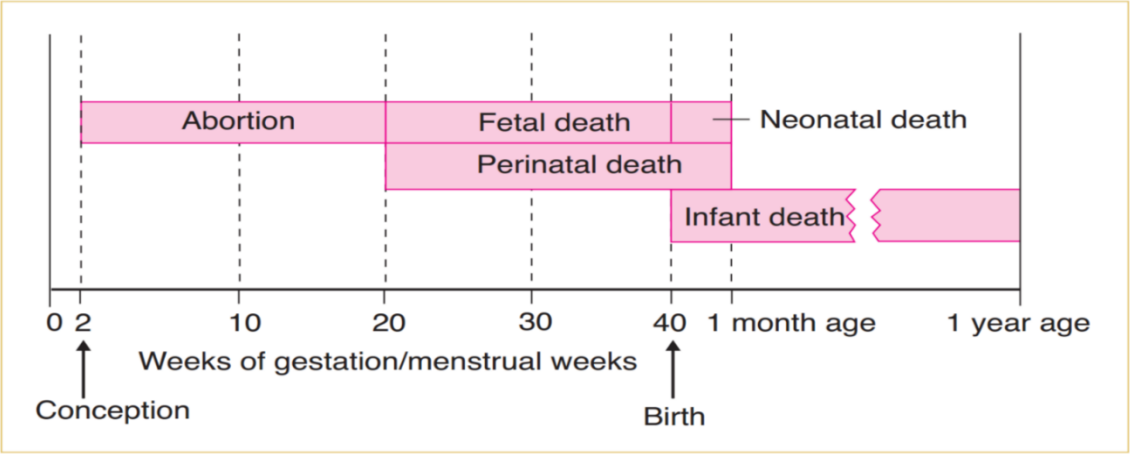




CHAPTER 5

Early Pregnancy Bleeding

Early Pregnancy Bleeding



- Definition:

- Bleeding that occurs before 12 weeks' gestation.

- The most common cause of early pregnancy loss is fetal in origin.

- Abortion is defined as a pregnancy that ends before 20 weeks gestation or a fetus less than 500 grams. Almost 80% of spontaneous abortions occur prior to 12 weeks gestation.

- Etiology:

A. Cytogenetic etiology: The majority of early pregnancy losses are caused by gross chromosomal abnormalities of the embryo or fetus.

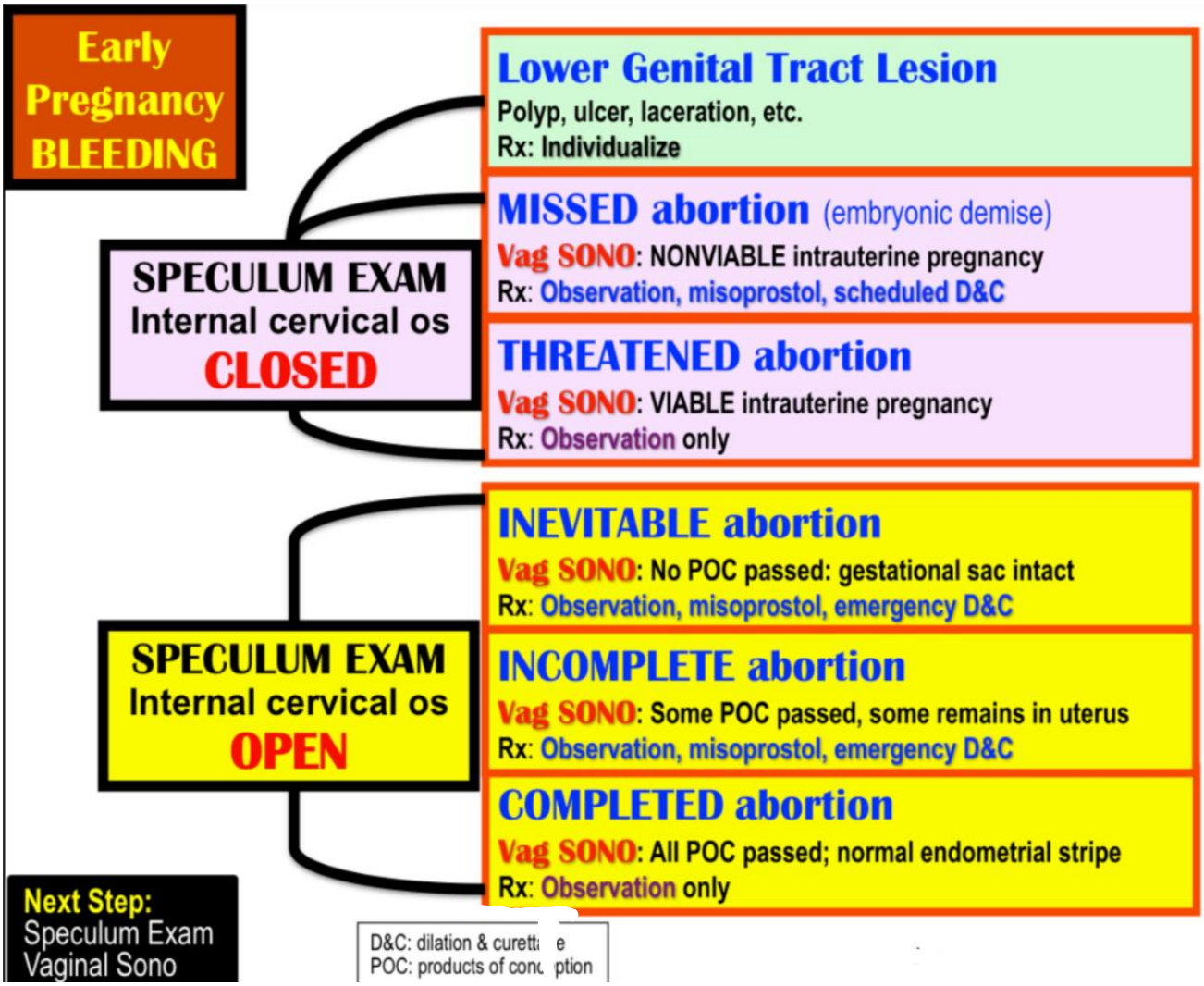
B. Mendelian etiology: Other losses may be caused by autosomal or X-linked dominant or recessive diseases.

C. Antiphospholipid syndrome: An uncommon cause of early pregnancy loss. Some women with SLE produce antibodies against their own vascular system and fetoplacental tissues. Treatment is subcutaneous heparin.

- Clinical Presentation:

- Speculum examination is essential to rule out vaginal or cervical lesions that are causing bleeding.

- Molar and ectopic pregnancy should be ruled out in all patients with early pregnancy bleeding.



- Clinical Entities:

- The following diagnoses represent findings along a continuum from the beginnings of losing the pregnancy to complete expulsion of the products of conception (POC):

A. Missed abortion:

- Sonogram finding of a nonviable pregnancy without vaginal bleeding, uterine cramping, or cervical dilation.

- Management: conservative management awaiting a spontaneous completed abortion, or Scheduled suction D&C, or induce contractions with misoprostol.

B. Threatened abortion:

- Sonogram finding of a viable pregnancy with vaginal bleeding but no cervical dilation.

- Half of these pregnancies will continue to term successfully.

- Management: Often the cause is implantation bleeding. Observation only. No intervention is generally indicated or effective.

C. Inevitable abortion:

- Vaginal bleeding and uterine cramping leading to cervical dilation, but no POC has yet been passed.

- Products of conception in the lower uterine segment.

- Management:
  - Conservative management awaiting a spontaneous completed abortion or induce contractions with misoprostol.

  - Emergency suction D&C if bleeding is heavy to prevent further blood loss and anemia.

D. Incomplete abortion:

- Vaginal bleeding and uterine cramping leading to cervical dilation, with some, but not all, POC having been passed.

- Management:
  - Conservative management awaiting a spontaneous completed abortion or induce contractions with misoprostol.

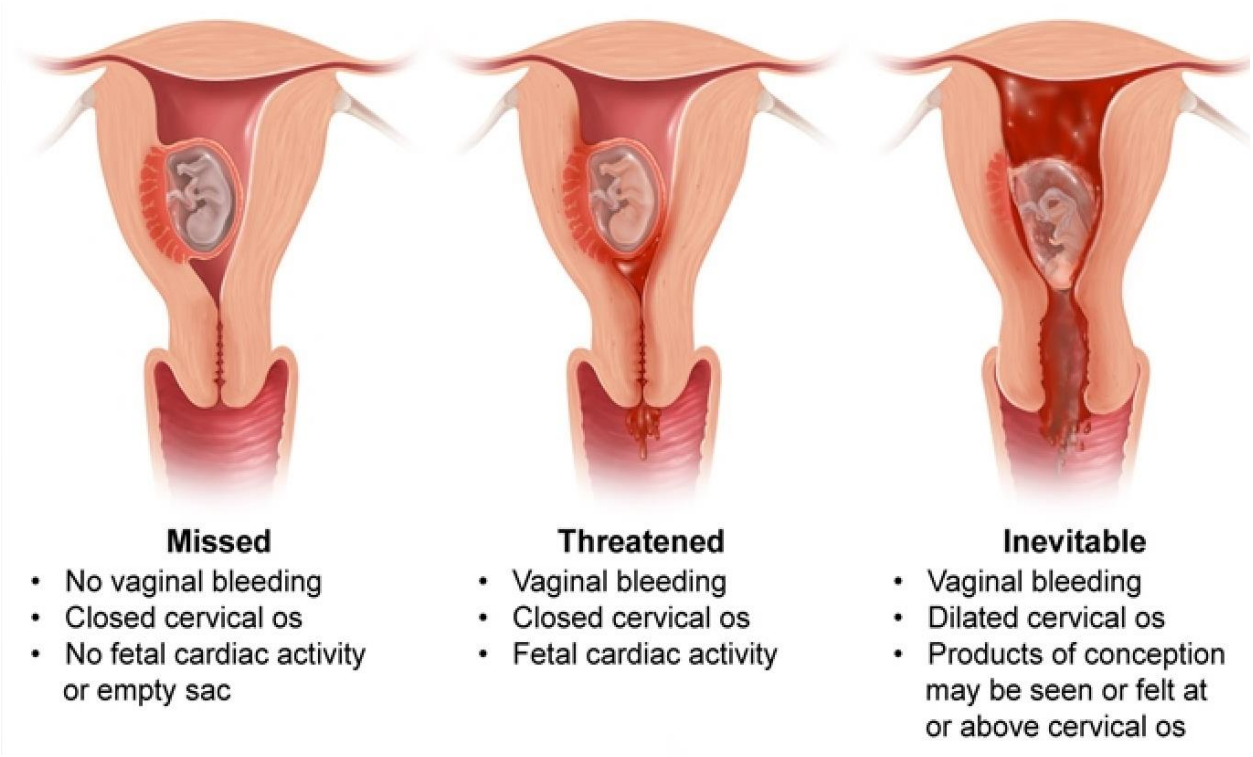
  - Emergency suction D&C if bleeding is heavy to prevent further blood loss and anemia.

  - In addition, patient requires Rho(D) immune globulin to prevent isoimmunization from Rh incompatibility.

E. Completed abortion:

- Vaginal bleeding and uterine cramping have led to all POC being passed. This is confirmed by a sonogram showing no intrauterine contents or debris.

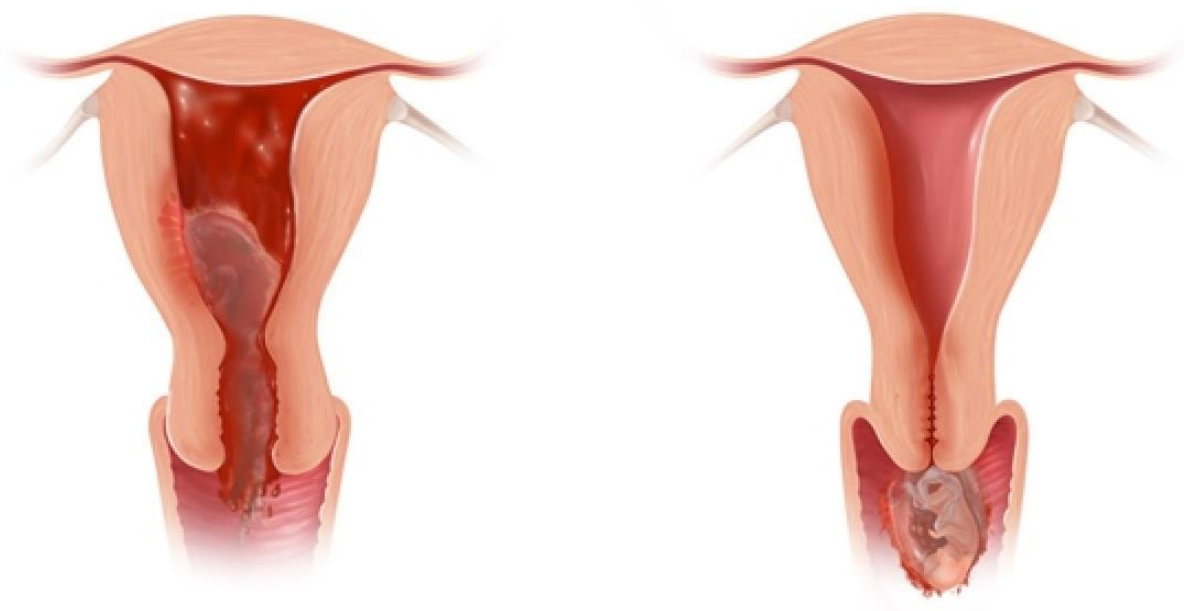
- Management: Conservative if an intrauterine pregnancy had been previously confirmed. Otherwise, serial β-human chorionic gonadotropin (β-hCG) titers should be obtained weekly until negative to ensure an ectopic pregnancy has not been missed.



Missed
- No vaginal bleeding
- Closed cervical os
- No fetal cardiac activity or empty sac

Threatened
- Vaginal bleeding
- Closed cervical os
- Fetal cardiac activity

Inevitable
- Vaginal bleeding
- Dilated cervical os
- Products of conception may be seen or felt at or above cervical os



Incomplete
- Vaginal bleeding
- Dilated cervical os
- Some products of conception expelled & some remain

Complete
- Vaginal bleeding
- Closed cervical os
- Products of conception completely expelled

❖ N.B:

- Septic abortion most commonly occurs after an unsterile and/or incomplete procedure for an elective abortion.
- It presents with fever, heavy vaginal bleeding, purulent discharge, and uterine tenderness.
- Septic abortion is a medical emergency that requires prompt treatment with broad-spectrum antibiotics and surgical evacuation of the uterus (suction curettage).

Septic abortion	
Risk factors	Retained POC from: • Elective abortion with nonsterile technique • Missed or incomplete abortion (rare)
Clinical presentation	• Fever, chills, abdominal pain • Sanguinopurulent vaginal discharge • Boggy, tender uterus; dilated cervix • Pelvic ultrasound: Retained POC, thick endometrial stripe
Management	• Intravenous fluids • Broad-spectrum antibiotics • Suction curettage

POC = products of conception.

Fetal demise

- Definition:

- The term applies to in utero death of a fetus after 20 weeks' gestation before birth.

- Antenatal demise occurs before labor.

- Intrapartum demise is the term if death occurs after the onset of labor.

- Significance:

- Disseminated intravascular coagulation (DIC) is the most serious consequence with prolonged fetal demise resulting from release of tissue thromboplastin from deteriorating fetal organs.

- Grief resolution may be prolonged if psychosocial issues are not appropriately addressed.

- Risk Factors:

- Fetal demise is most commonly idiopathic.

- When a cause is identified, risk factors include fetal aneuploidy, and fetal infection, antiphospholipid syndrome, overt maternal diabetes, maternal trauma, severe maternal isoimmunization.

- Presentation:

- After 20 weeks' gestation, the most common symptom is maternal report of absence of fetal movements or the uterine fundus less than dates.

- Diagnosis: Ultrasound demonstration of lack of fetal cardiac activity.

- Management:

- DIC present:

  - DIC is usually not seen until 4 weeks after demise.

  - Coagulopathy should be ruled out with appropriate laboratory testing: platelet count, d-dimer, fibrinogen, prothrombin time, partial thromboplastin time.

  - If DIC is identified, immediate delivery is necessary with selective blood product transfusion as clinically indicated.

- No DIC present:

  - Delivery may best be deferred for a number of days to allow for an appropriate grief response to begin.

  - Or if the patient wishes conservative management, follow weekly serial DIC laboratory tests.

- Ninety percent of patients start spontaneous labor after 2 weeks.

- Mode of delivery:
- Induction of labor with vaginal prostaglandin is appropriate in pregnancies of ≥20 weeks or if a fetal autopsy is indicated.

- Cesarean delivery is almost never appropriate for dead fetus.

- Psychosocial issues:
- Acceptance of the reality of the loss may be enhanced by allowing the patient and her family to see the fetus, hold the fetus, name the fetus, and have a burial.

- Encouraging expression of feelings and tears may speed grief resolution.

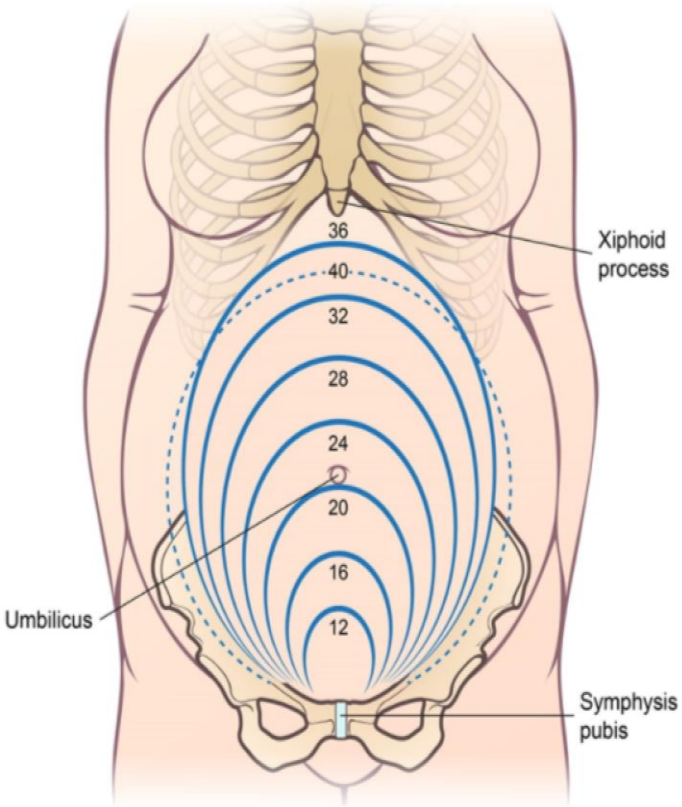
- Identify cause:
- The etiology can be maternal, placental, or fetal in origin, but the etiology is most often unknown.

Evaluation of fetal demise	
Fetal	• Autopsy • Gross & microscopic examination of placenta, membranes & cord • Karyotype/genetic studies
Maternal	• Kleihauer-Betke test for fetomaternal hemorrhage • Antiphospholipid antibodies • Coagulation studies*

*For history of recurrent pregnancy loss, family or personal history of venous thrombosis, fetal growth restriction

❖ N.B:

- After 20 weeks gestation, fundal height can be measured in centimeters.
- This is done by measuring from the pubic symphysis to the top of the fundus.
- This measurement correlates with the gestational age by +/- 3 weeks.



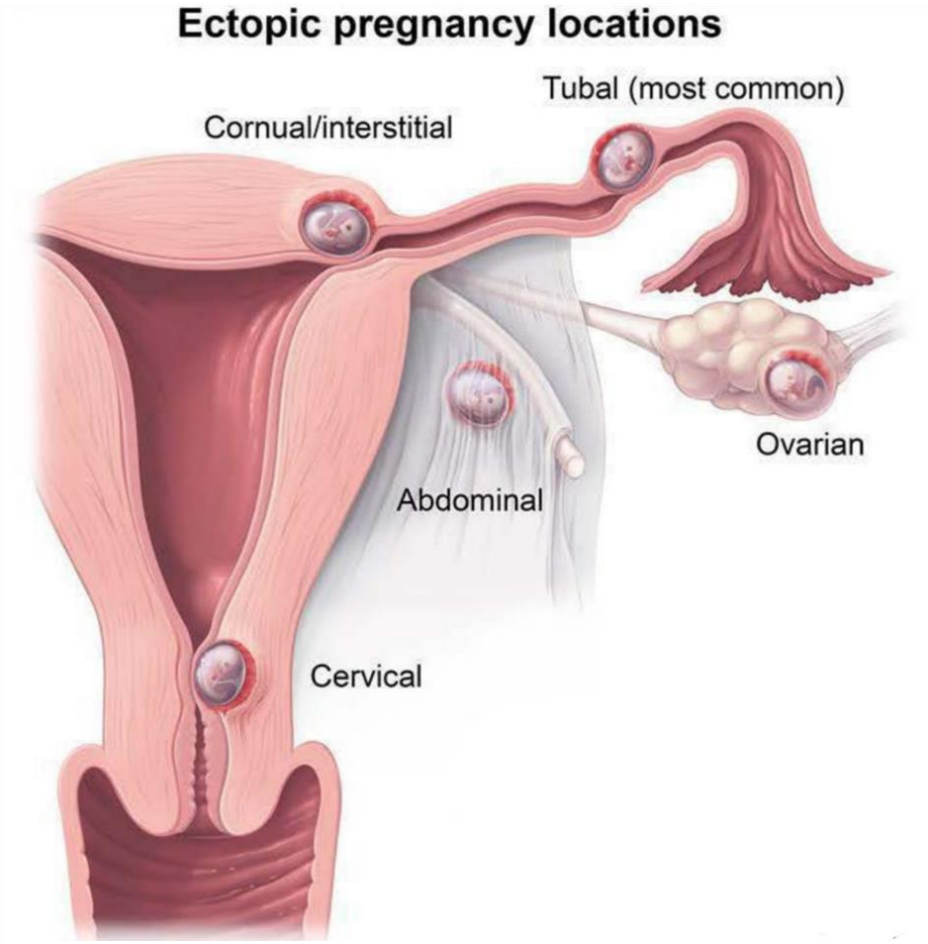
Ectopic Pregnancy

- Definition:

- This is a pregnancy in which implantation has occurred outside of the uterine cavity.

- The most common location of ectopic pregnancies is an oviduct.

- The most common location within the oviduct is the distal ampulla.



- Differential Diagnosis:

- In a reproductive age woman with abnormal vaginal bleeding, the possibility of pregnancy or complication of pregnancy should always be considered.

- With a positive pregnancy test, the differential diagnosis consists of a threatened abortion, incomplete abortion, ectopic pregnancy, and hydatidiform mole.

- Risk Factors:

- The most common predisposing cause is previous pelvic inflammatory disease (PID).

- Ectopic pregnancy risk is increased from any obstruction of normal zygote migration to the uterine cavity from tubal scarring or adhesions from any origin:
  - Infectious (PID, IUD).
  - Postsurgical (tubal ligation, tubal surgery).
  - Congenital (diethylstilbestrol [DES] exposure).

- One percent of pregnancies are ectopic pregnancies, and if the patient has had one ectopic pregnancy, the incidence becomes 15%.

- Clinical Findings:

- The classic triad with an unruptured ectopic pregnancy is amenorrhea, vaginal bleeding, and unilateral pelvic-abdominal pain.

- With a ruptured ectopic pregnancy, the findings reflect peritoneal irritation and the degree of hypovolemia due to intraperitoneal bleeding. This results in abdominal guarding and rigidity. Hypotension and tachycardia indicate significant blood loss.

- Diagnosis:

- The diagnosis of an unruptured ectopic pregnancy rests on the results of a quantitative serum β-hCG titer combined with the results of a vaginal sonogram.

- It is based on the assumption that when a normal intrauterine pregnancy has progressed to where it can be seen on vaginal sonogram at 5 weeks' gestation, the serum β-hCG titer will exceed 1,500 mIU.

- Failure to see a normal intrauterine gestational sac when the serum β-hCG titer is >1,500 mIU is presumptive diagnosis of an ectopic pregnancy.

- Transabdominal ultrasound cannot reliably visualize a gestational sac in early pregnancy.

- Management:

- Ruptured ectopic:
  - The diagnosis of ruptured ectopic pregnancy is presumed with a history of amenorrhea, vaginal bleeding, and abdominal pain in the presence of a hemodynamically unstable patient.

  - Immediate surgical intervention to stop the bleeding is vital, usually by laparotomy.

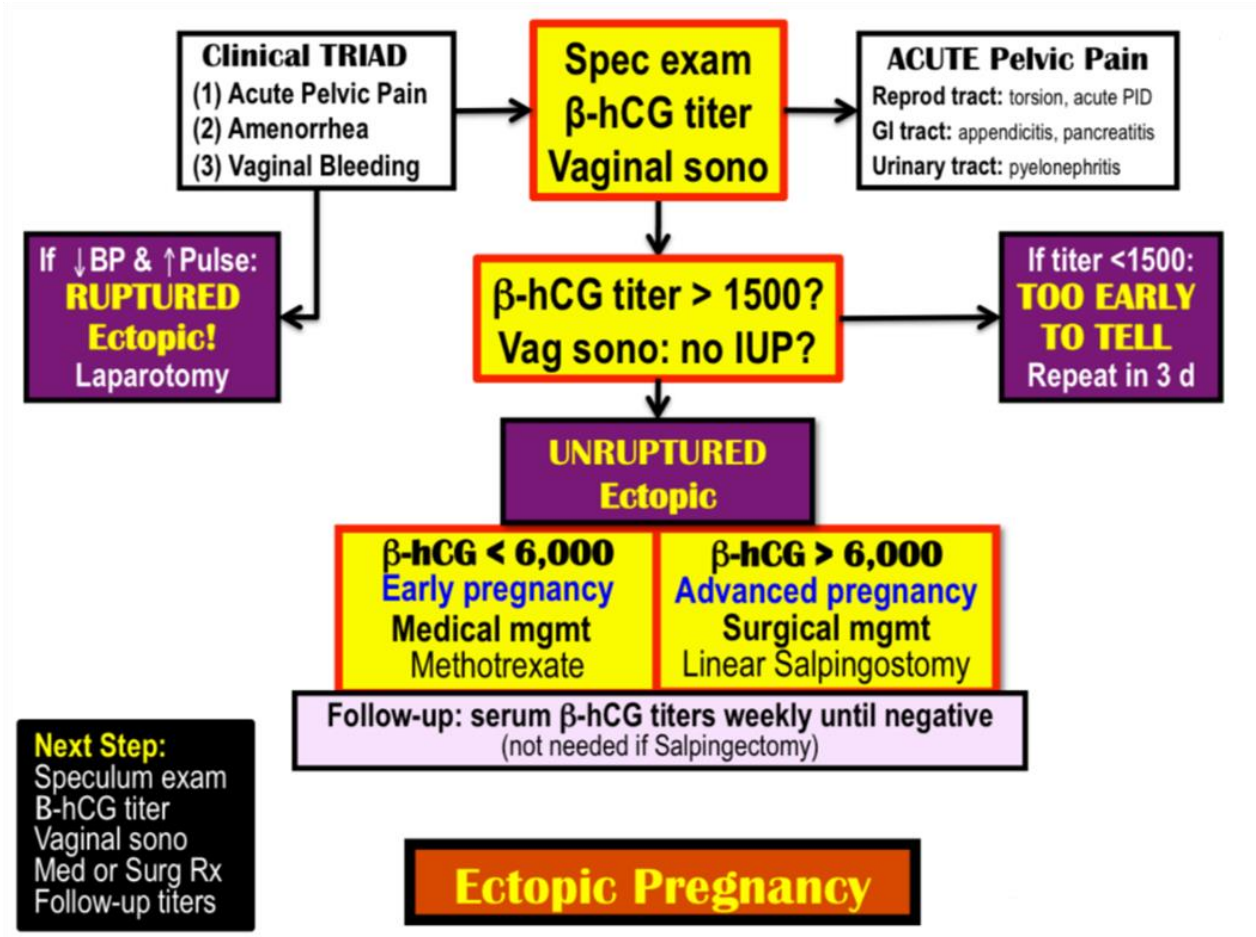
- Intrauterine pregnancy:
  - If the sonogram reveals an IUP, management will be based on the findings.

  - If the diagnosis is hydatidiform mole, the patient should be treated with a suction curettage and followed up on a weekly basis with β-hCG.

- Possible ectopic:
  - If the sonogram does not reveal an IUP, but the quantitative β-hCG is <1,500 mIU, it is impossible to differentiate a normal IUP from an ectopic pregnancy.
  - Because β-hCG levels in a normal IUP double every 58 hours, the appropriate management will be to repeat the quantitative β-hCG and vaginal sonogram every 2-3 days until the β-hCG level exceeds 1,500 mIU.
  - With that information an ectopic pregnancy can be distinguished from an IUP.
- Unruptured ectopic:
  - Management can be medical with methotrexate or surgical with laparoscopy.
  - Medical treatment is preferable because of the lower cost, with otherwise similar outcomes.

A. Methotrexate:
  - This folate antagonist attacks rapidly proliferating tissues including trophoblastic villi.
  - Criteria for methotrexate include pregnancy mass <3.5 cm diameter, absence of fetal heart motion and β-hCG level <6,000 mIU (early pregnancy).
  - Follow-up with serial β-hCG levels is crucial to ensure pregnancy resolution.
  - Rh-negative women should be administered RhoGAM.

B. Laparoscopy:
  - If criteria for methotrexate are not met, surgical evaluation is performed through a laparoscopy or through a laparotomy incision.
  - The preferred procedure for an unruptured ampullary tubal pregnancy is a salpingostomy, in which the trophoblastic villi are dissected free preserving the oviduct.
  - After a salpingostomy β-hCG titers should be obtained on a weekly basis to make sure that there is resolution of the pregnancy.
  - Salpingectomy is reserved for the patient with a ruptured ectopic pregnancy or those with no desire for further fertility.



Ectopic pregnancy	
Risk factors	• Previous ectopic pregnancy • Previous pelvic/tubal surgery • Pelvic inflammatory disease
Clinical features	• Abdominal pain, amenorrhea, vaginal bleeding • Hypovolemic shock in ruptured ectopic pregnancy • Cervical motion, adnexal &/or abdominal tenderness • ± Palpable adnexal mass
Diagnosis	• Positive hCG • Transvaginal ultrasound revealing adnexal mass, empty uterus
Management	• Stable: Methotrexate • Unstable: Surgery

CHAPTER 6

Late Pregnancy bleeding

Late Pregnancy bleeding

- Definition:

- Vaginal bleeding occurring after 20 weeks' gestation.

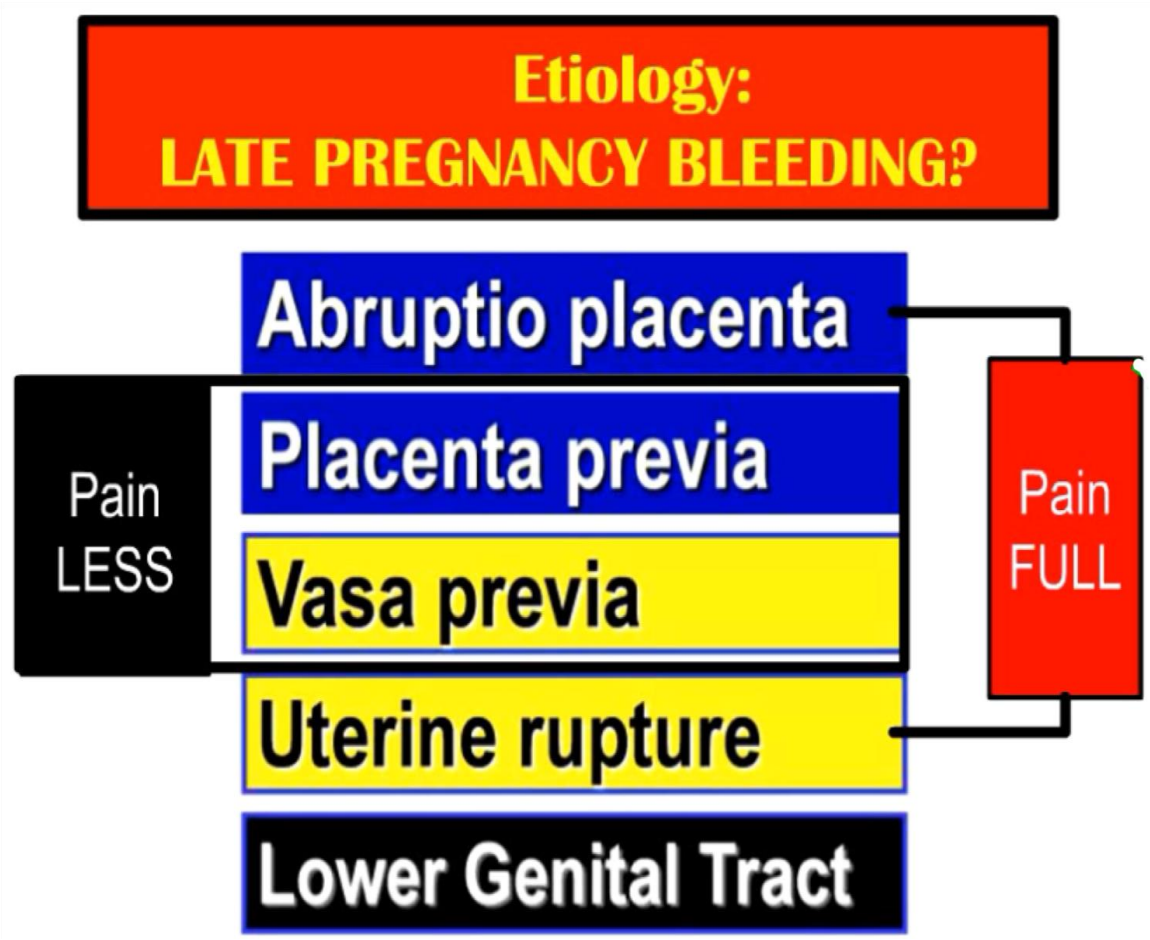
- Prevalence is <5%, but when it does occur, prematurity and perinatal mortality quadruple.

- Etiology:

A. Cervical causes include erosion, polyps, and, rarely, carcinoma.

B. Vaginal causes include varicosities and lacerations.

C. Placental causes include abruptio placentae, placenta previa, and vasa previa.



- Initial Investigation:

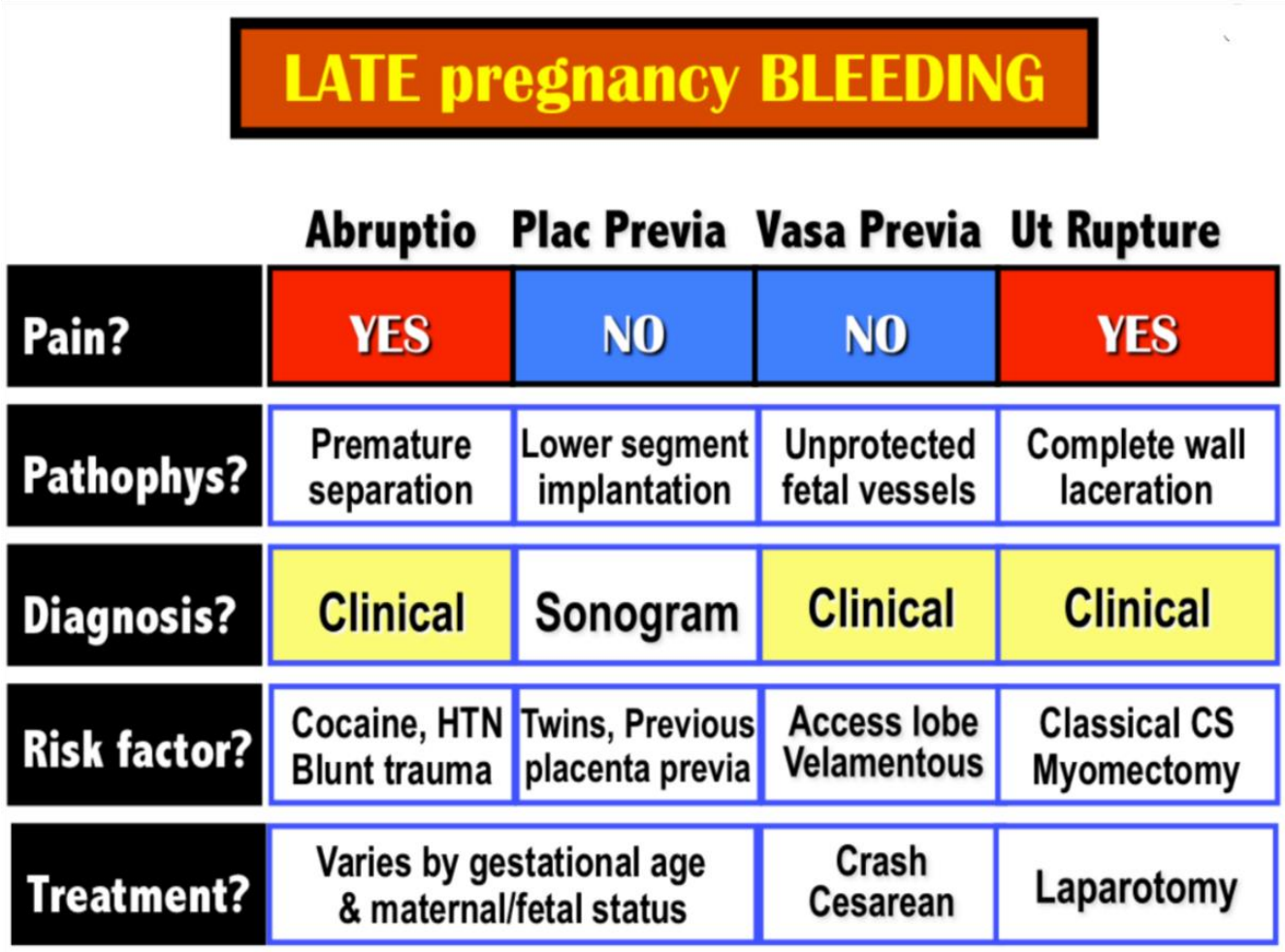
- Complete blood count, disseminated intravascular coagulation (DIC) workup (platelets, prothrombin time, partial thromboplastin time, fibrinogen, D-dimer), type and cross-match, and sonogram for placental location.

- The most common cause of obstetric DIC is Abruptio placenta.

- Never perform a digital or speculum examination until ultrasound study rules out placenta previa.

- Initial Management:

- Start an IV line with a large-bore needle; if maternal vital signs are unstable → run isotonic fluids and place a urinary catheter to monitor urine output.



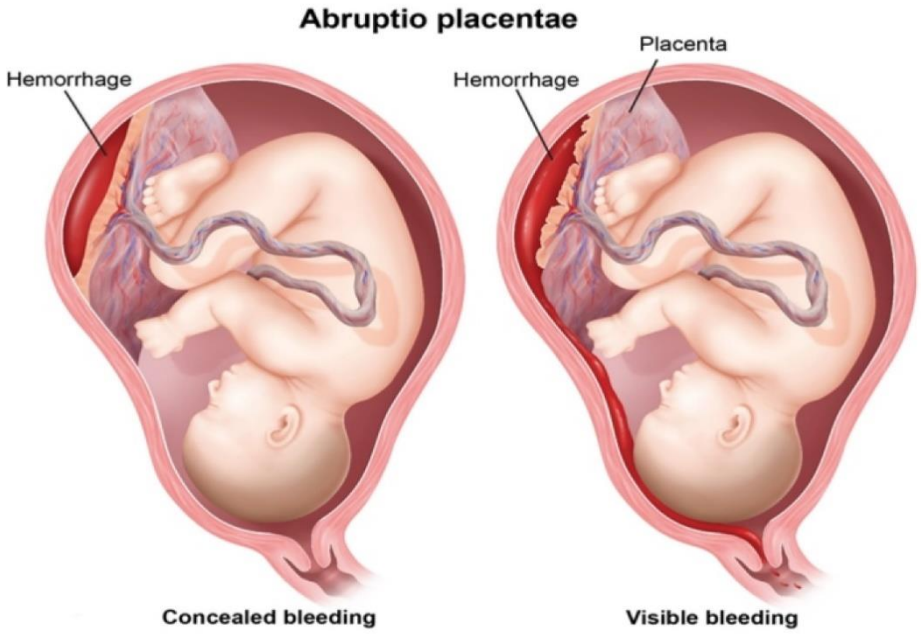
Abruptio placenta

- Etiology/Pathophysiology:

- A normally implanted placenta (not in the lower uterine segment) separates from the uterine wall before delivery of the fetus.

- Most commonly bleeding is overt and external. In this situation blood dissects between placental membranes exiting out the vagina.

- Less commonly, if bleeding remains concealed or internal, the retroplacental hematoma remains within the uterus.



- Risk Factors:

- Abruptio placentae is seen more commonly with previous abruption, hypertension, and maternal blunt trauma.

- Other risk factors are smoking and maternal cocaine abuse.

- Clinical Presentation:

- Abruptio placentae is the most common cause of painful late-trimester bleeding, occurring in 1% of pregnancies at term.

- Diagnosis:

- This is based on the presence of painful late-trimester vaginal bleeding with a normal fundal or lateral uterine wall placental implantation not over the lower uterine segment.

- Management:

- Varies by gestational age and maternal/fetal status:

A. Emergency cesarean delivery:

- This is performed if maternal or fetal jeopardy is present as soon as the mother is stabilized.

B. Vaginal delivery:

- This is performed if bleeding is heavy but controlled or pregnancy is >36 weeks.

- Perform amniotomy and induce labor.

C. Conservative in-hospital observation:

- This is performed if mother and fetus are stable and remote from term, bleeding is minimal or decreasing, and contractions are subsiding.

- The first step in management is aggressive fluid resuscitation with crystalloids. In addition, the patient should be placed in a left lateral decubitus position to displace the uterus off the aortocaval vessels and maximize cardiac output.

- Complications:

- Significant bleeding puts the patient at risk for hypovolemic shock and disseminated intravascular coagulation due to tissue factor released by decidual bleeding.

- A very large separation can cause fetal hypoxia, which presents as fetal heart rate tracing abnormalities (loss of variability) and places the fetus at risk for demise.

- Couvelaire uterus refers to blood extravasating between the myometrial fibers, appearing like bruises on the serosal surface.

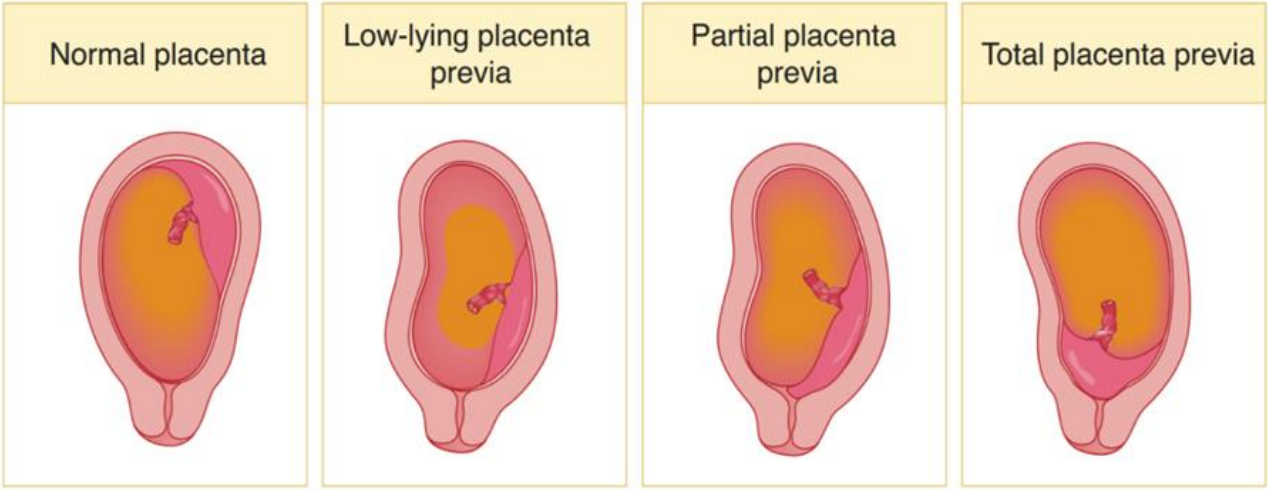
Placental abruption	
Risk factors	• Maternal hypertension or preeclampsia/eclampsia • Abdominal trauma • Prior placental abruption • Cocaine & tobacco use
Clinical presentation	• Sudden-onset vaginal bleeding (80%) • Abdominal or back pain • High-frequency, low-intensity contractions • Hypertonic, tender uterus
Diagnosis	• Primarily by clinical presentation • Ultrasound (not required for diagnosis) to rule out placenta previa; may show retroplacental hematoma

Placenta previa

- Etiology/Pathophysiology:

- Placenta previa is present when the placenta is implanted in the lower uterine segment.

- Usually the lower implanted placenta atrophies and the upper placenta hypertrophies, resulting in migration of the placenta.



- At term placenta previa is found in only 0.5% of pregnancies.

- Risk Factors:

- Placenta previa is seen more commonly with previous placenta previa, multiparity, and multiple gestation (increase placental surface area).

- Increasing cesarean delivery rates have caused an increased incidence of placenta previa because the uterine scar and change in vascularity likely alter early pregnancy implantation.

- Diagnosis:

- This is based on the presence of painless late-trimester vaginal bleeding with an obstetric ultrasound showing placental implantation over the lower uterine segment.

- Painless vaginal bleeding develops due to avulsion of the anchoring villi of an abnormally implanted placenta as lower uterine segment stretching occurs in the latter part of pregnancy.

- Management:

- Asymptomatic patients (no vaginal bleeding) undergo routine obstetric care and third-trimester ultrasound to evaluate for previa resolution.

- Management of vaginal bleeding varies by gestational age and maternal/fetal status:

A. Emergency cesarean delivery:

- This is performed if maternal or fetal jeopardy is present after stabilization of the mother.

B. Scheduled cesarean delivery:

- This is performed if the mother has been stable after fetal lung maturity has been confirmed by amniocentesis, usually at 36 weeks' gestation.

C. Conservative in-hospital observation:

- Conservative management of bed rest is performed in preterm gestations if mother and fetus are stable and remote from term.

- Replace blood loss with crystalloid and blood products as needed.

- Need pelvic rest (no intercourse or digital vaginal examination) because minimal cervical manipulation can cause cervical changes (shortening, dilation) that can result in partial placental detachment and massive maternal hemorrhage.

Placenta previa	
Risk factors	• Prior placenta previa • Prior cesarean delivery • Multiple gestation
Clinical features	• Painless vaginal bleeding >20 weeks gestation
Diagnosis	• Transabdominal followed by transvaginal sonogram
Management	• No intercourse • No digital cervical examination • Inpatient admission for bleeding episodes

Placenta accrete/increta/percreta

- Placental villi normally invade only the superficial layers of the endometrial decidua basalis.

- When the villi invade too deeply into the wall of the uterus, the condition is known as placenta accreta, placenta increta, or placenta percreta, depending the depth of the invasion:

- Placenta accreta occurs when the villi invade the deeper layers of the endometrial deciduus basalis but do not penetrate the myometrium. Placenta accreta is the most common, accounting for approximately 80% of all cases.

- Placenta increta occurs when the villi invade the myometrium but do not reach the uterine serosal surface or the bladder. It accounts for approximately 15% of all cases.

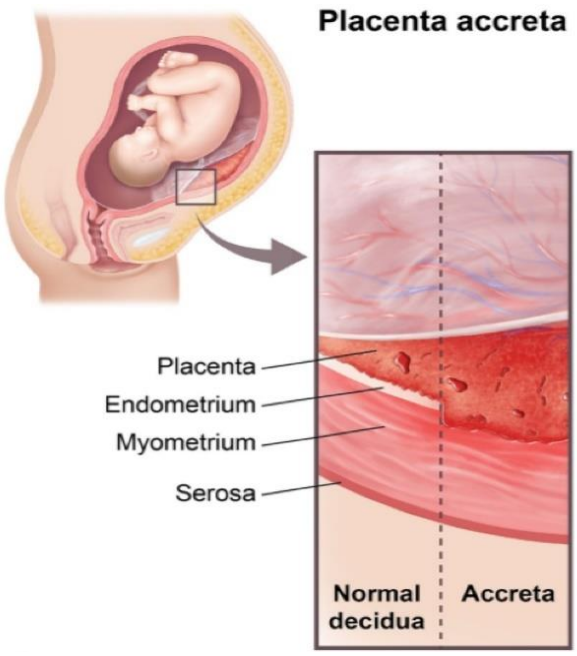
- Placenta percreta occurs when the villi invade all the way to the uterine serosa or into the bladder. Placenta percreta is the least common of the 3 conditions, accounting for approximately 5% of all cases.

- Risk factors for placenta accreta include a prior cesarean delivery, a history of dilation and curettage, and maternal age >35.

- Placenta accreta is typically diagnosed by antenatal ultrasound findings that include irregularity or absence of the placental-myometrial interface.

- Antenatally diagnosed placenta accreta is delivered by planned cesarean hysterectomy.

- Undiagnosed placenta accreta presents as difficulty with placental delivery. The placenta does not detach from the uterus and necessitates a manual extraction, which is then complicated by severe hemorrhage.



Vasa previa

- Etiology/Pathophysiology:

- Vasa previa is present when fetal vessels traverse the fetal membranes over the internal cervical os.

- These vessels may be from either a velamentous insertion of the umbilical cord or may be joining an accessory (succenturiate) placental lobe to the main disk of the placenta.

- If these fetal vessels rupture the bleeding is from the fetoplacental circulation, and fetal exsanguination will rapidly occur, leading to fetal death.

- Diagnosis:

- This is rarely confirmed before delivery but may be suspected when antenatal sonogram with color-flow Doppler reveals a vessel crossing the membranes over the internal cervical os.

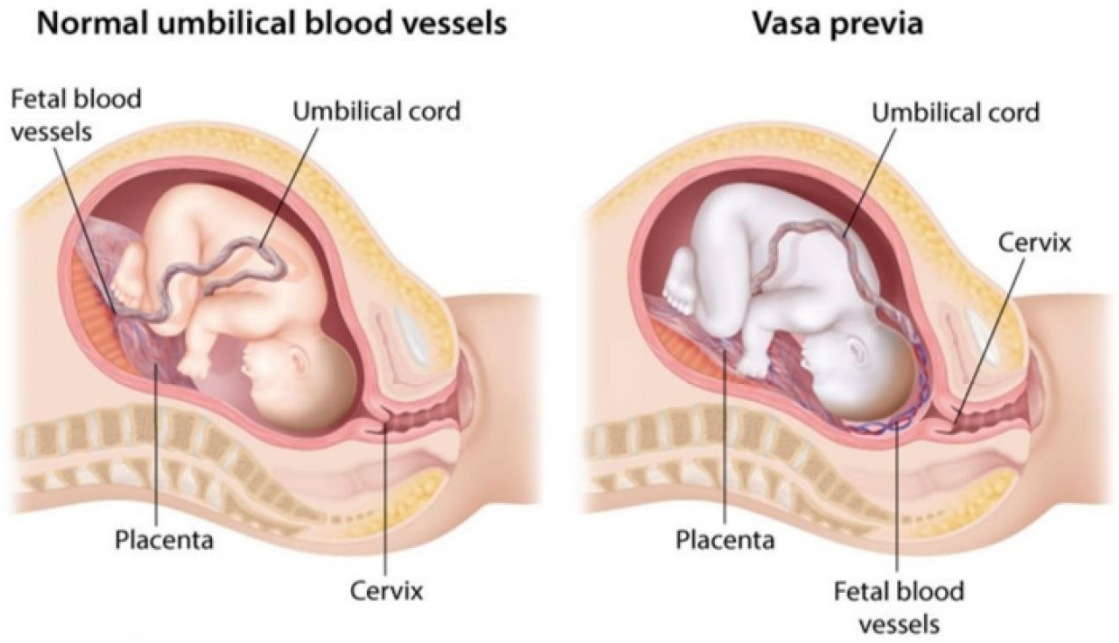
- The diagnosis is usually confirmed after delivery on examination of the placenta and fetal membranes.

- Clinical Presentation:

- The classic triad is rupture of membranes and painless vaginal bleeding, followed by fetal bradycardia.

- Management:

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



Uterine rupture

- Definition:

- Uterine rupture is complete separation of the wall of the pregnant uterus with or without expulsion of the fetus that endangers the life of the mother or the fetus, or both.

- Uterine rupture is a rare but life-threatening complication of attempted vaginal birth after a prior classical (vertical) cesarean delivery or myomectomy.

- Most uterine ruptures occur in patients with a history of uterine surgery (previous classic uterine incision, myomectomy) as the inelastic scar may not be able to withstand labor contractions.

- Vaginal delivery is safe after a low transverse (horizontal uterine incision) cesarean delivery.

- Clinical Presentation:

- The most common findings are painful vaginal bleeding, loss of electronic fetal heart rate signal due to disruption of the maternal-placental circulation, and loss of station of fetal head. Rupture may occur both before labor as well as during labor.

- Regression of fetus: fetus was moving toward delivery but is no longer in the canal because it withdrew into the abdomen.

- Diagnosis:

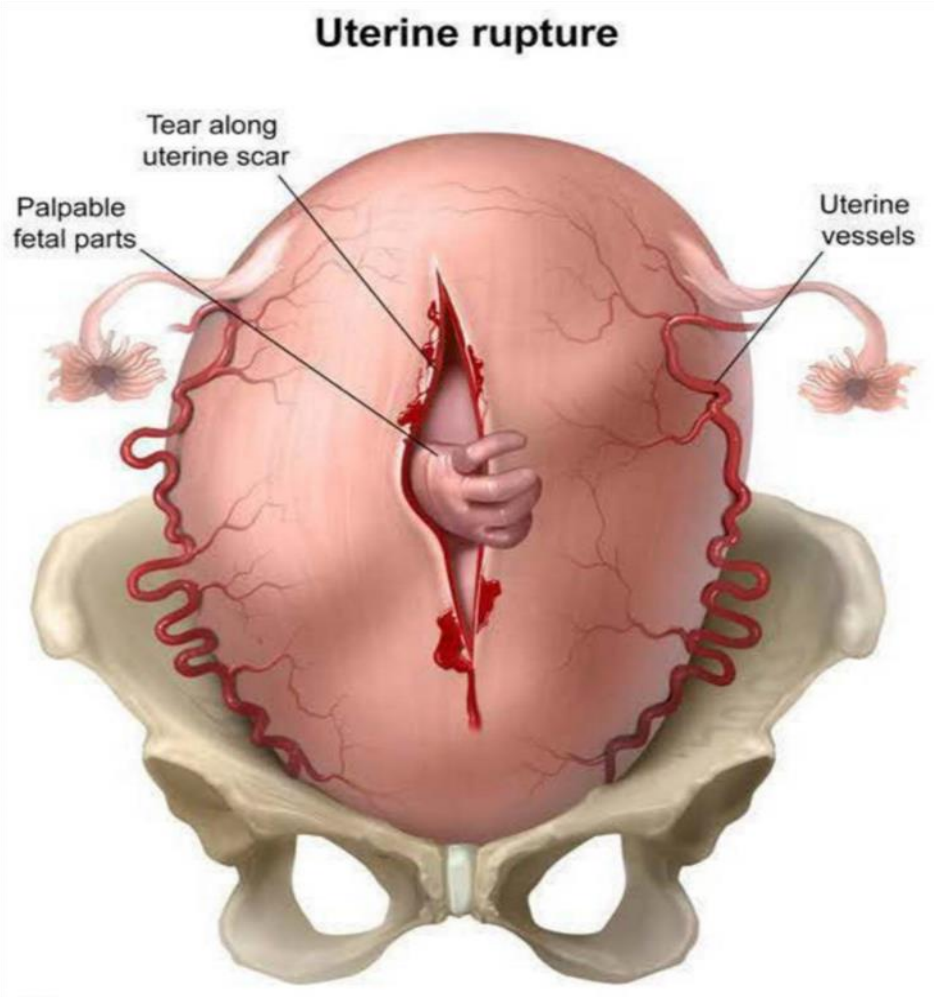
- Confirmation of the diagnosis is made by surgical exploration of the uterus and identifying the tear.

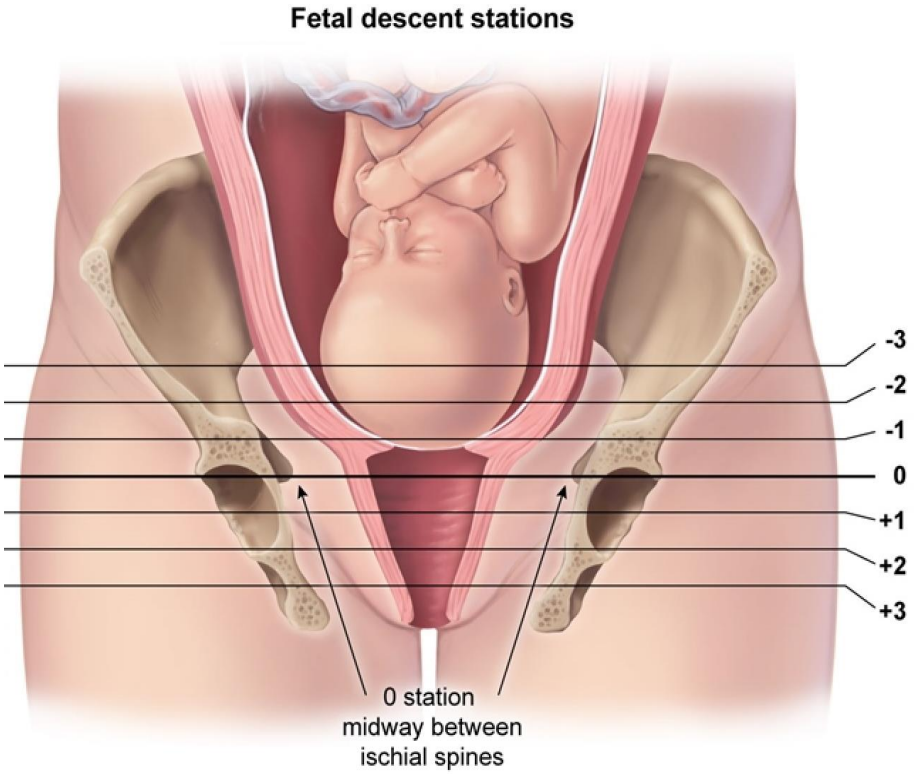
- Management:

- Treatment is an immediate laparotomy with delivery of the fetus.

- A cesarean delivery is not done, because the baby may not be in the uterus, but floating in the abdomen. Repair of the uterus or hysterectomy will follow. If the patient undergoes a repair of the uterus, all subsequent pregnancies will be delivered via cesarean birth at 36 weeks.

- Hysterectomy is performed in the unstable patient or one who does not desire further childbearing.


Uterine rupture
Tear along uterine scar
Palpable fetal parts
Uterine vessels


Fetal descent stations
-3
-2
-1
0
+1
+2
+3
0 station midway between ischial spines

CHAPTER 7

Obstetrics complications

Obstetrics complications

Cervical insufficiency

- The terms “cervical insufficiency” and “cervical incompetency” have been used to describe the inability of the uterine cervix to retain a pregnancy to viability in the absence of contractions or labor.

- Etiology:

- Causes may include trauma from rapid forceful cervical dilation associated with second trimester abortion procedures, cervical laceration from rapid delivery, injury from deep cervical conization, or congenital weakness from diethylstilbestrol (DES) exposure.

- Diagnosis:

- With a history of 1 or more unexplained second-trimester pregnancy losses, Serial transvaginal ultrasound evaluations of the cervix after 16-20 weeks may be helpful.

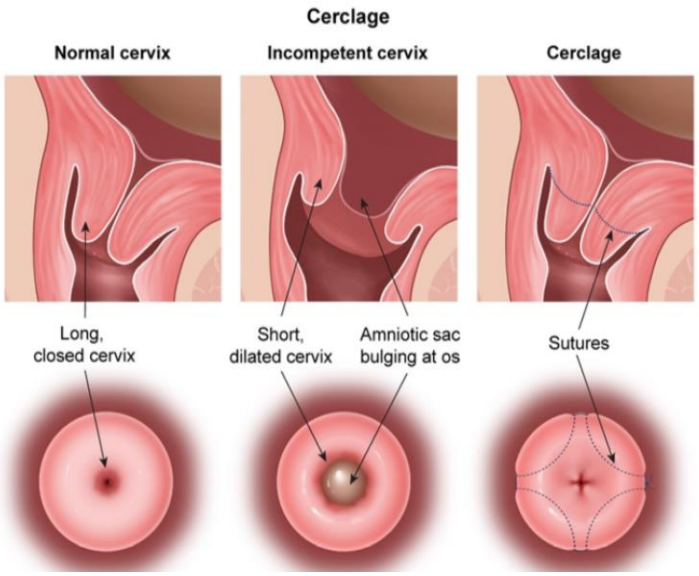
- Management:

- Elective cerclage placement at 13-14 weeks gestation is appropriate after sonographic demonstration for fetal normality.

- Emergency or urgent cerclage may be considered with sonographic evidence of cervical insufficiency after ruling out labor and chorioamnionitis.

- Shirodkar cerclage utilizes a submucosal placement of the suture that is buried beneath the mucosa and left in place. Cesarean delivery is performed at term.

- McDonald cerclage places a removable suture in the cervix. The benefit is that vaginal delivery can be allowed to take place, avoiding a cesarean. Cerclage removal should take place at 36-37 weeks, after fetal lung maturity has taken place but before the usual onset of spontaneous labor that could result in avulsion of the suture.



Multiple gestation

- Definition:

- This is a pregnancy in which more than one fetus is present.

- The fetuses may arise from one or more zygotes and are usually separate, but may rarely be conjoined.

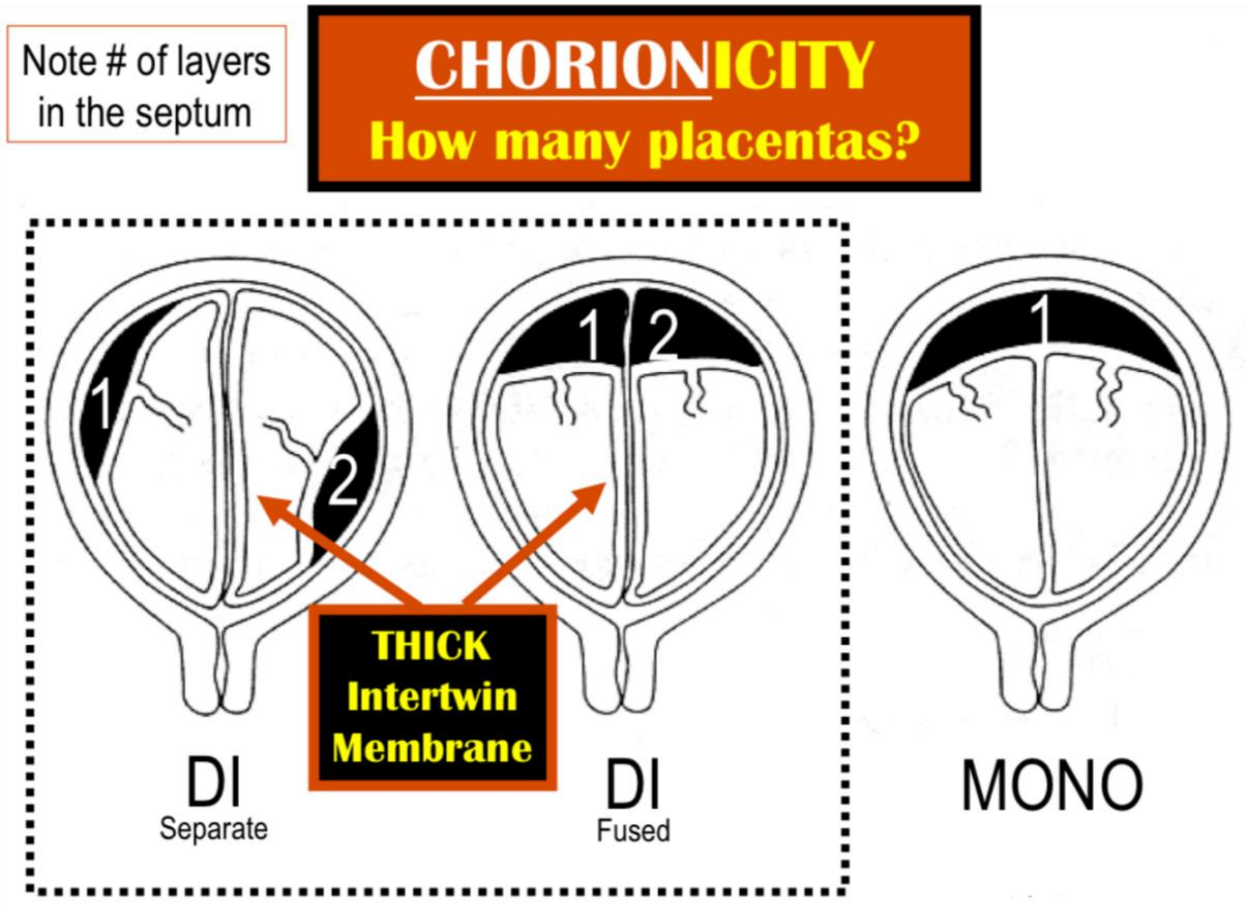
- Risk Factors:

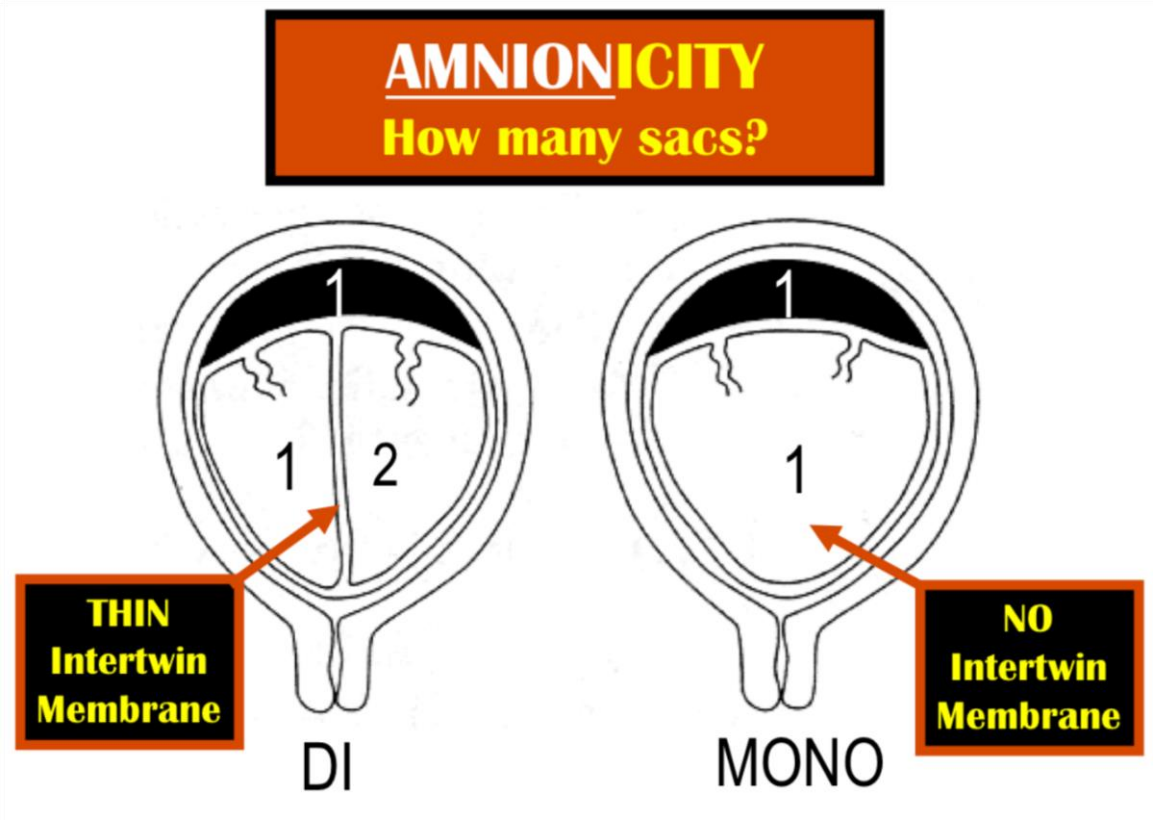
- Dizygotic twins are most common. Identifiable risk factors include race, geography, family history, or ovulation induction. Risk of twinning is up to 10% with clomiphene citrate and up to 30% with human menopausal gonadotropin.

- Monozygotic twins have no identifiable risk factors.

- Diagnosis:

- Obstetric sonogram demonstration of more than one intrauterine fetus.





- Dizygotic twins arise from multiple ovulation with 2 zygotes. They are always dichorionic, diamnionic.

- Monozygotic twins arise from one zygote. Chorionicity and amnionicity vary according to the duration of time from fertilization to cleavage:

A. Up to 72 hours (separation up to the morula stage):
- The twins are dichorionic, diamnionic.
- There are 2 placentas and 2 sacs.
- This is the lowest risk of all monozygotic twins.

B. Between 4 and 8 days (separation at the blastocyst stage):
- The twins are monochorionic, diamnionic.
- There is 1 placenta and 2 sacs.
- A specific additional complication is twin-twin transfusion, which develops in 15% of mono-di twins.
- The twins share a single placenta but do so unequally.
- The donor twin gets less blood supply, resulting in growth restriction, oligohydramnios, and anemia. However, neonatal outcome is usually better.
- The recipient twin gets more blood supply, resulting in excessive growth, polyhydramnios, and polycythemia.
- Intrauterine fetal surgery is indicated to laser the vascular connections on the placental surface between the 2 fetuses.

C. Between 9 and 12 days (splitting of the embryonic disk):

- The twins are monochorionic, monoamnionic.
- There is only 1 placenta and 1 sac.
- Specific additional risks are twin-twin transfusion but particularly umbilical cord entanglement which can result in fetal death.
- This is the highest risk of all monozygotic twins.

D. After 12 days:

- Conjoined twins result.
- Most often this condition is lethal.

- Clinical Findings:

- Hyperemesis gravidarum is more common from high levels of β-hCG.

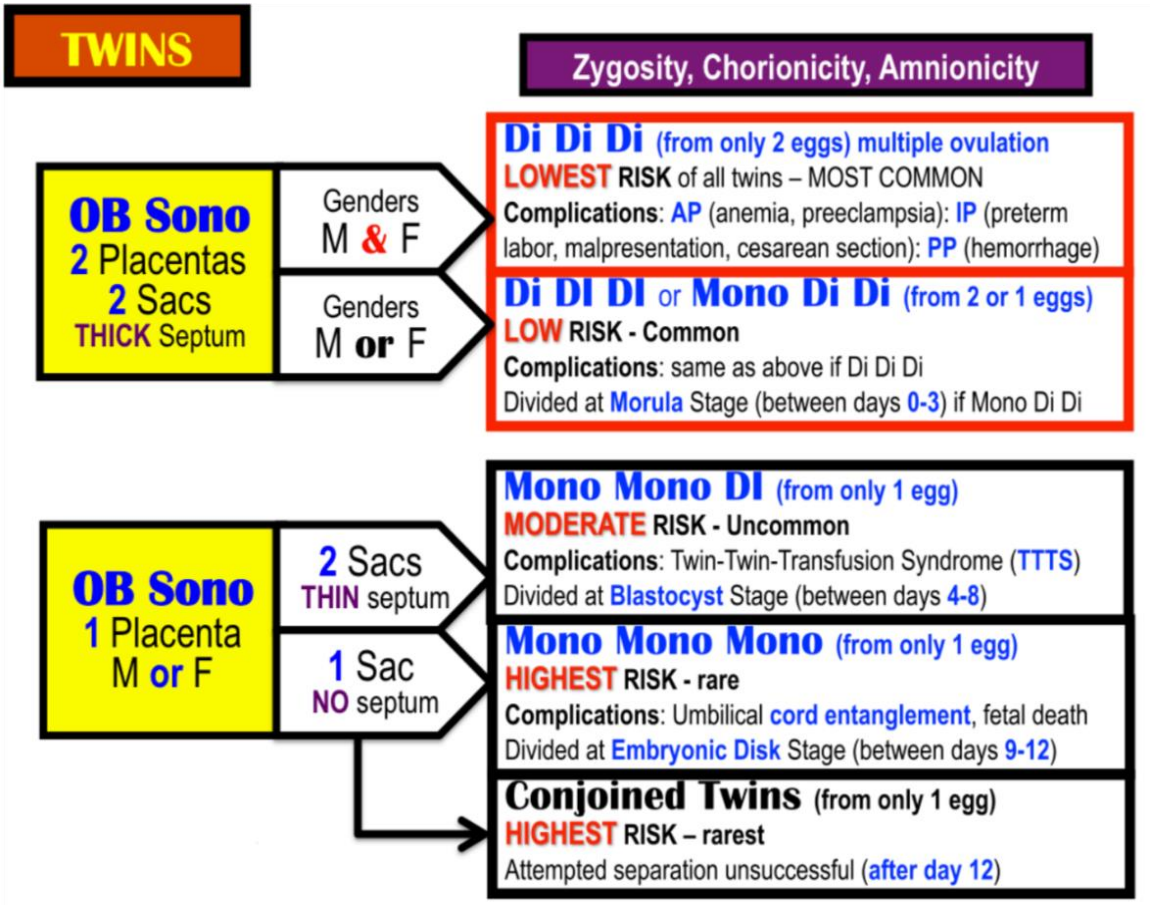
- Uterus is larger than dates.

- Maternal serum α-fetoprotein is excessively higher than with one fetus.

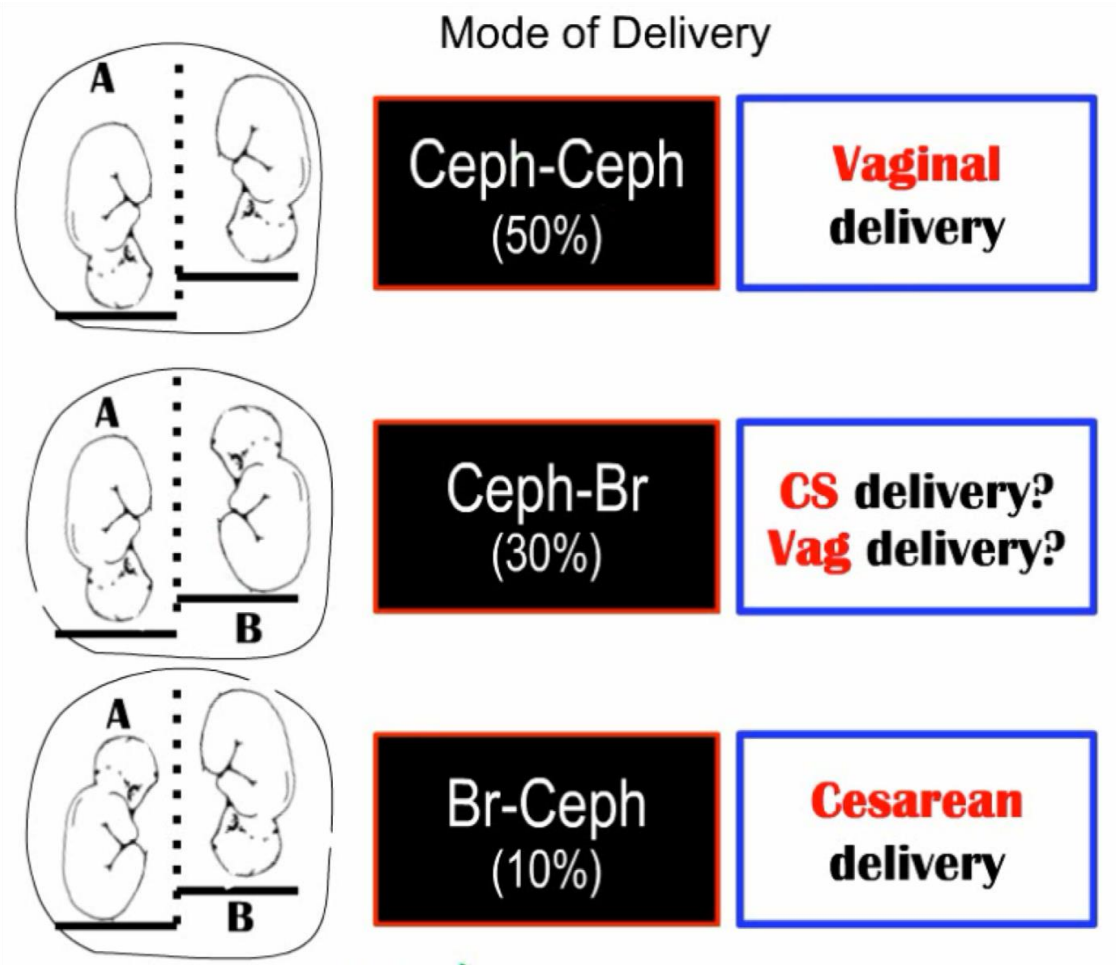
- Complications:

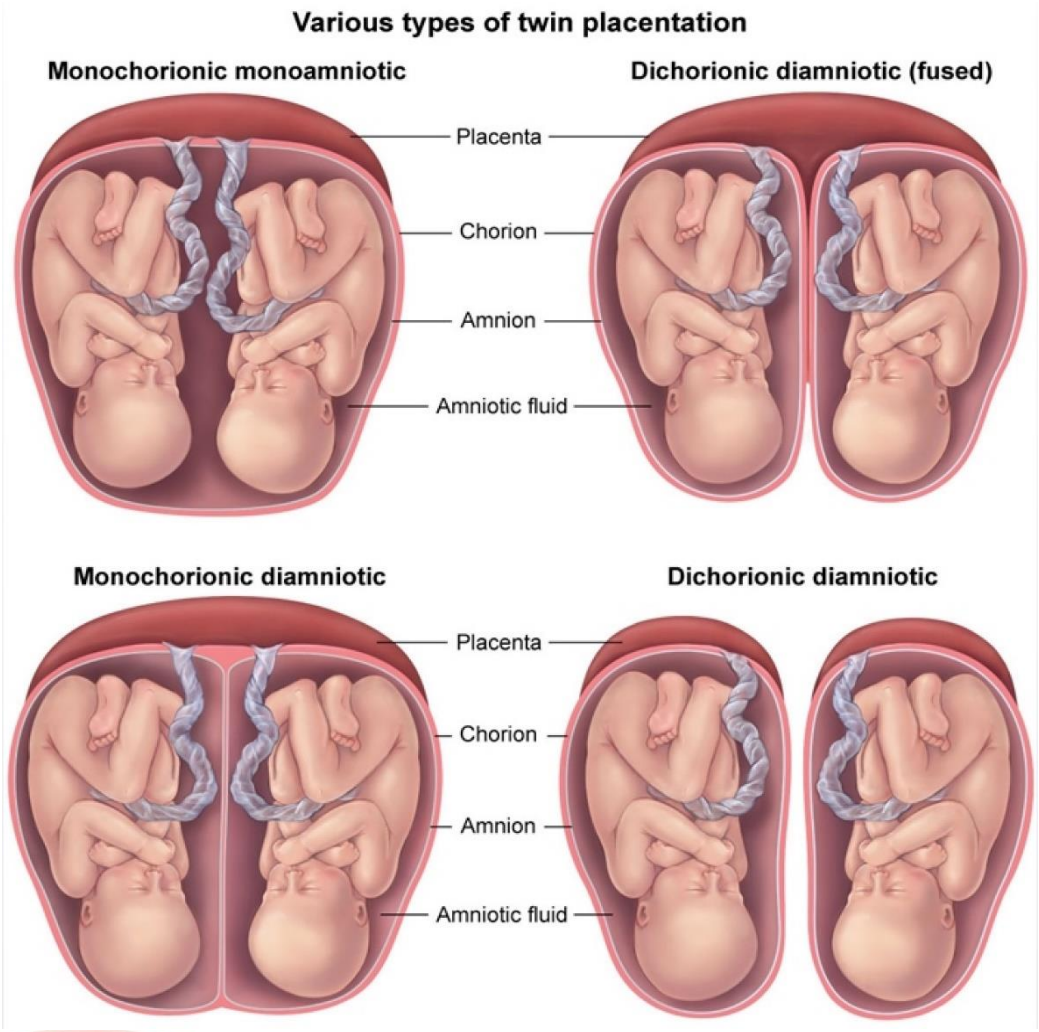
- For all twin pregnancies include nutritional anemias (iron and folate), preeclampsia, preterm labor (50%), malpresentation (50%), cesarean delivery (50%), and postpartum hemorrhage.

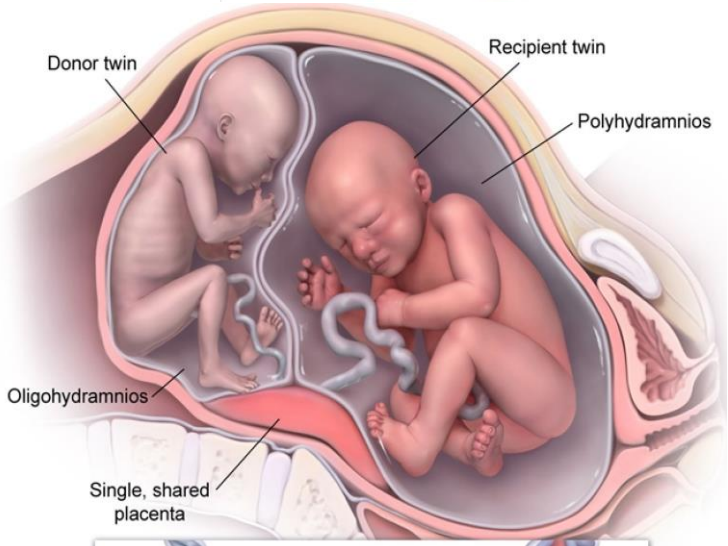
- Management:

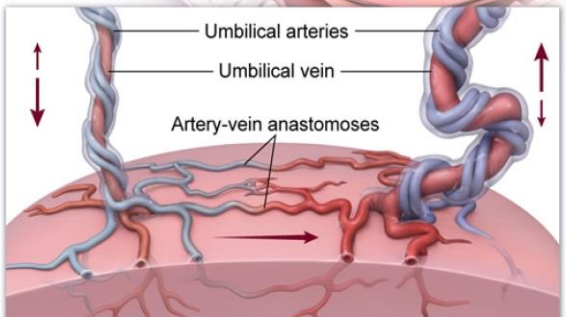


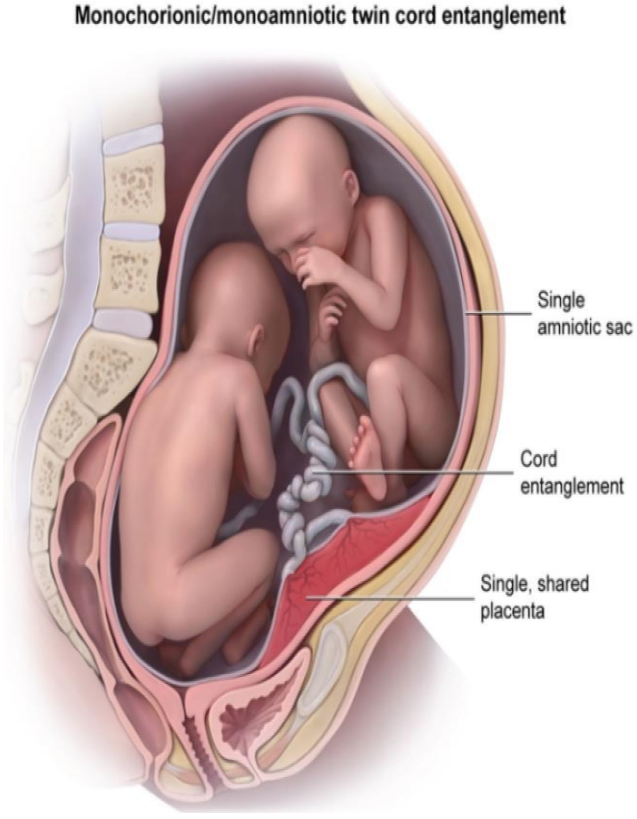
- Antepartum:
  - Give mother iron and folate supplementation to prevent anemia.
  - Monitor blood pressure to detect preeclampsia.
  - Educate mother regarding preterm labor symptoms and signs.
  - Perform serial ultrasound examinations looking for twin- twin transfusion (amniotic fluid discordance).
- Intrapartum:
  - Route of delivery is based on presentation in labor.
  - Vaginal delivery if both are cephalic presentation (50%).
  - Cesarean delivery if first twin in noncephalic presentation.
- Postpartum: Watch for postpartum hemorrhage from uterine atony owing to an over-distended uterus.




Various types of twin placentation
Monochorionic monoamniotic
Dichorionic diamniotic (fused)
Placenta
Chorion
Amnion
Amniotic fluid
Monochorionic diamniotic
Dichorionic diamniotic
Placenta
Chorion
Amnion
Amniotic fluid


Donor twin
Recipient twin
Polyhydramnios
Oligohydramnios
Single, shared placenta


Umbilical arteries
Umbilical vein
Artery-vein anastomoses


Monochorionic/monoamniotic twin cord entanglement
Single amniotic sac
Cord entanglement
Single, shared placenta

Alloimmunization

- Definition:

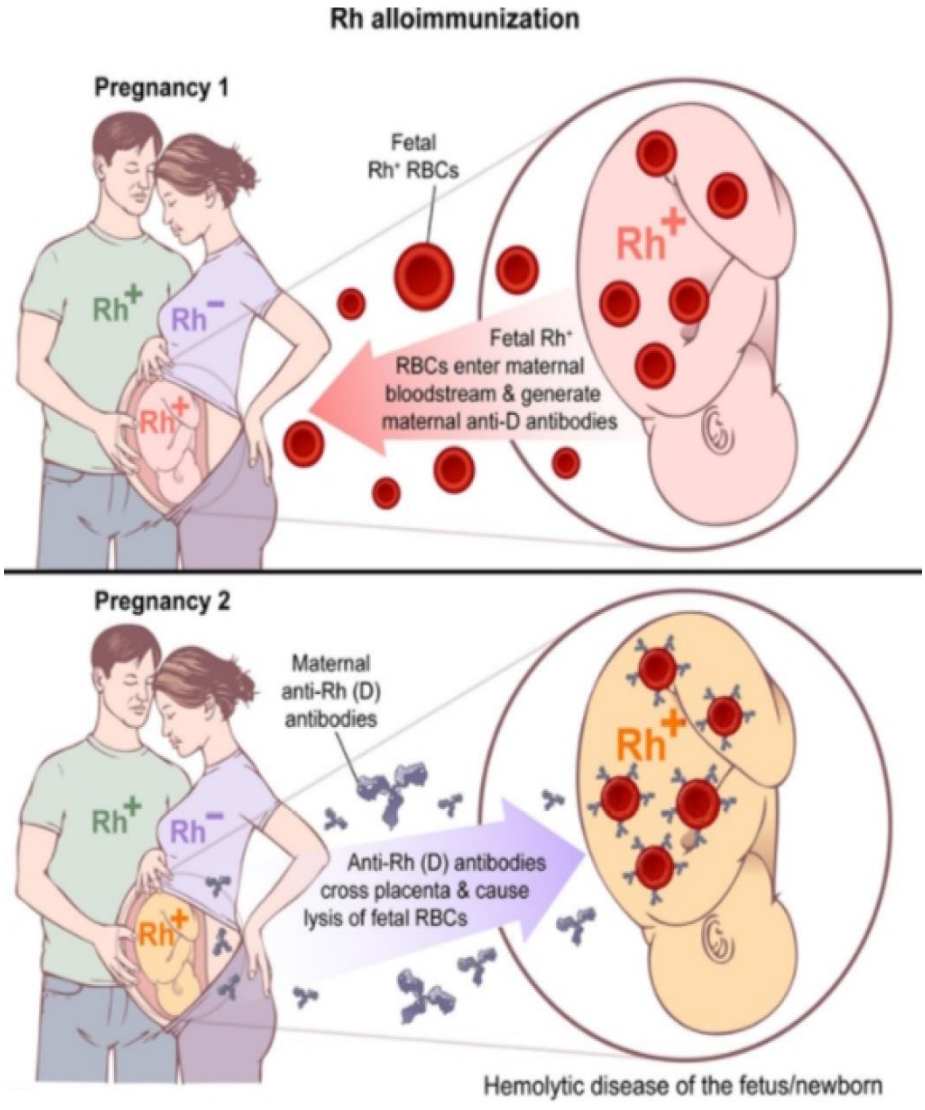
- A pregnant woman has developed antibodies to foreign red blood cells (RBCs), most commonly against those of her current or previous fetus(es), but also caused by transfusion of mismatched blood.

- Pathophysiology:

- Hemolytic disease of the newborn (HDN) is a continuum ranging from hyperbilirubinemia to erythroblastosis fetalis. HDN is caused by maternal antibodies crossing into the fetal circulation and targeting antigen-positive fetal RBCs, resulting in hemolysis. When severe, this can result in anemia, fetal hydrops, and even death.

- The most common RBC antigens are of the Rh system (C, c, D, E, e), with the most common being big D.

- Antibodies to RBC antigens are detected by indirect Coombs test. The concentration of antibodies is reported in dilutional titers with the lowest level being 1:1, and titers increasing by doubling (1:1, 1:2, 1:4, 1:8, 1:16, 1:32... etc.).



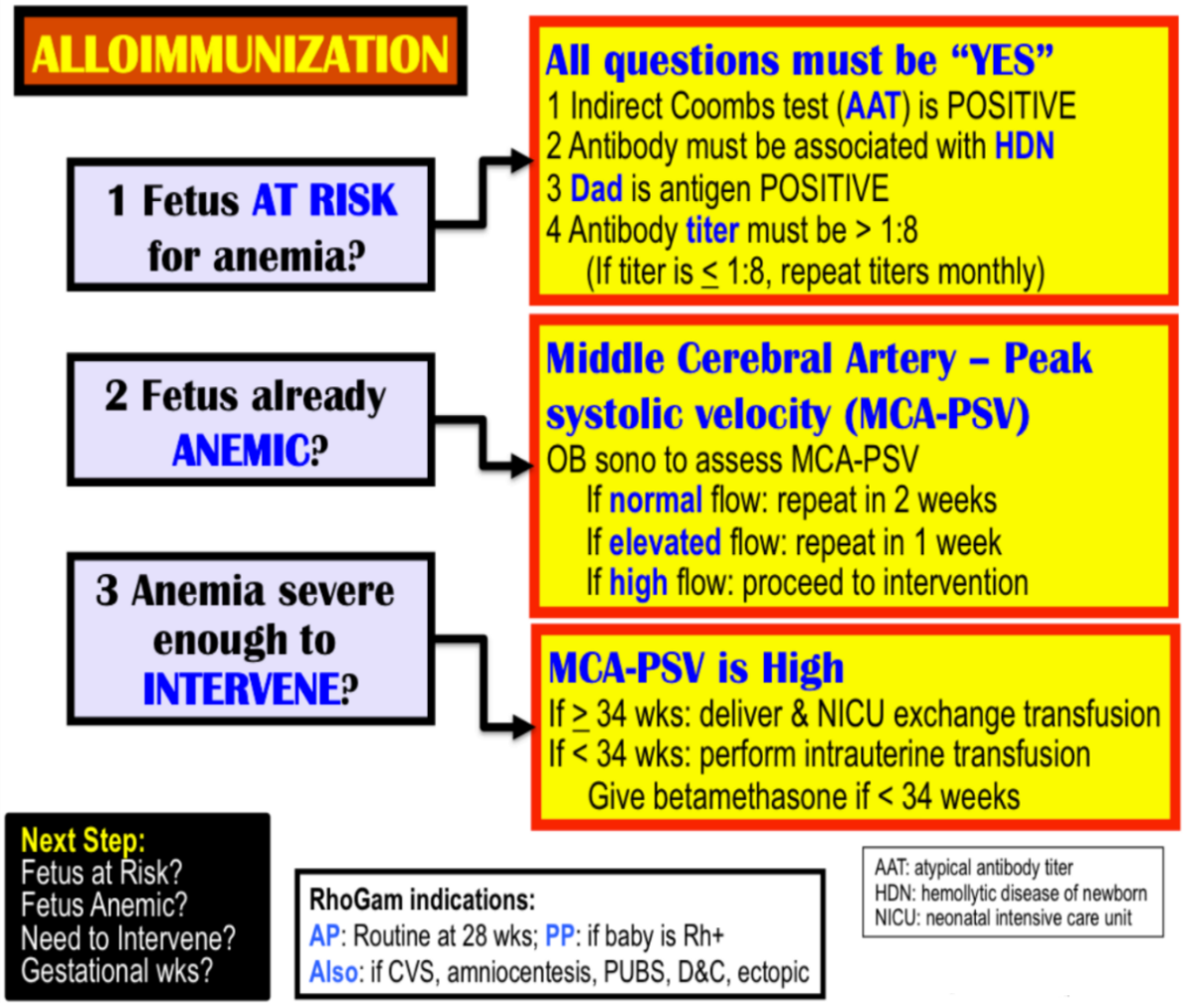
- Risk Factors:

- Alloimmunization most commonly occurs when fetal RBCs enter the mother's circulation transplacentally at delivery.

- Other pregnancy-related risk factors are amniocentesis, ectopic pregnancy, D&C, abruptio placenta, and placenta previa.

- It can also occur if a woman is transfused with mismatched RBCs.

- Management:



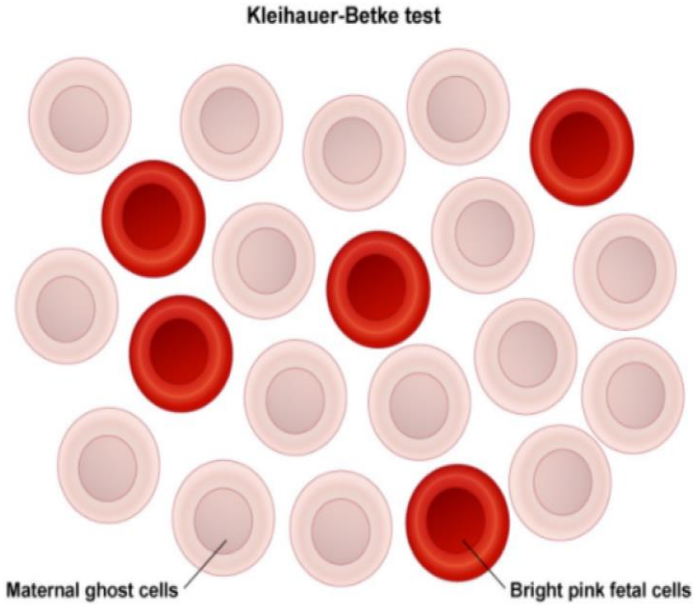
- Prevention:

- RhoGAM is pooled anti-D IgG passive antibodies that are given IM to a pregnant woman when there is significant risk of fetal RBCs passing into her circulation. The passive IgG antibodies attach to the foreign RBC antigens, causing lysis to occur before the maternal lymphocytes become stimulated.

- RhoGAM is routinely given to Rh(D)-negative mothers at 28 weeks, and within 72 h of chorionic villus sampling (CVS), amniocentesis, or D&C. It is also given within 72 h of delivery of an Rh(D)-positive infant.

- The initial timing of 28-32 weeks is selected because the half-life of anti-D immune globulin is about 6 weeks, which would cover any potential future exposure to fetal red blood cells through most of the third trimester.

- Kleihauer-Betke test quantitates the volume of fetal RBCs in the maternal circulation by differential staining of fetal and maternal RBCs on a peripheral smear. This can assess whether more than one vial of RhoGAM needs to be given when large volumes of fetal-maternal bleed may occur (abruptio placenta).



Indications for prophylactic administration of anti-D immune globulin for Rh(D)-negative patients*
• At 28-32 weeks gestation
• <72 hours after delivery of Rh(D)-positive infant
• <72 hours after spontaneous abortion
• Ectopic pregnancy
• Threatened abortion
• Hydatidiform mole
• Chorionic villus sampling, amniocentesis
• Abdominal trauma
• 2nd- & 3rd-trimester bleeding
• External cephalic version

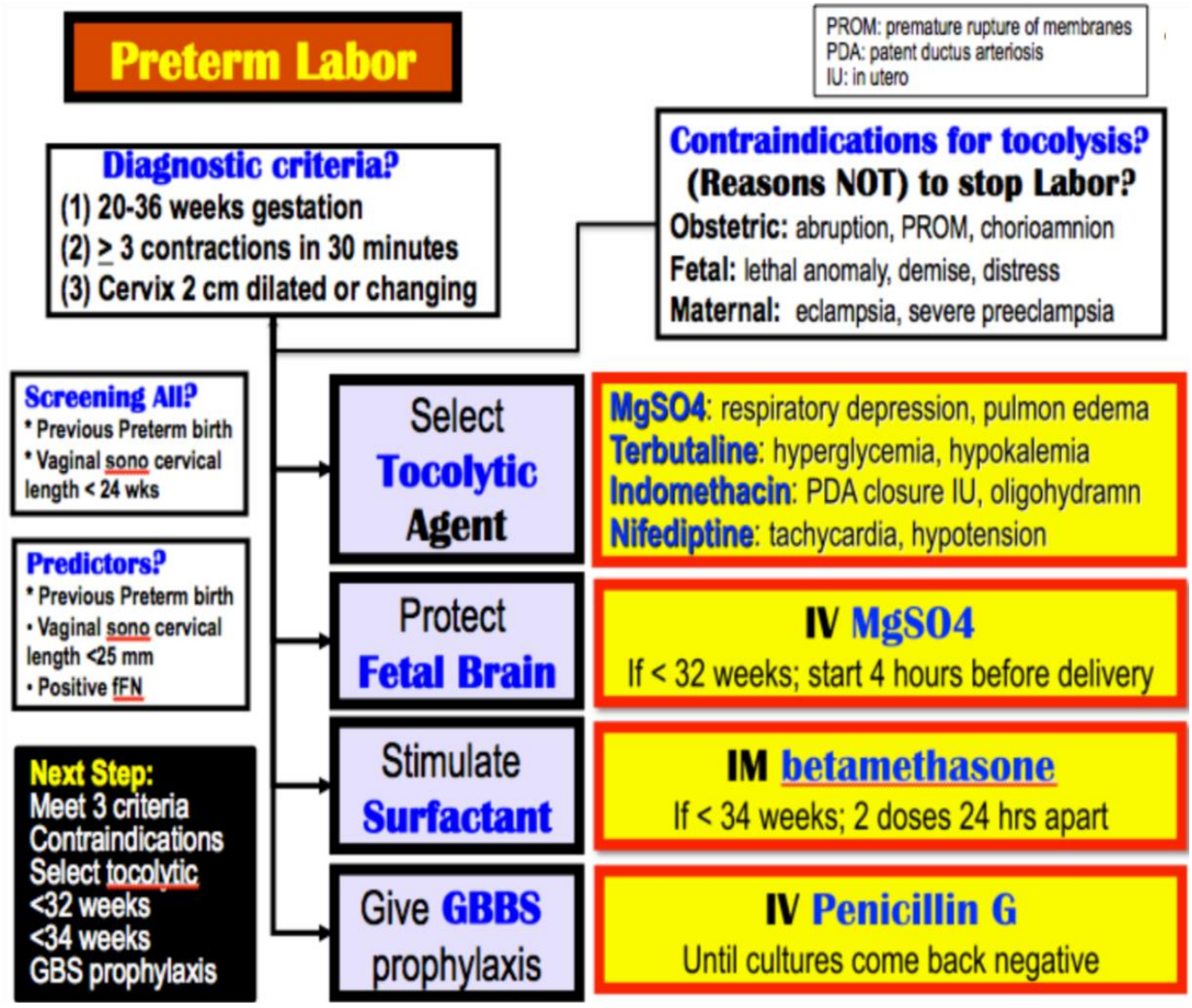
*Antepartum prophylaxis is not indicated if the father is Rh(D) negative.

Preterm labor

- Preterm delivery is the most common cause of perinatal morbidity and mortality. Overall, 12% of pregnancies deliver prematurely.

- Many patients will have preterm contractions but not be in preterm labor. Three criteria need to be met:

- Gestational age: pregnancy duration >20 weeks, but <37 weeks.
- Uterine contractions: at least 3 contractions in 30 min.
- Cervical change: serial examinations show a change in dilation or effacement, or a single examination shows cervical dilation of >2 cm. A short cervical length is a strong predictor of preterm labor.



- Management:

- Confirm labor using the 3 criteria listed earlier.

- Rule out contraindications to tocolysis using criteria listed above.

- Initiate IV hydration with isotonic fluids.

- Start IV MgSo4 for fetal neuroprotection (if <32 weeks) at least 4 hours before anticipated birth.

- Start tocolytic therapy with terbutaline, nifedipine or indomethacin (if <32 weeks) for no longer than 48 hours to allow for antenatal steroid effect.

- Administer maternal IM betamethasone to stimulate fetal type II pneumocyte surfactant production if gestational age is <34 weeks.

- Obtain cervical and urine cultures before giving IV penicillin G (or erythromycin) for group B Streptococcus sepsis prophylaxis.

- Risk Factors:

- Most common: prior preterm birth (PTB), short transvaginal (TV) cervical length (<25 mm), PROM, multiple gestation, history of cervical surgery, uterine anomaly.

- The most significant risk factor for spontaneous preterm delivery is a history of spontaneous preterm delivery in a prior pregnancy.

- Supplementation with exogenous progesterone decreases the rate of preterm delivery in patients with short cervices or a history of preterm birth.

- All gravidas should be screened:

- History: previous PTB.

- Sonographic cervical length: prior to 24 weeks.

- Interventions to prevent preterm delivery:

A. Singleton pregnancy:

- Weekly IM 17-hydroxy progesterone caproate (17-OH-P) if cervical length >25 mm with prior spontaneous PTB.

- Weekly IM 17 -OH-P plus cervical cerclage placement if cervical length <25 mm before 24 weeks with prior PTB.

- Daily vaginal progesterone if cervical length <20 mm before 24 weeks but no prior PTB.

B. Twin pregnancy: no interventions shown to have any benefit

▪ Fetal Fibronectin (fFN):

- fFN is a protein matrix produced by fetal cells that acts as a biological glue binding the trophoblast to the maternal decidua. It "leaks" into the vagina if PTB is likely and can be measured with a rapid test using a vaginal swab.

- Interpretation: main value of the test is a negative. With a positive result, the likelihood of PTB is 50%.

▪ Intravenous Magnesium Sulfate for Fetal Neuroprotection:

- Maternal IV MgSo4 may reduce the severity and risk of cerebral palsy in surviving very preterm neonates.

- Start infusion if PTB is anticipated <32 weeks gestation regardless of the anticipated route of delivery.

▪ Antenatal Corticosteroid therapy:

- A single course of corticosteroids is recommended for pregnant women with gestational age 24-34 weeks of gestation who are at risk of preterm delivery within 7 days.

- Neonates whose mothers receive antenatal corticosteroids have significantly lower severity, frequency, or both of respiratory distress syndrome, intracranial hemorrhage, necrotizing enterocolitis and death.

▪ Tocolytic Agents:

- Parenteral agents may prolong pregnancy but for no more than 72 h.

- This does provide a window of time for (1) administration of maternal IM betamethasone to enhance fetal pulmonary surfactant and (2) transportation of mother and fetus in utero to a facility with neonatal intensive care.

- Oral tocolytic agents are no more effective than placebo.

A. Magnesium sulfate:

- It is a competitive inhibitor of calcium.

- Clinical monitoring is based on decreasing but maintaining detectable deep tendon reflexes.

- Side effects include muscle weakness, respiratory depression, and pulmonary edema. Magnesium overdose is treated with IV calcium gluconate.

- Contraindications include renal insufficiency and myasthenia gravis.

B. β-Adrenergic agonists (terbutaline):

- Tocolytic effect depends on the β_2-adrenergic receptor myometrial activity → causes myometrial relaxation.

- Cardiovascular side effects (hypertension, tachycardia) are from β_1 receptor cardio-vascular activity. Other side effects are hyperglycemia, hypokalemia, and pulmonary edema.

- Contraindications include cardiac disease, diabetes mellitus, uncontrolled hyperthyroidism.

C. Calcium-channel blockers:

- Decrease intracellular calcium (nifedipine).
- Side effects include reflex tachycardia, hypotension, and myocardial depression.
- Contraindications include hypotension.

D. Prostaglandin synthetase inhibitors:

- Decrease smooth muscle contractility by decreasing prostaglandin production (indomethacin).
- Side effects include oligohydramnios, in utero ductus arteriosus closure, and neonatal necrotizing enterocolitis.
- Contraindications include gestational age >32 weeks.

Premature rupture of membranes

- Definition:

- Rupture of the fetal membranes before the onset of labor, whether at term or preterm.

- Risk Factors:

- Ascending infection from the lower genital tract is the most common risk factor for PROM. Other risk factors are local membrane defects and cigarette smoking.

- Clinical Presentation:

- Typical history is a sudden gush of copious vaginal fluid.

- On external examination, clear fluid is flowing out of the vagina.

- Oligohydramnios is seen on ultrasound examination.

- Diagnosis:

- PROM is diagnosed by sterile speculum examination meeting the following criteria:
  - Pooling positive: clear, watery amniotic fluid is seen in the posterior vaginal fornix.
  - Nitrazine positive: the fluid turns pH-sensitive paper blue.
  - Fern positive: the fluid displays a ferning pattern when allowed to air dry on a microscope glass slide.

- Chorioamnionitis is diagnosed clinically with all the following criteria needed: Maternal fever and uterine tenderness, Maternal tachycardia, fetal tachycardia (>160/min), malodorous amniotic fluid, Purulent vaginal discharge, in the presence of confirmed PROM, in the absence of a URI or UTI.

- Management:

- Treatment of PROM depends on the fetus's gestational age and the presence of chorioamnionitis.

- If uterine contractions occur, tocolysis is contraindicated.

- If chorioamnionitis is present (Etiology is typically polymicrobial), obtain cervical cultures, start broad-spectrum therapeutic IV antibiotics, and initiate prompt delivery to reduce the risk of life-threatening neonatal infection and maternal complications.

- If no infection (uncomplicated) is present, management will be based on gestational age as follows:

A. Before viability (<24 weeks):

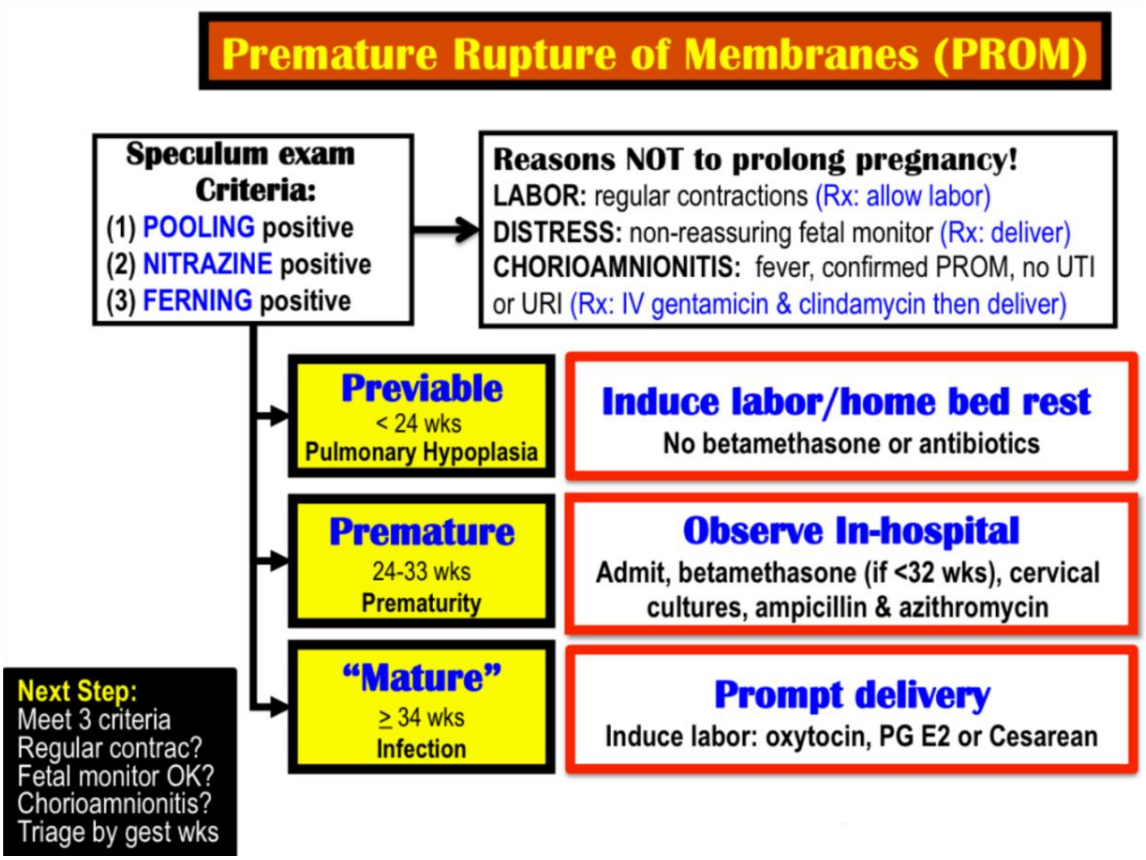
- Outcome is dismal (previable).
- Risk of fetal pulmonary hypoplasia is high.
- Either induce labor or manage patient with bed rest at home.

B. With preterm viability (24-33 weeks):

- Conservative management.
- Hospitalize the patient at bed rest, administer IM betamethasone to enhance fetal lung maturity if <32 weeks, obtain cervical cultures, and start a 7-day course of prophylactic ampicillin and erythromycin (to decrease risk of developing chorioamnionitis while waiting for steroids to begin working).
- Delivery is indicated if there are signs of intraamniotic infection, deteriorating fetal/maternal status, or at 34 weeks gestation.

C. At term (>34 weeks):

- Initiate prompt delivery to decreases the incidence of chorioamnionitis.
- If vaginal delivery is expected, use oxytocin or prostaglandins as indicated. Otherwise, perform cesarean delivery.



Post-term pregnancy

- Definition:

- Because most of the time the date of conception is not known, a practical definition is a pregnancy that continues >42 weeks after the first day of the last menstrual period.

- Etiology:

- The most common cause of true postdates cases are idiopathic (no known cause). It does occur more commonly in young primigravidas.

- Significance:

- Perinatal mortality:

  - Increased two- to threefold.

  - This is a direct result of changes on placental function over time.

- Macrosomia syndrome (80%):

  - In most patients, placental function continues providing nutritional substrates and gas exchange to the fetus, resulting in a healthy but large fetus.

  - Shoulder dystocia is more common with risks of fetal hypoxemia and brachial plexus injury.

- Dysmaturity syndrome (20%):

  - In a minority of patients, placental function declines as infarction and aging lead to placental scarring and loss of subcutaneous tissue.

  - This reduction of metabolic and respiratory support to the fetus can lead to the asphyxia that is responsible for the increased perinatal morbidity and mortality.

  - Oligohydramnios results in umbilical cord compression.

  - Hypoxia results in acidosis and in utero meconium passage.

- Management:

- Patients can be classified into 3 groups:

A. Dates sure, favorable cervix:

  - Management is aggressive.

  - There is no benefit to the fetus or mother in continuing the pregnancy.

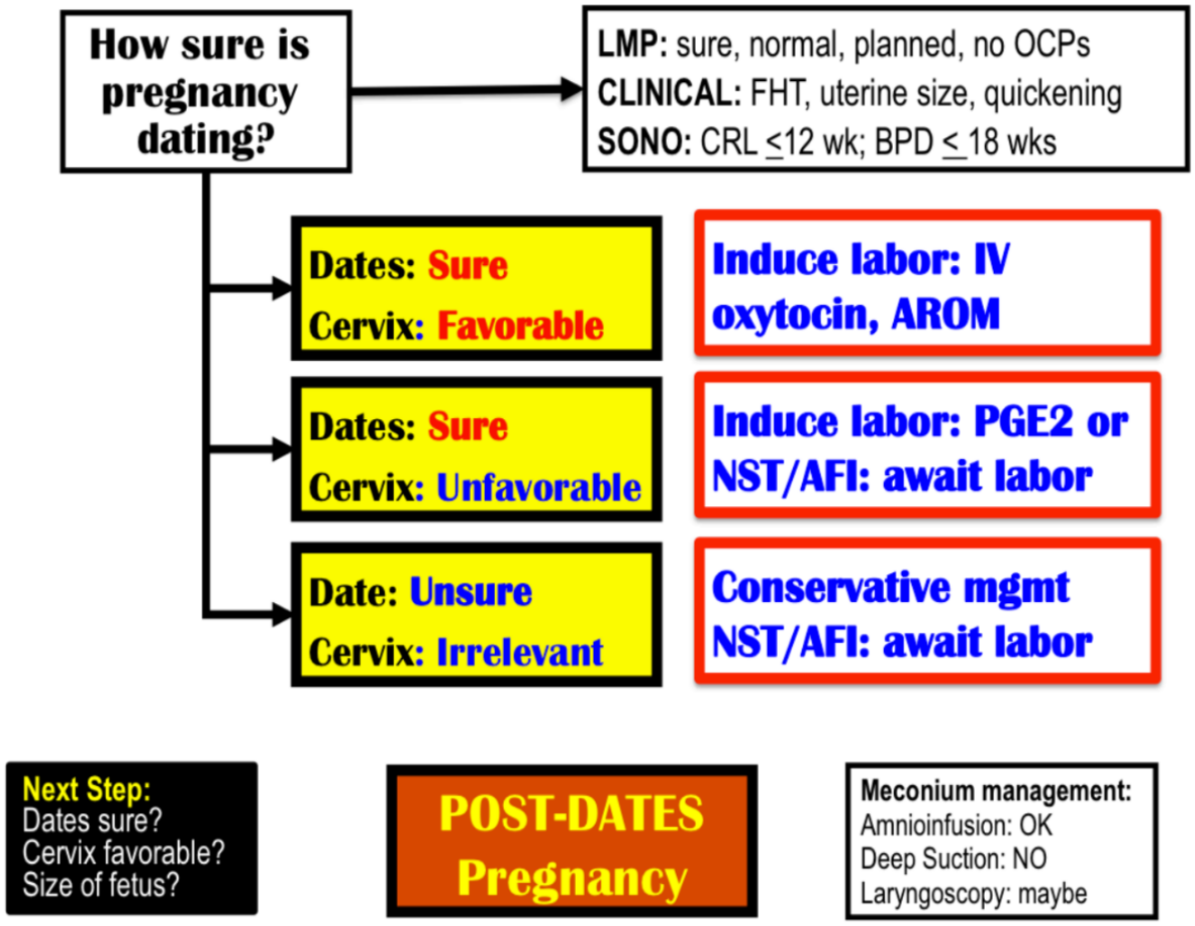
  - Induce labor with IV oxytocin and artificial rupture of membranes.

B. Dates sure, unfavorable cervix:

- Management could be aggressive, with cervical ripening initiated with vaginal or cervical prostaglandin E_2 followed by IV oxytocin.
- Or management could be conservative with twice weekly non-stress test (NSTs) and Amniotic Fluid Index (AFIs) awaiting spontaneous labor.
- The diagnosis of oligohydramnios is an indication for delivery even if antepartum fetal testing is normal.

C. Dates unsure:

- Management is conservative.
- Perform twice weekly NSTs and AFIs to ensure fetal well-being and await spontaneous labor.
- If fetal jeopardy is identified, delivery should be expedited.

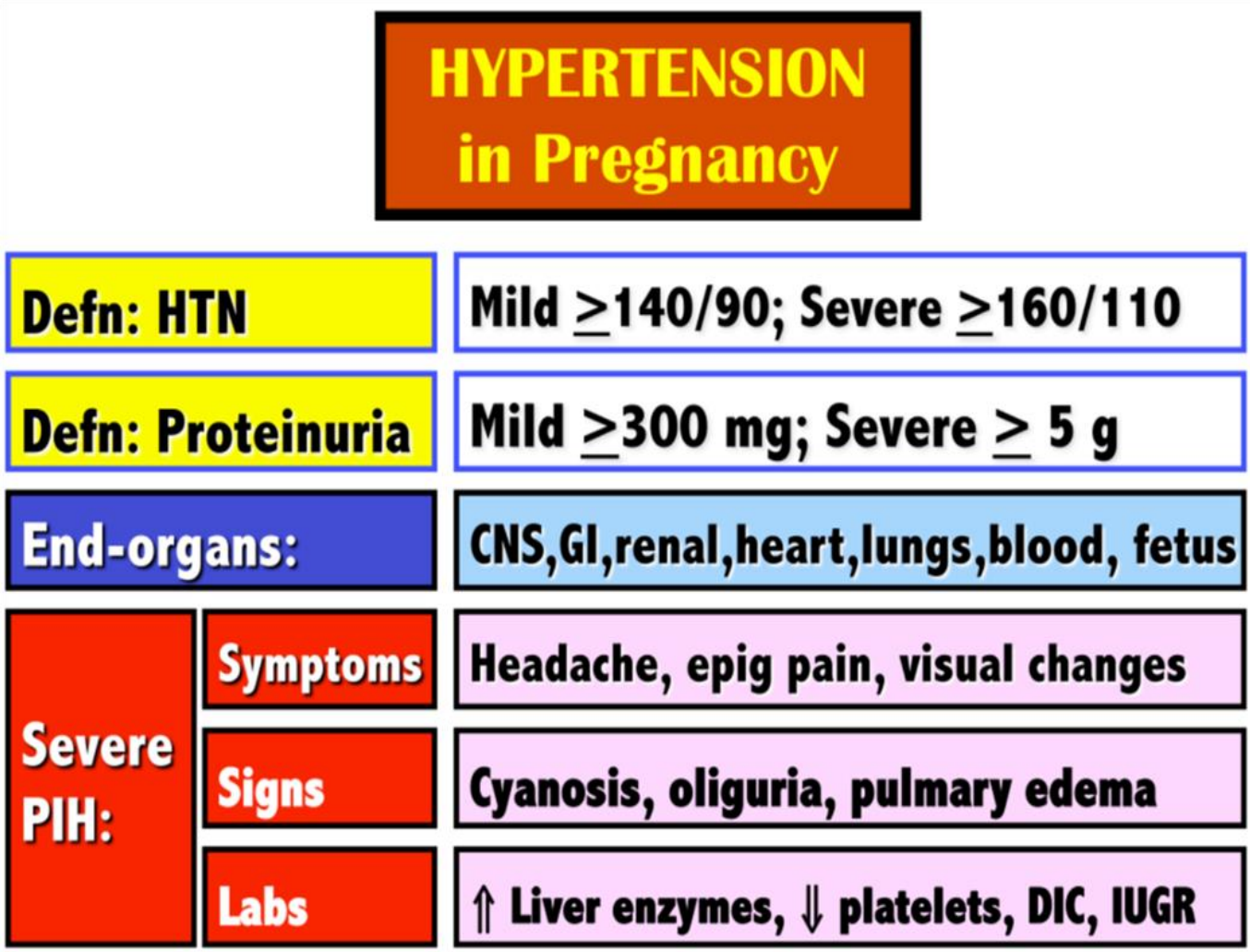


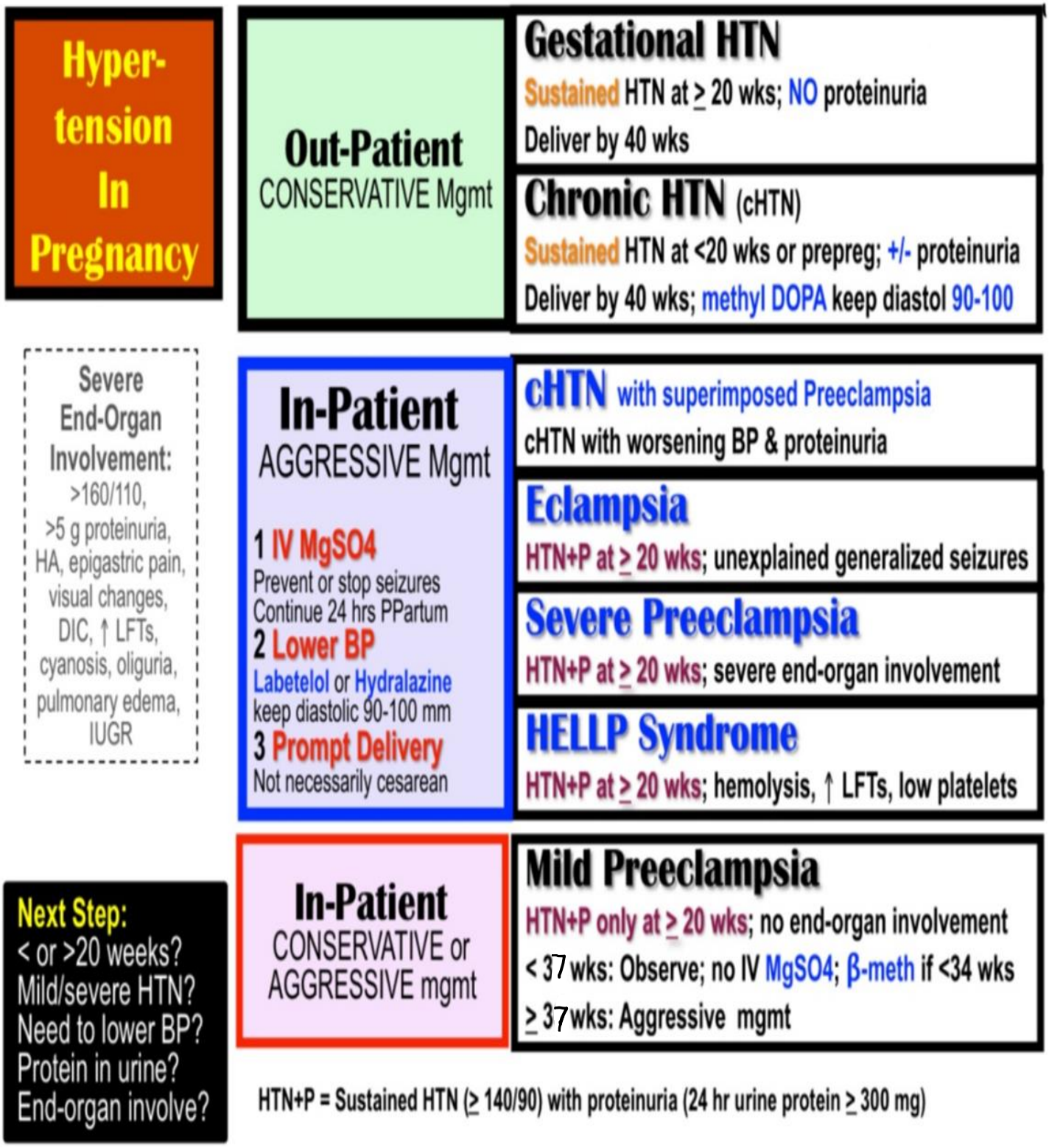
CHAPTER 8

Hypertensive complications in pregnancy

Hypertensive complications in pregnancy

- Systolic and diastolic BP both decline early in the first trimester; then they gradually rise toward term but never return quite to prepregnancy baseline.
- Diastolic falls more than systolic, as much as 15 mm Hg.
- Arterial BP is never normally elevated in pregnancy.




Hyper-tension In Pregnancy
Out-Patient
CONSERVATIVE Mgmt
Gestational HTN
Sustained HTN at ≥ 20 wks; NO proteinuria
Deliver by 40 wks
Chronic HTN (cHTN)
Sustained HTN at <20 wks or prepreg; +/- proteinuria
Deliver by 40 wks; methyl DOPA keep diastol 90-100
Severe End-Organ Involvement:
>160/110,
>5 g proteinuria,
HA, epigastric pain, visual changes,
DIC, ↑ LFTs,
cyanosis, oliguria,
pulmonary edema,
IUGR
In-Patient
AGGRESSIVE Mgmt
1 IV MgSO4
Prevent or stop seizures
Continue 24 hrs PPartum
2 Lower BP
Labetelol or Hydralazine
keep diastolic 90-100 mm
3 Prompt Delivery
Not necessarily cesarean
cHTN with superimposed Preeclampsia
cHTN with worsening BP & proteinuria
Eclampsia
HTN+P at ≥ 20 wks; unexplained generalized seizures
Severe Preeclampsia
HTN+P at ≥ 20 wks; severe end-organ involvement
HELLP Syndrome
HTN+P at ≥ 20 wks; hemolysis, ↑ LFTs, low platelets
Next Step:
< or >20 weeks?
Mild/severe HTN?
Need to lower BP?
Protein in urine?
End-organ involve?
In-Patient
CONSERVATIVE or
AGGRESSIVE mgmt
Mild Preeclampsia
HTN+P only at ≥ 20 wks; no end-organ involvement
< 37 wks: Observe; no IV MgSO4; β-meth if <34 wks
≥ 37 wks: Aggressive mgmt
HTN+P = Sustained HTN (≥ 140/90) with proteinuria (24 hr urine protein ≥ 300 mg)

Gestational hypertension

- Definition:
- Gestational hypertension is diagnosed with sustained elevation of BP ≥ 140/90 mmHg after 20 weeks of pregnancy without proteinuria.
- BP returns to normal baseline postpartum.
- Preeclampsia should always be ruled out.

- Symptoms:
- No symptoms of preeclampsia are seen (headache, epigastric pain, visual disturbances).

- Management:
- Conservative outpatient management is appropriate.
- Close observation since 30% of patients will develop preeclampsia.
- Deliver by 40 weeks.

Preeclampsia

- Definition:
- Preeclampsia is sustained BP elevation in pregnancy after 20 weeks' gestation in the absence of preexisting hypertension.
- Chronic hypertension should always be ruled out.

- Diagnosis:
- Sustained BP elevation of ≥140/90 mm Hg.
- Proteinuria of ≥300 mg on a 24-h urine collection or protein/creatinine ratio of ≥0.3.

- Risk Factors:
- Preeclampsia is found 8 times more frequently ir primiparas. Other risk factors are multiple gestation, hydatidiform mole, diabetes mellitus, age extremes, chronic hypertension, and chronic renal disease.
- In high-risk patients, daily low-dose aspirin is the only therapy proven to decrease the risk of preeclampsia because it inhibits platelet aggregation and helps prevent placental ischemia. It is initiated at 12-28 weeks gestation (but optimally before 16 weeks), then continued daily until delivery.

- Etiology/Pathophysiology:

- Pathophysiology involves diffuse vasospasm caused by:
  - Loss of the normal pregnancy-related refractoriness to vasoactive substances such as angiotensin.
  - Relative or absolute changes in the following prostaglandin substances: increases in the vasoconstrictor thromboxane along with decreases in the potent vasodilator prostacyclin.

- This vasospasm contributes to intravascular volume constriction and decreased perfusion of most organs including uteroplacental unit, kidneys, liver, brain, and heart.

- Decreased renal blood flow leads to decreased clearance of body metabolic wastes.

- Capillary injury leads to loss of intravascular volume into the interstitial space and subsequent edema.

- Uteroplacental insufficiency can lead to fetal growth restriction/low birth weight (small for gestational age infant) even if the neonate is delivered at term.

- Presenting Symptoms and Physical Examination:

- With preeclampsia without severe features the symptoms and physical findings, if present, are generally related to excess weight gain and fluid retention.

- Presence of new onset of persistent headache, epigastric pain, or visual disturbances would move the diagnosis from preeclampsia without severe features to preeclampsia with severe features.

- Laboratory Abnormalities:

- Evidence of hemoconcentration is shown by elevation of hemoglobin, hematocrit, blood urea nitrogen (BUN), serum creatinine, and serum uric acid.

- Proteinuria is present. Proteinuria is best evaluated by a urine protein-to- creatinine ratio or a 24-hour urine collection for total protein (gold standard).

- Evidence of disseminated intravascular coagulation (DIC) or liver enzyme elevation would move the diagnosis from preeclampsia without severe features to preeclampsia with severe features.

- Management:

- The only definitive cure is delivery and removal of all fetal-placental tissue.

- However, delivery may be deferred in preeclampsia without severe features to minimize neonatal complications of prematurity.

- Management is based on gestational age:

A. Conservative management:
   - Before 37 weeks' gestation as long as mother and fetus are stable, mild preeclampsia is managed in the hospital or as outpatient, watching for possible progression to severe preeclampsia.

- No antihypertensive agents or MgSO4 are used.

B. Delivery:

- At ≥37 weeks' gestation, delivery is indicated with dilute IV oxytocin induction of labor and continuous infusion of IV MgSO4 to prevent eclamptic seizures.

▪ Complications:

- Progression from preeclampsia without severe features to preeclampsia with severe features may occur.

Preeclampsia with severe features

▪ Diagnostic Tests:

- The diagnosis is made on the basis of the finding of at least mild elevation of BP and mild proteinuria plus any one of the following:
  - Sustained BP elevation of ≥160/110.
  - Evidence of maternal jeopardy. This may include symptoms (headache, epigastric pain, visual changes), thrombocytopenia (platelet count <100,000/mL), doubling of liver transaminases, pulmonary edema, serum creatinine >1.1 mg/dL, or doubling of serum creatinine.
  - Edema may or may not be seen.

▪ Risk Factors:

- These are the same as preeclampsia with the addition of diseases with small vessel disease such as systemic lupus and longstanding overt diabetes.

▪ Etiology/Pathophysiology:

- Pathophysiology is the same as preeclampsia but involves severe diffuse vasospasm and more intense capillary injury to where the ischemia demonstrates itself in overt, usually multiorgan system injury.

▪ Symptoms:

- Presence of new onset of persistent headache, epigastric pain, or visual disturbances is characteristic of preeclampsia with severe features.

▪ Laboratory Abnormalities:

- Evidence of hemoconcentration will be more severe.

- Proteinuria is described under diagnostic tests.

- Evidence of DIC and hepatocellular injury is characteristic of severe preeclampsia.

- Management:

A. Aggressive prompt delivery:

- Aggressive prompt delivery is indicated for preeclampsia with severe features at any gestational age with evidence of maternal jeopardy or fetal jeopardy.
- Main goals are seizure prevention and BP control.
- Administer IV MgSO4 to prevent convulsions. Continue IV MgSO4 for 24 hours after delivery.
- Lower BP to diastolic values 90-100 mm Hg with IV hydralazine and/or labetalol.
- More aggressive BP control may jeopardize uteroplacental fetal perfusion.
- Attempt vaginal delivery with IV oxytocin infusion if mother and fetus are stable.
- Cesarean section is only for obstetric indications.

B. Conservative inpatient management:

- Conservative inpatient management may rarely be attempted in absence of maternal and fetal jeopardy with gestational age 26-34 weeks if BP can be brought <160/110 mm Hg.
- This should take place in an intensive care, tertiary-care setting.
- Continuous IV MgSO4 should be administered, and maternal betamethasone should be given to enhance fetal lung maturity.

- Complications:

- Progression from preeclampsia with severe features to eclampsia may occur.
- Maternal complications from preeclampsia include abruptio placentae, disseminated intravascular coagulation, and eclampsia.

Eclampsia

- Definition:

- Eclampsia is the presence of unexplained generalized seizures in a hypertensive, proteinuric pregnant woman in the last half of pregnancy.

- Etiology/Pathophysiology:

- Pathophysiology is severe diffuse cerebral vasospasm resulting in cerebral perfusion deficits and cerebral edema.

- Symptoms:

- In addition to those of mild and severe preeclampsia, the most significant finding is unexplained tonic-clonic seizures.

- Diagnosis:

- The diagnosis is made clinically with unexplained generalized seizures occurring in a hypertensive, proteinuric pregnant woman in the last half of pregnancy.

- Laboratory Abnormalities are the same as found with mild and severe preeclampsia.

- Management:

- The first step is to protect the mother's airway and tongue.

- Administer IV MgSO4 to stop seizures. Continue IV MgSO4 for 24 hours after delivery.

- Aggressive prompt delivery is indicated for eclampsia at any gestational age after stabilization of the mother and the fetus. Attempt vaginal delivery with IV oxytocin infusion if mother and fetus are stable.

- Lower diastolic BP between 90 and 100 mm Hg with IV hydralazine and/or labetalol.

- Complications:

- Intracerebral hemorrhage can occur with even death resulting.

Chronic hypertension with or without superimposed preeclampsia

- The diagnosis of chronic HTN is made when BP ≥140/90 mm Hg with onset before the pregnancy or before 20 weeks' gestation.

- Chronic HTN with Superimposed Preeclampsia:

- This complication occurs in 25% of patients with chronic HTN.

- The diagnosis is made on the basis of established chronic HTN along with any of the following:
  - Documented rising BP values.
  - Demonstrated worsening proteinuria.
  - Evidence of maternal jeopardy (headache, epigastric pain, visual changes, thrombocytopenia [platelet count <100,000/mL], elevated liver enzymes, pulmonary edema, oliguria [<750 mL/24 h], or cyanosis).
  - Edema may or may not be seen.

- Laboratory Abnormalities:

- Those with mild HTN and no end-organ involvement have normal laboratory tests.

- Those with renal disease may have evidence of decreased renal function including proteinuria, lowered creatinine clearance, and elevated BUN, creatinine, and uric acid.

- Management:

A. Uncomplicated chronic HTN:

- Conservative outpatient management is appropriate with uncomplicated mild-to-moderate chronic HTN.

- Serial sonograms and antenatal testing are appropriate after 30 weeks' gestation to monitor for increased risk of IUGR.

- Serial BP and urine protein assessment is indicated for early identification of superimposed preeclampsia.

- Induce labor at 39 weeks if the cervix is favorable.

B. Chronic HTN with superimposed preeclampsia:

- Aggressive prompt delivery is indicated for chronic HTN with superimposed preeclampsia at any gestational age.

- Administer IV MgSO4 to prevent convulsions. Continue IV MgSO4 for 24 hours after delivery.

- Keep diastolic BP between 90 and 100 mm Hg with IV hydralazine and/or labetalol.

- Attempt vaginal delivery with IV oxytocin infusion if mother and fetus are stable.

- Complications:

- Progression from chronic HTN to superimposed preeclampsia, which can lead to maternal and fetal death.

HELLP Syndrome

- Definition:

- HELLP syndrome is a potential manifestation of severe preeclampsia.

- Hemolysis, Elevated Liver enzymes, Low Platelets.

- Right upper quadrant pain, microangiopathic Hemolytic anemia (Blood smear shows schistocytes), Elevated Liver enzymes, and Low Platelet count in a pregnant patient raise suspicion for the syndrome.

- The abdominal pain is due to liver swelling with distension of the hepatic (Glisson's) capsule.

- Risk Factors:

- HELLP syndrome occurs twice as often in multigravidas as primigravidas.

- Management:

- Prompt delivery at any gestational age is appropriate.

- Administer IV MgSO4 to prevent convulsions. Continue IV MgSO4 for 24 hours after delivery.

- Use of maternal corticosteroids may enhance postpartum normalization of liver enzymes and platelet count.

- Antihypertensive drugs.

- Complications:

- Conditions that are associated with HELLP syndrome include DIC (due to release of tissue factor from injured placenta), abruptio placenta, fetal demise, ascites, and hepatic rupture.

Antihypertensive Drug Therapy Issues

- Discontinue medications:

- This may be done in patients with mild-to-moderate HTN caused by the normal decrease in BP that occurs in pregnancy.

- Pharmacologic treatment in patients with diastolic BP <90 mm Hg or systolic BP <140 mm Hg does not improve either maternal or fetal outcome.

- Maintain medications:

- This may be necessary in patients with severe HTN.

- The drug of choice is methyl-dopa because of extensive experience and documented fetal safety.

- First-line drugs for blood pressure control in maternal hypertensive crisis include hydralazine, labetalol, and nifedipine.

- "Never use" medications:

- Angiotensin-converting enzyme inhibitors are contraindicated in pregnancy, as they have been associated with fetal hypocalvaria, renal failure, oligohydramnios, and death.

- Diuretics should not be initiated during pregnancy owing to possible adverse fetal effects of associated plasma volume reduction.

- BP target range:

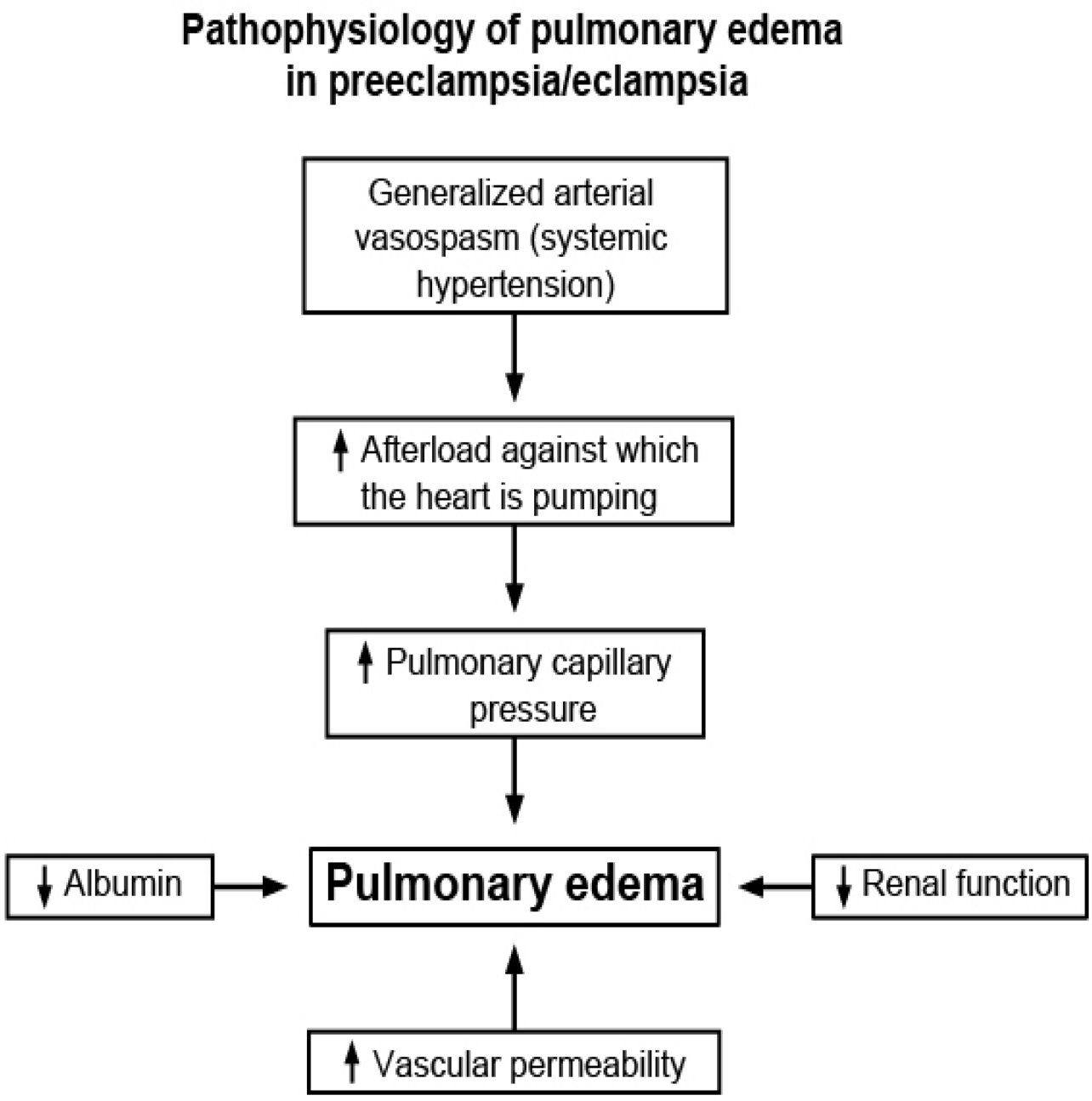
- Reduction of BP to normal levels in pregnancy may jeopardize utero-placental blood flow.

- Maintain diastolic values between 90 and 100 mm Hg.

❖ N.B:

1. Acute pulmonary edema is a rare and life-threatening complication of severe preeclampsia.

- Preeclamptic patients have generalized arterial vasospasm leading to increased systemic vascular resistance and high cardiac afterload. The heart becomes hyperdynamic to try to overcome the systemic hypertension. Additional factors that may contribute to pulmonary edema include decreased renal function, decreased serum albumin, and endothelial damage leading to increased capillary permeability.
- Management includes supplemental oxygen, fluid restriction, and diuresis in severe cases. Fluid restriction and diuresis must be used with caution as plasma volume is effectively decreased through third-spacing and placental perfusion can be compromised.



2. Magnesium sulfate is commonly administered for eclamptic seizure prevention and fetal neuroprotection.

- All patients on magnesium should be monitored for signs of toxicity (somnolence, areflexia, respiratory suppression).
- Because magnesium is excreted renally, patients with renal insufficiency are at increased risk for toxicity.
- Calcium gluconate is the first-line treatment for magnesium toxicity.

CHAPTER 9

Diabetes in Pregnancy

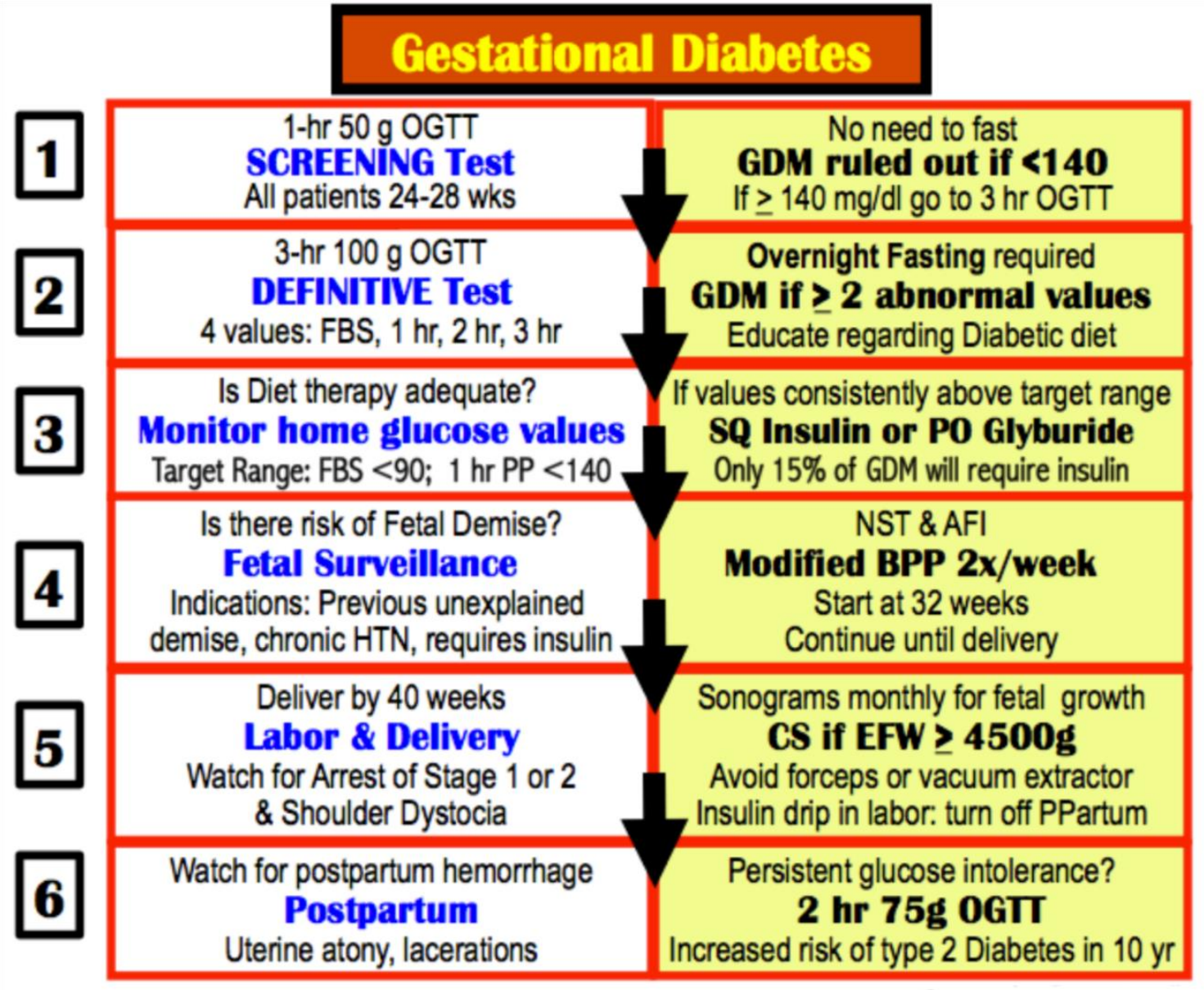
Diabetes in Pregnancy

- Definition:

- A pregnant woman is unable to maintain fasting (FBS) or post-challenge glucose values in the normal pregnant range before or after a standard 100-g glucose challenge.

- Risk factors:

- Obesity, age >30 years, and positive family history are the most common risk factors for gestational diabetes.



- Diagnosis:

A. 1-h 50-g oral glucose tolerance test (OGTT):

- This screening test is administered to all pregnant women between 24- and 28-weeks' gestation.
- No fasting state is needed.
- A 50-g glucose load is given, and serum glucose is measured 1 h later.
- A normal value is <140 mg/dL.
- Fifteen percent of pregnant women will have an abnormal screening test, which is ≥ 140 mg/dL.
- Management is a 3-h 100-g OGTT.

B. 3-h 100-g OGTT:

- This is the definitive test for glucose intolerance in pregnancy.
- Fifteen percent of women with an abnormal screening test will be found to have gestational diabetes mellitus.
- After an overnight fast, a fasting blood sugar (FBS) is drawn.
- An FBS >125 mg/dL indicates overt diabetes mellitus, and no further testing is performed.
- If the FBS is <126 mg/dL, administer a 100-g glucose load, followed by glucose levels at 1, 2, and 3 h.
- Normal values are FBS <95 mg/dL, 1 h <180 mg/dL, 2 h <155 mg/dL, and 3 h <140 mg/dL.
- Gestational diabetes is diagnosed if ≥2 values are abnormal.
- Impaired glucose intolerance is diagnosed if only 1 value is abnormal.

- Management:

- The most significant factor in management of diabetic pregnancies is achieving maternal euglycemia.
- American Diabetes Association diet: Educate patient regarding spreading calories evenly throughout the day. Eighty percent of patients with GDM can maintain glucose control with diet therapy.
- Home blood glucose monitoring: Patient checks her own blood glucose values at least four times a day with target values of FBS <90 mg/dL and 1 h after meal of <140 mg/dL.
- Insulin therapy: Start subcutaneous insulin with type 1 and type 2 DM and with GDM if home glucose values are consistently above the target range.

- Oral hypoglycemic agents:
  - These were contraindicated in the past because of concern that they would cross the placenta and cause fetal or neonatal hypoglycemia.

  - Glyburide appears to cross the placenta minimally, if at all, and is being used for patients with GDM who cannot be controlled by diet alone.

- Preconception Anomaly Prevention:
- Anomalies are mediated through hyperglycemia and are highest with poor glycemic control during embryogenesis.

- Anomalies are not increased in GDM because hyperglycemia is not present in the first half of pregnancy.

- Women with overt diabetes are at increased risk of fetal anomalies. This risk can be minimized by lifestyle modification.

- Most common fetal anomalies with overt DM are NTD and congenital heart disease. An uncommon anomaly, but one highly specific for overt DM, is caudal regression syndrome.

- Euglycemia: Maintaining glucose values at normal levels reduces anomaly risk close to that of nondiabetes; start 3 months prior to discontinuing contraception.

- Folate supplementation: Folic acid, 4 mg a day, should be started 3 months prior to conception to prevent both fetal neural tube defects, as well as congenital heart defects.

CHAPTER 10

Disproportionate Fetal Growth

Disproportionate Fetal Growth

Intrauterine growth restriction (IUGR)

- Definition:

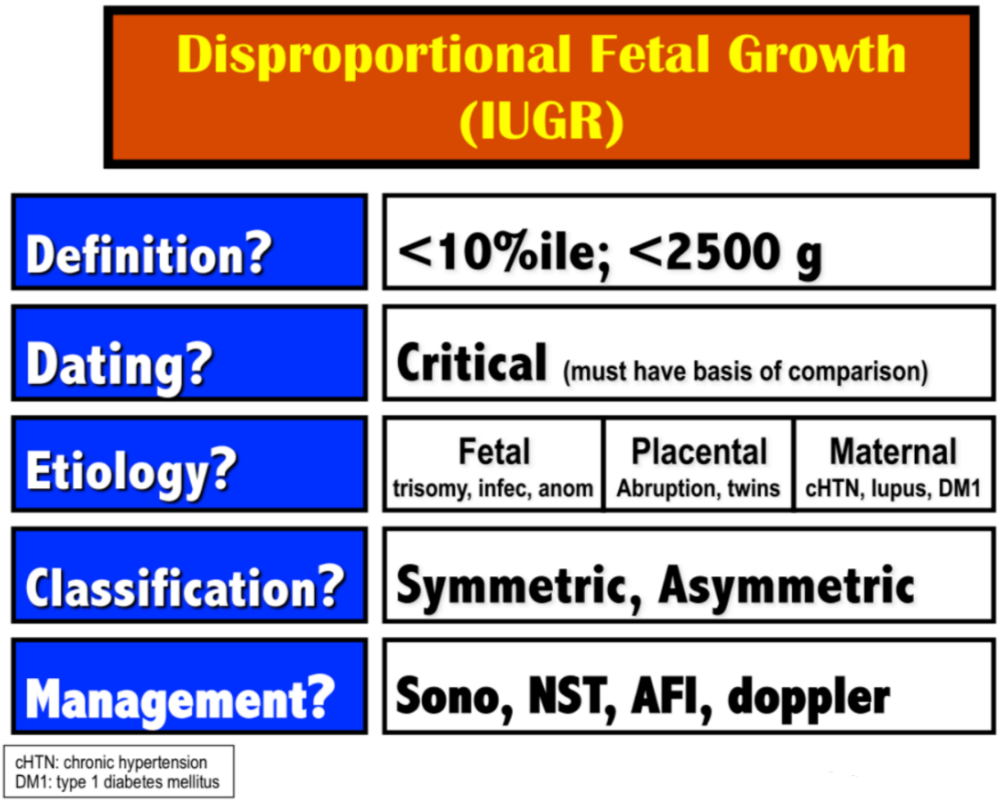
- Fetus with estimated fetal weight (EFW) < 10th percentile for gestational age. This assumes the fetus is not growing to its genetic potential.

- Another definition is <2,500 grams.

- Dating:

- Accurate early pregnancy dating is essential for making the diagnosis.

- An early sonogram (<20 weeks) is most accurate if conception date is unknown.



- Causes:

A. Fetal Causes:

- Examples include aneuploidy (T21, T18, T13); infection (TORCH), structural anomalies (congenital heart disease, neural tube defects, ventral wall defects).

- These causes typically lead to symmetric IUGR.

B. Placental Causes:

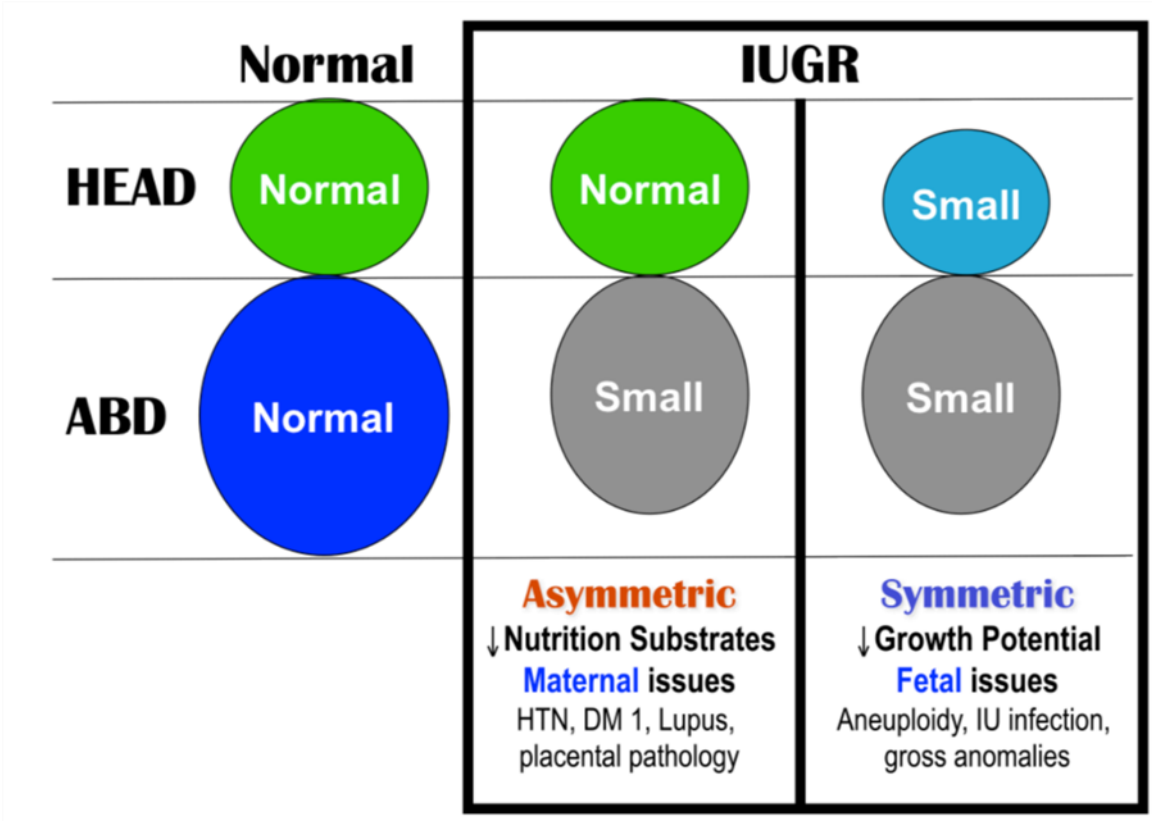
- Examples include infarction, abruption, twin-twin transfusion syndrome (TTTS), velamentous cord insertion.

- These causes typically lead to asymmetric IUGR.

C. Maternal Causes:

- Examples include hypertension (chronic, preeclampsia), small vessel disease (SLE, long-standing type 1 diabetes), malnutrition, tobacco, alcohol, drug use (Amphetamine abuse).

- These causes typically lead to asymmetric IUGR.



- Types:

A. Symmetric IUGR:

- All ultrasound parameters are smaller than expected.

- Etiology is decreased growth potential (aneuploidy, early intrauterine infection, gross anatomic anomaly).

- Workup should include detailed sonogram, karyotype, and screen for fetal infections.

- Antepartum tests are usually normal.

B. Asymmetric IUGR:

- Ultrasound parameters show head sparing, but abdomen is small.

- Etiology is decreased placental perfusion due to chronic maternal diseases (hypertension, diabetes, SLE, cardiovascular disease) or abnormal placentation (abruption and infarction).

- Amniotic fluid index is often decreased, especially if uteroplacental insufficiency is severe.

- Monitoring is with serial sonograms, non-stress test, amniotic fluid index, biophysical profile, and umbilical artery Dopplers.

Macrosomia

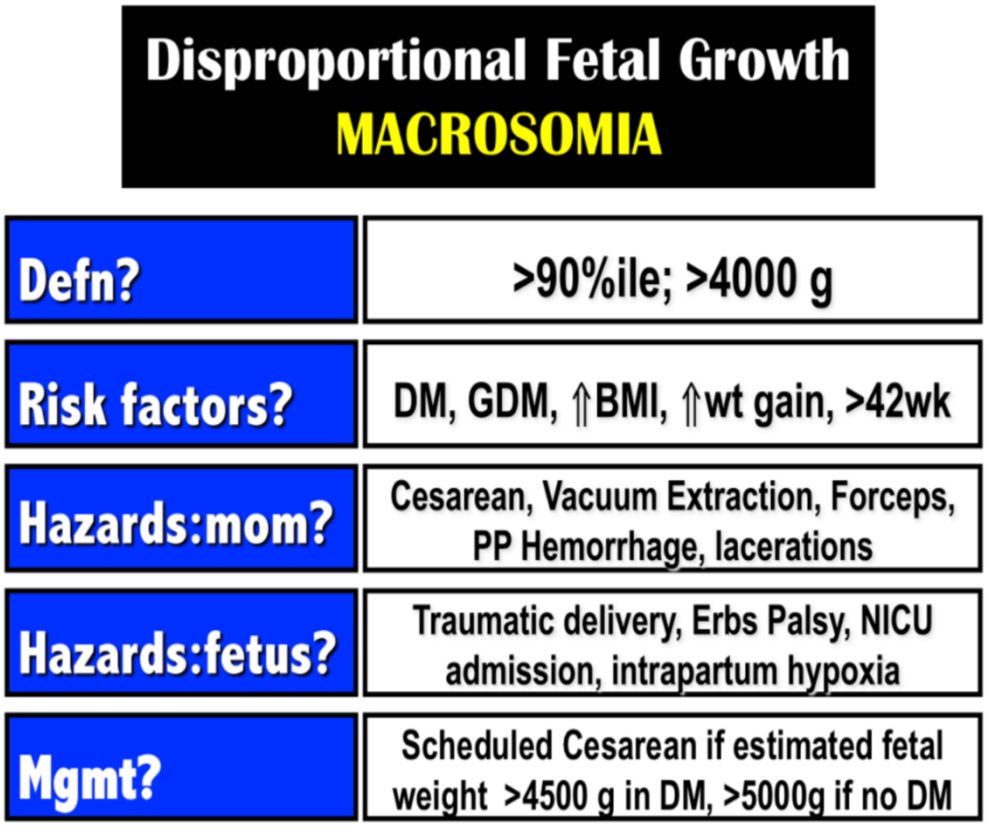
- Definition:

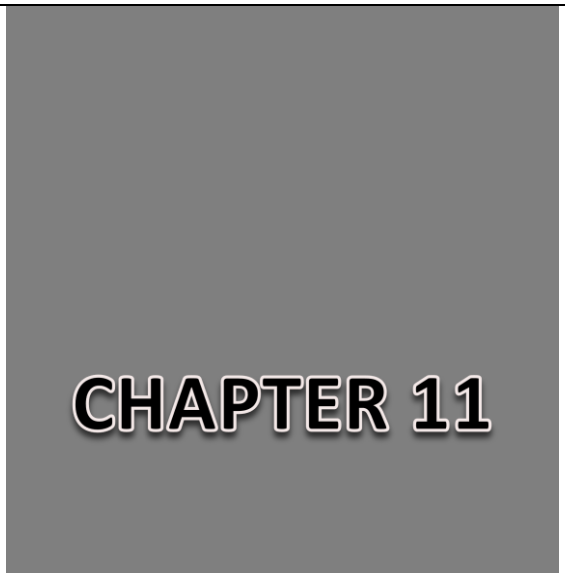
- Fetus with estimated fetal weight (EFW) >90-95th percentile for gestational age.

- Birth weight >4,000-4,500 grams.

- Risk Factors:

- Gestational diabetes mellitus, overt diabetes, prolonged gestation, increase in BMI (obesity), increase in pregnancy weight gain, multiparity, male fetus.

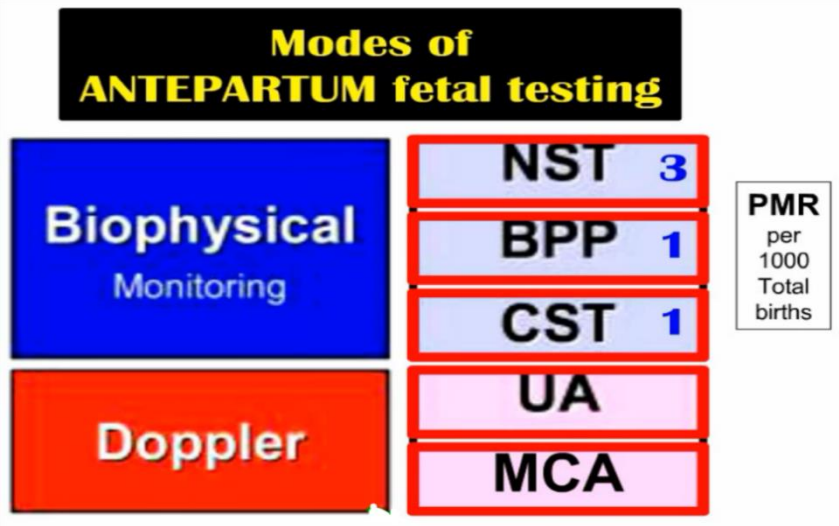




Antepartum Fetal Testing

Antepartum Fetal Testing

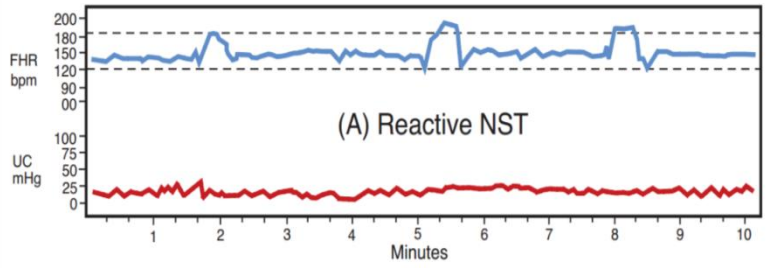
- Antenatal fetal tests are highly accurate in confirming fetal well-being but are poor predictors of fetal jeopardy.
- Antepartum fetal surveillance evaluates for fetal hypoxia. It is performed in pregnancies with a high risk of fetal demise due to maternal (hypertension, diabetes mellitus, decreased fetal movements) or fetal (post-term pregnancy, growth restriction) conditions.



Nonstress test (NST)

- A nonstress test (NST) is performed to assess fetal status and identify fetuses at risk of adverse outcomes.
- This test assesses the frequency of fetal movements using an external fetal heart rate (FHR) monitoring device to detect the presence or absence of accelerations.
- The heart rate of a well-oxygenated fetus rises with fetal movement (accelerations). Accelerations are always reassuring.

Nonstress test	
Reactive	• Baseline of 110-160/min • Moderate variability (6-25/min) • ≥2 accelerations in 20 minutes, each peaking ≥15/min above baseline & lasting ≥15 seconds
Nonreactive	• Does not meet criteria for reactivity



(A) Normal baseline range, and no UCs are present. Thus, only the NST component can be assessed. Because 3 accelerations are present, the assessment is reactive NST. **This is a reassuring tracing.**

- Reactive NST:

- Requires the presence of 2 accelerations in a 20-min window of time meeting the above criteria.

- This is reassuring and highly predictive for fetal well-being.

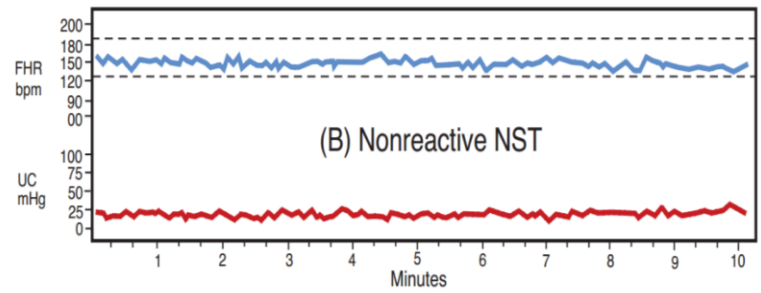
- Nonreactive NST:

- It is diagnosed when any criteria for reactivity are not met: either the number of accelerations in 20 min or the amplitude or duration of the acceleration.

- Nonhypoxemic causes include fetal sleep, prematurity, drug effects, and CNS anomalies.

- Management is fetal vibroacoustic stimulation to see whether this results in reactivity.

- A nonreactive NST has a high false-positive rate and low positive predictive value and cannot rule in fetal acidemia. A nonreactive NST requires further evaluation with a biophysical profile (BPP) or contraction stress test (CST). These tests are equivalent in assessing fetal status and are selected based on available resources and relevant contraindications.



(B) Normal baseline range and no UCs are present. Thus, only the NST component can be assessed. Because no accelerations are present, the assessment is nonreactive NST. Because **this is not a reassuring tracing**, the next step should be a vibroacoustic fetal stimulation.

- Fetal Heart Rate:

- Normal: 110 to 160 beats per minute.

- Bradycardia: below 110 beats per minute.

- Tachycardia: above 160 beats per minute.

Biophysical profile (BPP)

- A complete BPP:

- Measures 5 components of fetal well-being:

1. NST.
2. Amniotic fluid volume.
3. Fetal gross body movements.
4. Fetal extremity tone.
5. Fetal breathing movements.

- The last 4 components are assessed using obstetric ultrasound.

- High risk pregnancy may need weekly BPPs starting at 32 weeks gestation.

- Scores given for each component are 0 or 2, with maximum possible score of 10 and minimum score of 0.

- A normal BPP (8/10 or 10/10) suggests that the fetus is well- oxygenated.

- A score of 0/10 to 4/10 indicates fetal hypoxia due to placental dysfunction (placental insufficiency). Risk factors for placental insufficiency include advanced maternal age, tobacco use, hypertension, and diabetes. The patient requires prompt delivery due to the high likelihood of fetal demise.

- A BPP of 6/10 is equivocal and should be repeated in 24 hours.

Biophysical profile*	
Component	**Normal finding**
Nonstress test	Reactive fetal heart rate monitoring
Amniotic fluid volume	Single fluid pocket ≥2 cm × 1 cm or amniotic fluid index >5
Fetal movements	≥3 general body movements
Fetal tone	≥1 episodes of flexion/extension of fetal limbs or spine
Fetal breathing movements	≥1 breathing episode for ≥30 seconds

Maximum score = 10; 0 = abnormal; 2 = normal for each component.

*Performed continuous observation for ≥30 minutes.

- A modified BPP:

- Includes only the NST and amniotic fluid volume.

- Its predictive value is almost as high as a complete BPP.

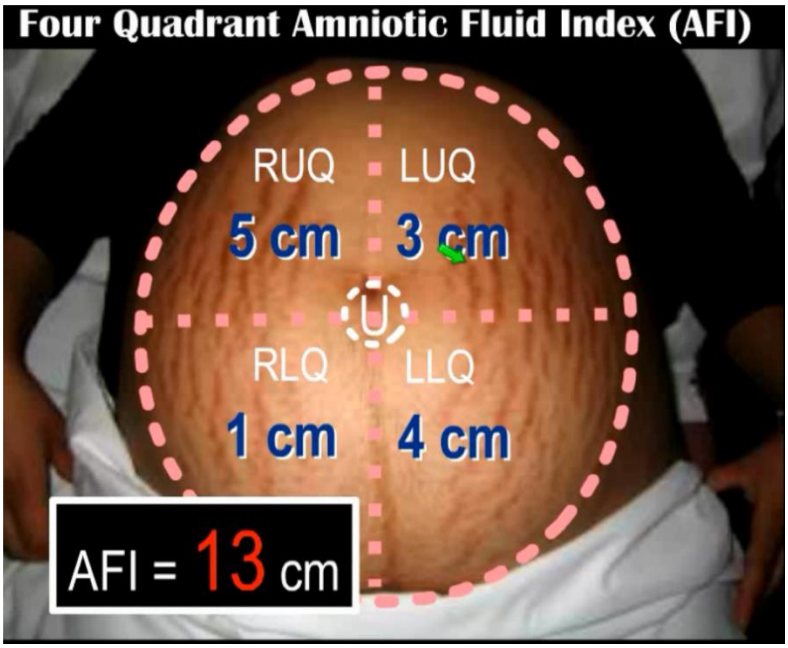
Amniotic fluid index

- The 4-quadrant amniotic fluid index test assesses in centimeters the deepest single vertical amniotic fluid pocket in each of the 4 quadrants of the uterus.

- The sum of the pockets is known as the amniotic fluid index, or AFI.

- Interpretation is as follows:

- A single deepest pocket <2 cm or an amniotic fluid index ≤ 5: oligohydramnios.
- ≥24 cm: polyhydramnios.



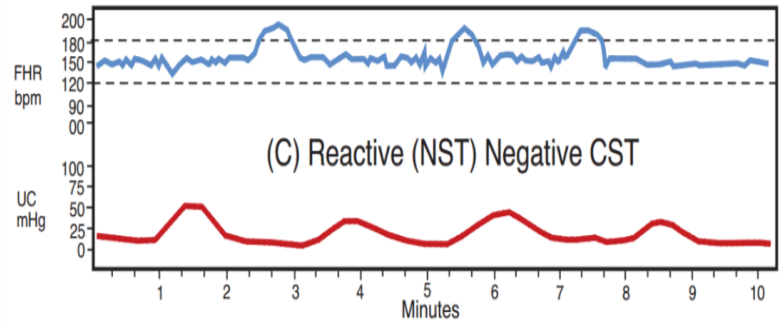
Amniotic fluid index (AFI)		
	Oligohydramnios (AFI <5 cm)	**Polyhydramnios (AFI ≥24 cm)**
Causes	• Preeclampsia • Abruptio placentae • Uteroplacental insufficiency • Renal anomalies • NSAIDs	• Esophageal/duodenal atresia • Anencephaly • Multiple gestation • Congenital infection • Diabetes mellitus
Complications	• Meconium aspiration • Preterm delivery • Umbilical cord compression	• Fetal malposition • Umbilical cord prolapse • Preterm labor • Preterm premature rupture of membranes

NSAIDs = nonsteroidal anti-inflammatory drugs.

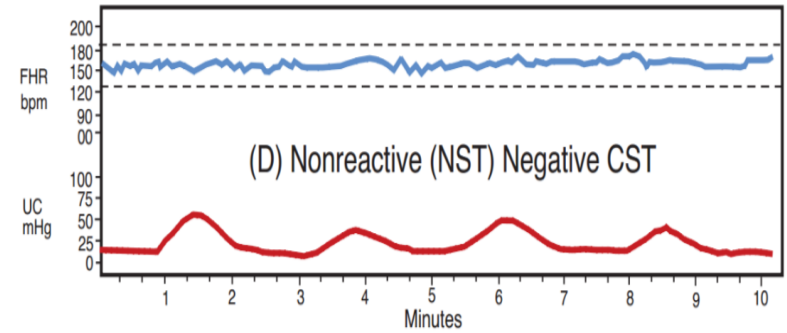
Contraction stress test (CST)

- If 3 or more uterine contractions (UCs) are present in 10 minutes, the CST components can be assessed as negative or positive.
- This test assesses the ability of the fetus to tolerate transitory decreases in intervillous blood flow that occur with uterine contractions.
- It uses both external FHR and contraction monitoring devices and is based on the presence or absence of late decelerations. These are gradual decreases in FHR below the baseline. The deceleration onset and end is delayed in relation to contractions.
- If 3 contractions in 10 min are not spontaneously present, they may be induced with either IV oxytocin infusion or nipple stimulation.
- This test is rarely performed because of the cost and personnel time required. The most common indication is a BPP of 4 or 6.
- <u>Negative CST:</u>

- Requires absence of any late decelerations with contractions.
- This is reassuring and highly reassuring for fetal well-being.



(C) Normal baseline range and 4 UCs are present in 10 minutes. Thus, both the NST and CST components can be assessed. Because 3 accelerations are present, and no late decelerations are present, the assessment is reactive NST, negative CST. This is a reassuring tracing.



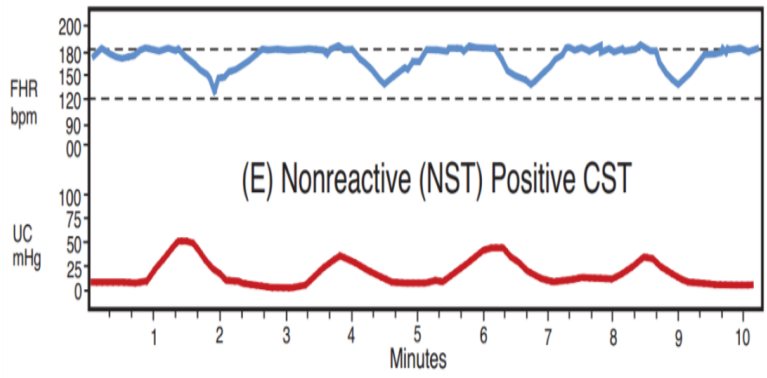
(D) Normal baseline range and 4 UCs are present in 10 minutes. Thus, both the NST and CST components can be assessed. Even though no accelerations can be seen, no late decelerations are present. The assessment is nonreactive NST, negative CST. **This suggests fetal sleep, sedation, or central nervous system (CNS) abnormality.**

- Positive CST:

- It is worrisome.

- This requires the presence of late decelerations associated with at least 50% of contractions.

- Management is prompt delivery.



(E) Elevated baseline range and 4 UCs are present in 10 minutes. Thus, both the NST and CST components can be assessed. No accelerations can be seen, but repetitive late decelerations are present. The assessment is nonreactive NST, positive CST. **This is highly suggestive of fetal compromise.**

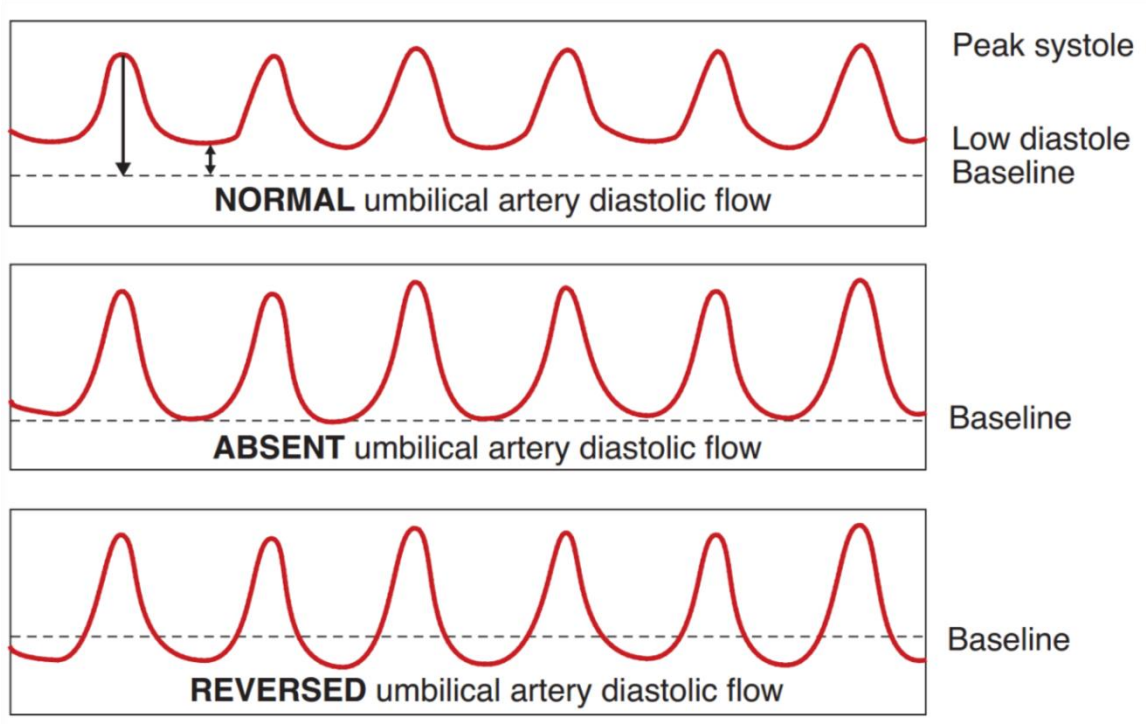
- Contraindications:

- CST should not be performed whenever contractions would be hazardous to the mother or fetus.

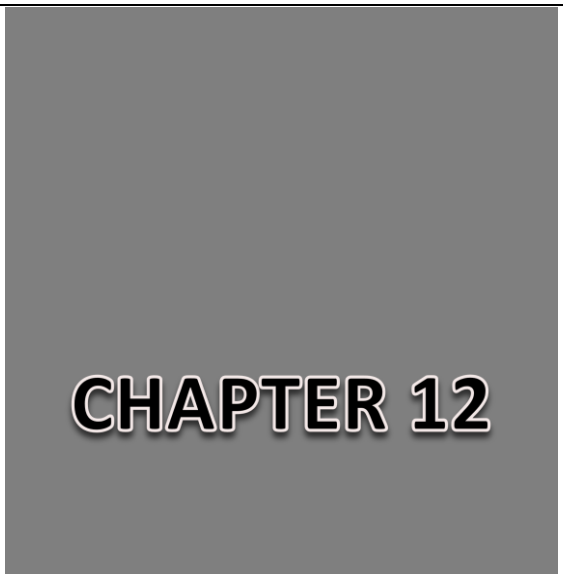
- Examples include previous classical uterine incision, previous myomectomy, placenta previa, incompetent cervix, preterm membrane rupture, and preterm labor.

Umbilical artery doppler

- This test measures the ratio of systolic and diastolic blood flow in the umbilical artery.
- The umbilical circulation normally has low resistance, so significant diastolic blood flow is expected.
- This test is predictive of poor perinatal outcome only in IUGR fetuses.
- Nonreassuring findings, which may indicate need for delivery, are absent diastolic flow and reversed diastolic flow.



Antepartum fetal surveillance			
Test	**Description**	**Normal result**	**Abnormal result**
Nonstress test	External fetal heart rate monitoring for 20-40 minutes	Reactive: ≥2 accelerations	• Nonreactive: <2 accelerations • Recurrent variable or late decelerations
Biophysical profile	Nonstress test plus ultrasound assessment of the following: • Amniotic fluid volume • Fetal breathing movement • Fetal movement • Fetal tone 2 points per category if normal & 0 points if abnormal (maximum 10/10)	8 or 10 points	• Equivocal: 6 points • Abnormal: 0, 2, or 4 points • Oligohydramnios
Contraction stress test	External fetal heart rate monitoring during spontaneous or induced (eg, oxytocin, nipple stimulation) uterine contractions	No late or recurrent variable decelerations	Late decelerations with >50% of contractions
Doppler sonography of the umbilical artery	Evaluation of umbilical artery flow in fetal intrauterine growth restriction only	High-velocity diastolic flow in umbilical artery	Decreased, absent, or reversed end-diastolic flow



Fetal orientation in utero

Fetal orientation in utero

Orientation in utero

- Lie:

- Orientation of the long axis of the fetus to the long axis of the uterus:

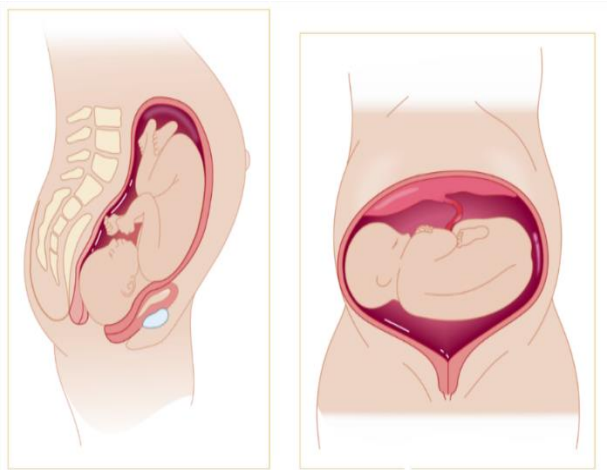
A. Longitudinal: fetus and mother are in same vertical axis (99% of fetuses at term).

B. Transverse:

- A transverse lie occurs when the fetal longitudinal axis is perpendicular to the longitudinal axis of the uterus.

- It is common at early gestational ages. Most fetuses spontaneously convert to longitudinal lie and cephalic presentation by term (>37 weeks gestation): therefore, preterm transverse lie is managed expectantly.

- Persistent malpresentation at term can be managed with external cephalic version or cesarean delivery.



- Presentation:

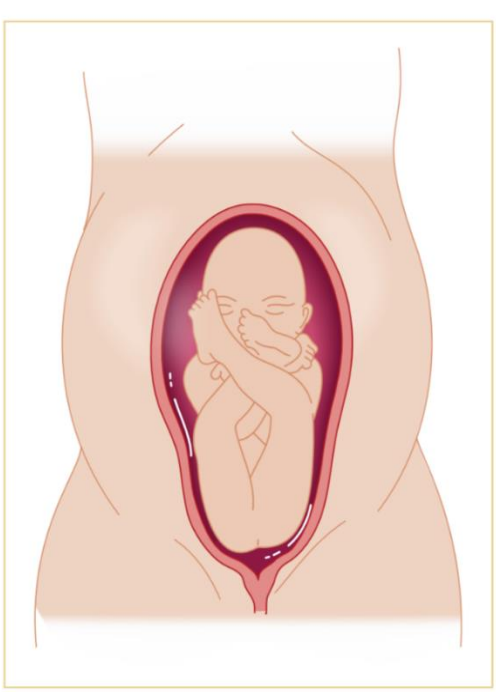
- Portion of the fetus overlying the pelvic inlet:

- Cephalic: head presents first. This is 96% of fetuses at term.

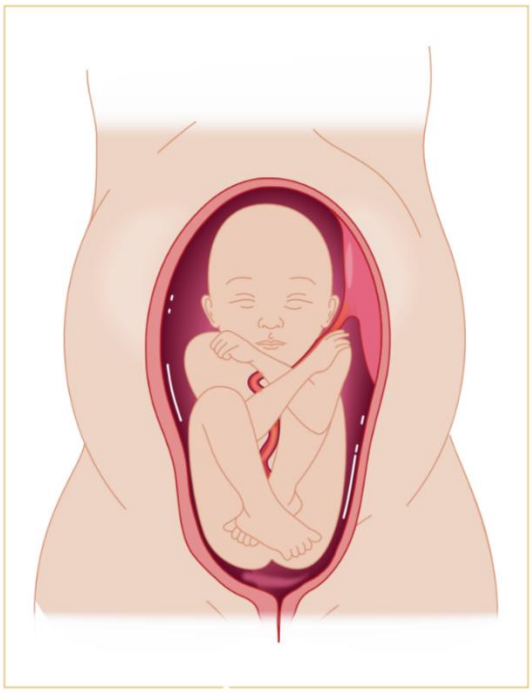
- Breech: feet or buttocks present first. The major risk of vaginal breech delivery is entrapment of the after-coming head.
- Frank breech: thighs are flexed, and legs extended. This is the only kind of breech that potentially could be safely delivered vaginally.

- Complete breech: thighs and legs flexed.

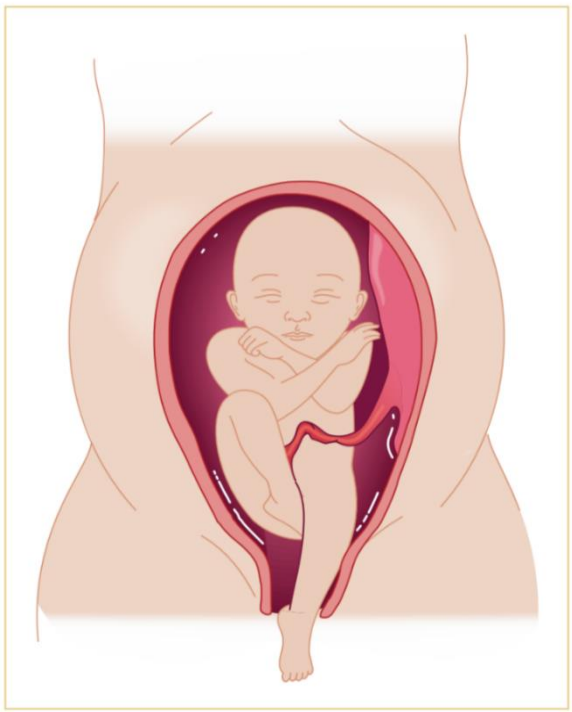
- Footling breech: thighs and legs extended.



Frank Breech



Complete Breech



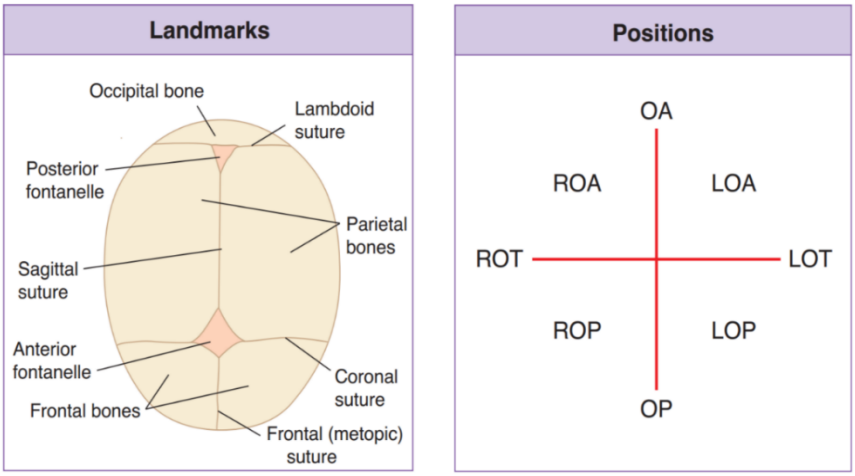
Footling Breech

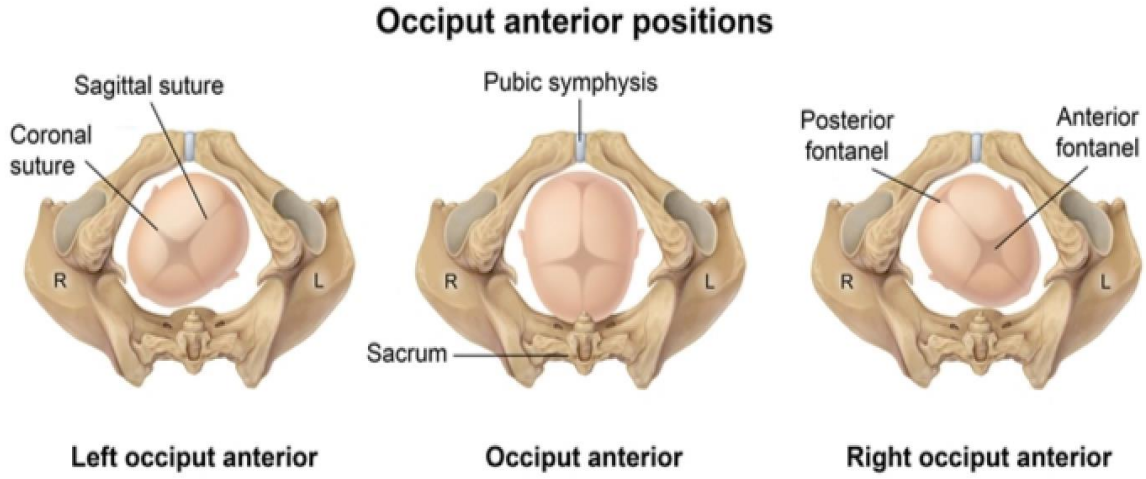
- Position:

- Relationship of a definite presenting fetal part to the maternal bony pelvis.

- It is expressed in terms stating whether the orientation part is anterior or posterior, left or right.

- The most common position at delivery is occiput anterior.





- Attitude:

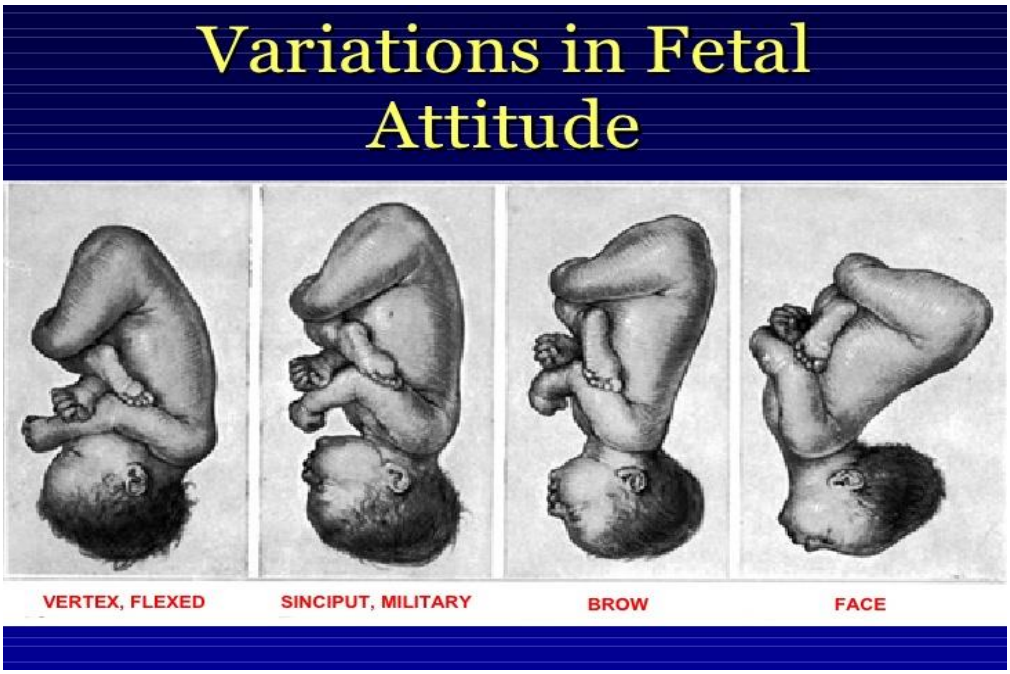
- Degree of extension-flexion of the fetal head with cephalic presentation:

  - Vertex: head is maximally flexed. The most common attitude.

  - Military: head is partially flexed.

  - Brow: head is partially extended.

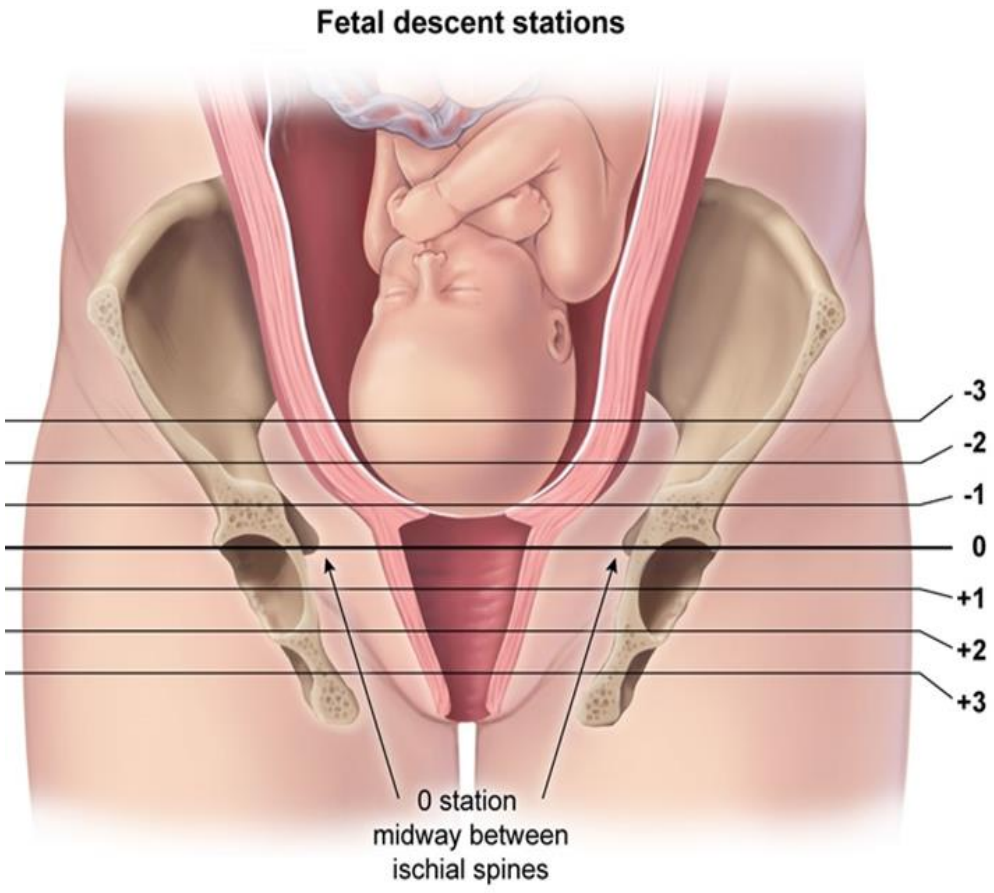
  - Face: head is maximally extended.



- Station:

- Degree of descent of the presenting part through the birth canal.

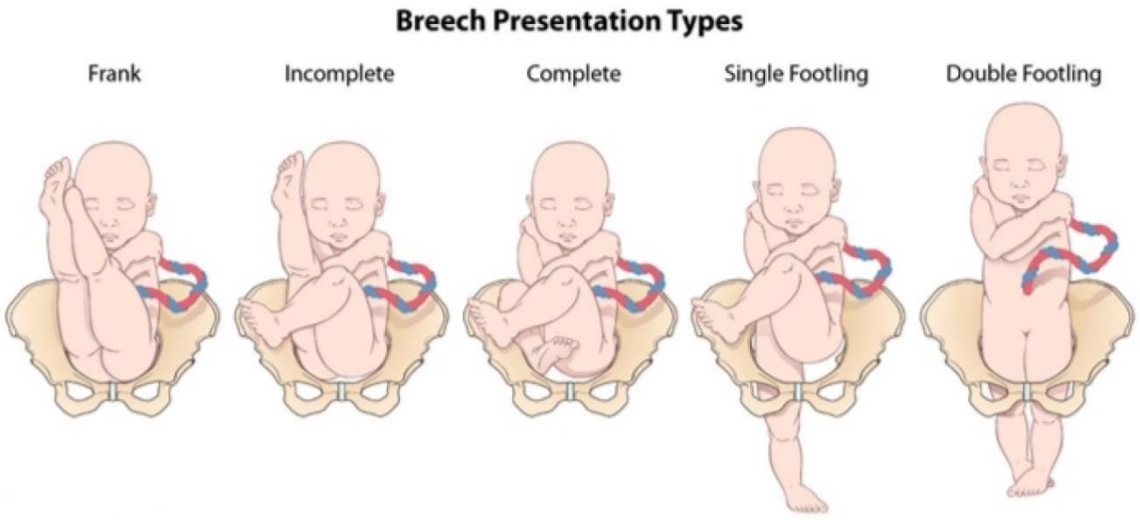
- Expressed in centimeters above or below the maternal ischial spine.



Malpresentation

- zBreech presentation describes a fetus whose buttocks or feet are the presenting part in the birth canal.

- Approximately 25% of fetuses <28 weeks gestation are in the breech presentation. By 37 weeks, only 4% of fetuses are breech.



- Risk factors for breech presentation include prematurity, multiparity, multiple gestation, uterine anomalies, uterine leiomyoma, fetal anomalies, and abnormal placentation.

- Breech presentation should be suspected if the fetal vertex (head) is palpated at the fundus or a fetal presenting part is not palpable on pelvic examination, and should always be confirmed by transabdominal ultrasound.

- Vaginal delivery of a singleton breech fetus is generally contraindicated due to a higher incidence of birth asphyxia and trauma compared to breech cesarean delivery.

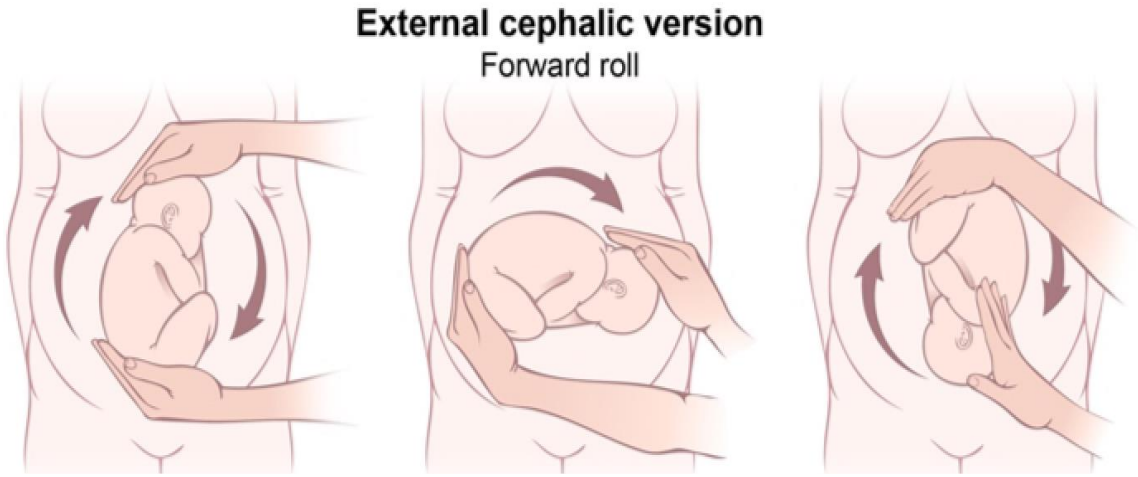
- External cephalic version (ECV) involves manual conversion of the fetus to vertex presentation so that the patient can labor and potentially avoid cesarean delivery. A patient with a singleton breech fetus with no contraindications to vaginal delivery (placenta previa, active herpes lesion, prior classical cesarean delivery) or ECV (ruptured membranes, abnormal fetal heart tracing, oligohydramnios) should be offered ECV at >37 weeks gestation and has been shown to reduce the rate of cesarean deliveries. A history of a low transverse cesarean delivery is not a contraindication for ECV and does not decrease the likelihood that ECV will be successful.

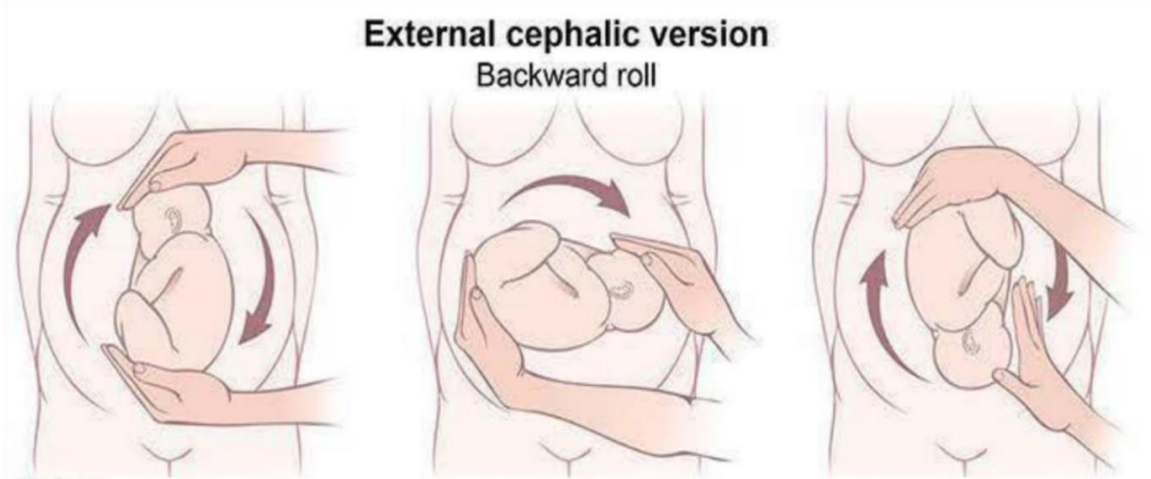
- In contrast, those with breech presentation and contraindications to vaginal delivery (eg, prior classical cesarean delivery, placenta previa), ECV is not performed and patients undergo cesarean delivery at 37 weeks gestation.

External cephalic version	
Procedure	• Manual rotation of fetus to cephalic presentation • Decreases cesarean delivery rate
Indications	• Breech/transverse presentation • ≥37 weeks gestation

Absolute contraindications	• Contraindication to vaginal delivery
	  ◦ Prior classical cesarean delivery
	  ◦ Prior extensive uterine myomectomy
	  ◦ Placenta previa

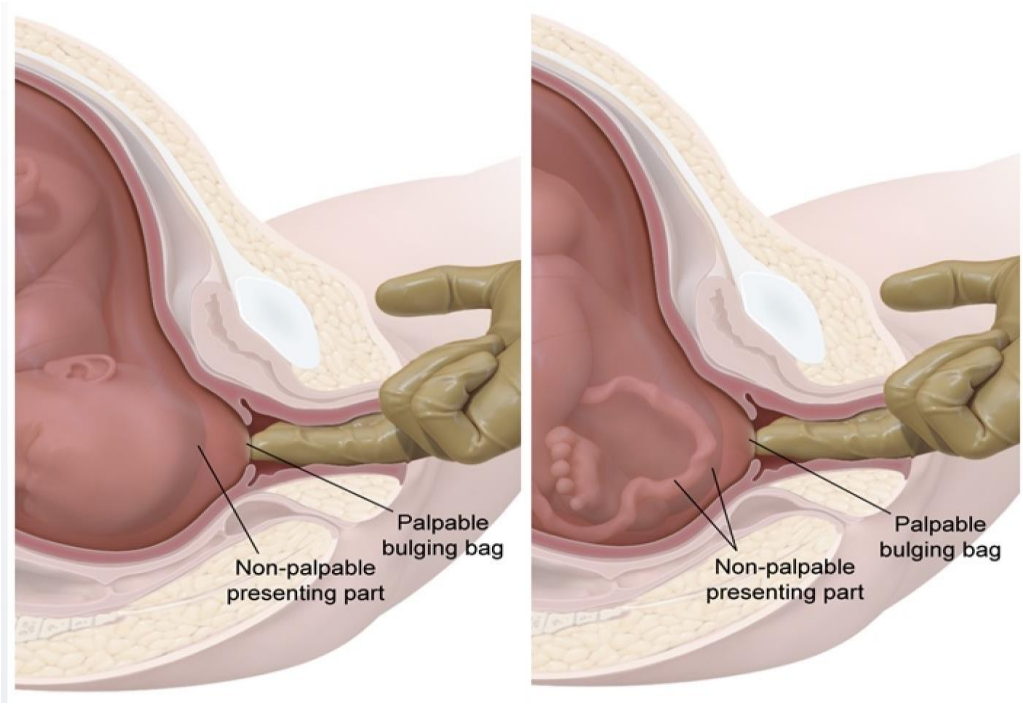
Complications	• Abruptio placentae • Intrauterine fetal demise





❖ N.B:

- If fetal presentation (cephalic, breech) is uncertain on digital cervical examination, a transabdominal ultrasound should be performed to confirm fetal presentation and determine the safest route of delivery.



CHAPTER 13

Normal and abnormal labor

Normal and abnormal labor

- Labor is a process whereby over time regular uterine contractions bring about progressive effacement and dilation of the cervix, resulting in delivery of the fetus and expulsion of the placenta.

- Contractions will occur at least every 5 min lasting 30s.

- Uterine Changes:

- The contractile upper uterine segment, containing mostly smooth muscle fibers, becomes thicker as labor progresses, exerting forces that expel the fetus down the birth canal.

- The lower uterine segment, containing mostly collagen fibers, passively thins out with contractions of the upper segment.

- Cervical Effacement:

- Cervical softening and thinning occur as increasing levels of oxytocin and prostaglandins lead to breakage of disulfide linkages of collagen fibers, resulting in increasing water content.

- Effacement is often expressed in percentages with the uneffaced (0%) cervix assumed to be 2 cm long and 2 cm wide.

- Progressive shortening and thinning lead to full effacement (100%) in which the cervix has no length and is paper-thin.

- Cervical Dilation:

- This occurs as the passive lower uterine segment is thinned and pulled up by the contractile upper segment.

- In early labor (latent phase), the rate of dilation is slow, but at 6 cm of dilation, the rate accelerates to a maximum rate in the active phase of labor.

- Complete dilation is expressed as 10 cm.

- Cardinal Movements of Labor:

- The first 3 steps occur simultaneously:

  - Engagement: movement of the presenting part below the plane of the pelvic inlet.

  - Descent: movement of the presenting part down through the curve of the birth canal.

  - Flexion: placement of the fetal chin on the thorax.

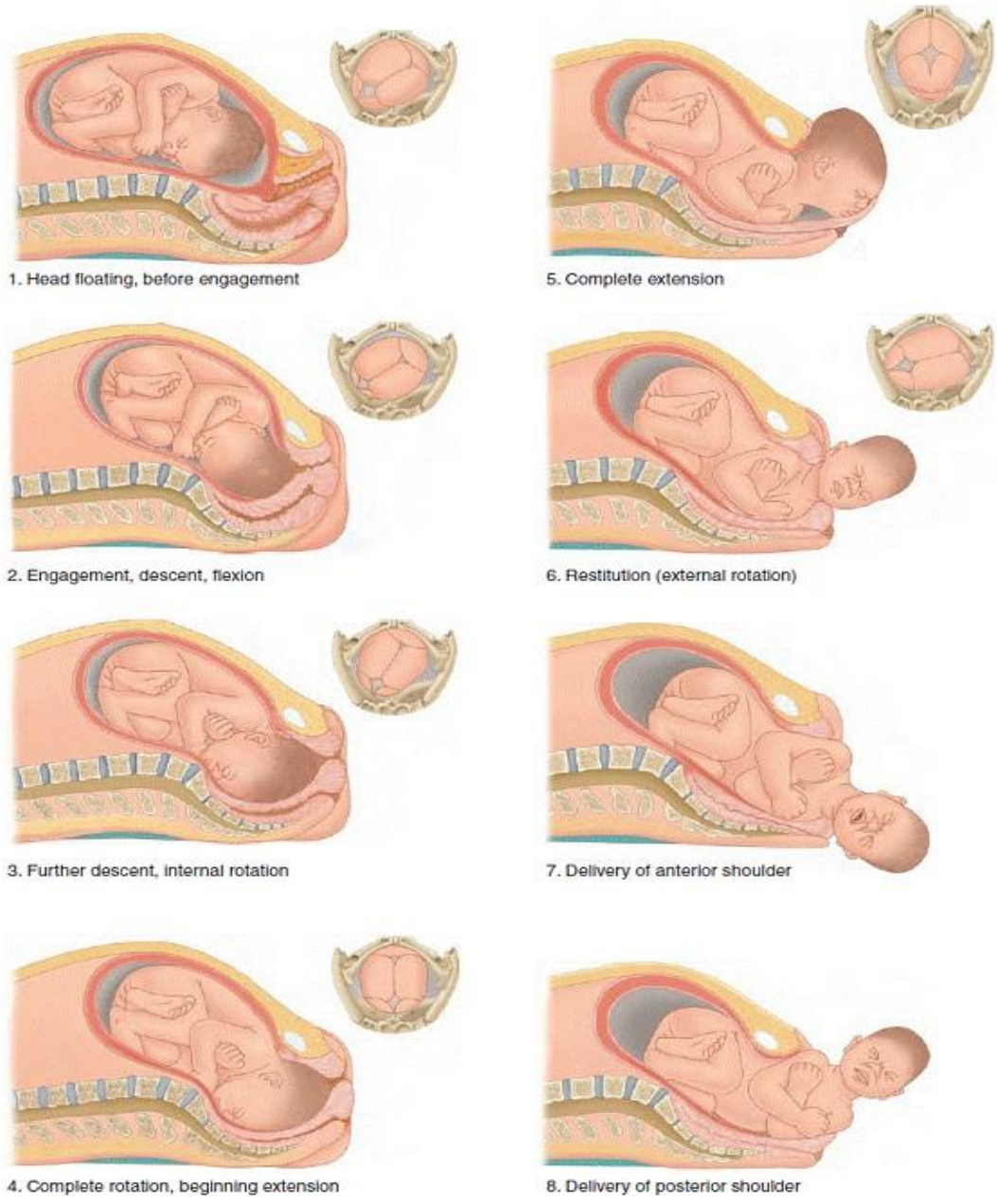
- The next 4 steps occur in order:

- Internal rotation: rotation of the position of the fetal head in the mid pelvis from transverse to anterior-posterior.

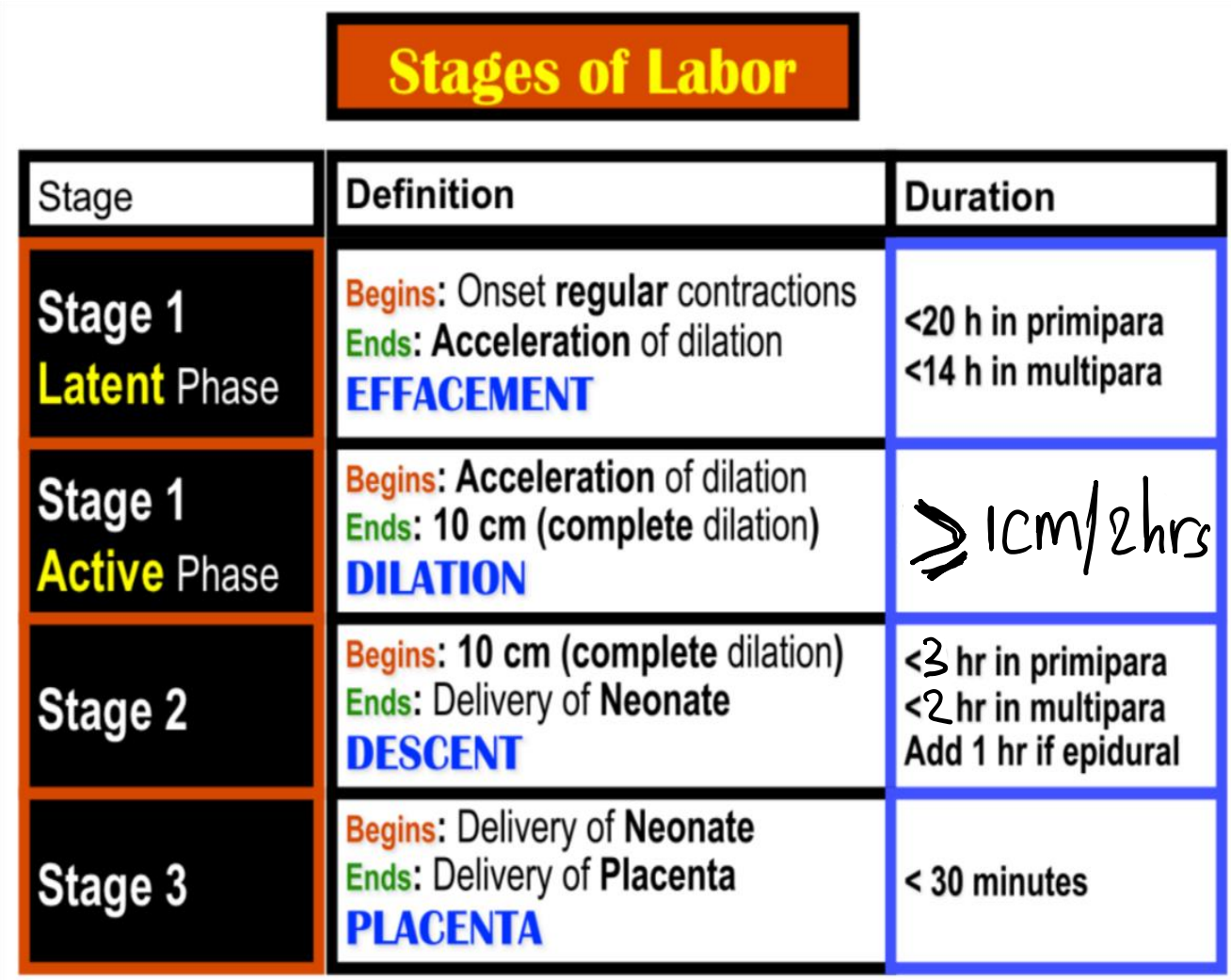
- Extension: movement of the fetal chin away from the thorax.

- External rotation: rotation of the fetal head outside the mother as the head passes through the pelvic outlet.

- Expulsion: delivery of the fetal shoulders and body.



Stages of labor



- Stage 1:

- The first stage of labor begins with the onset of regular contractions and ends when the patient is 10 cm dilated.

- It consists of a latent phase involving gradual cervical dilation and an active phase with rapid dilation.

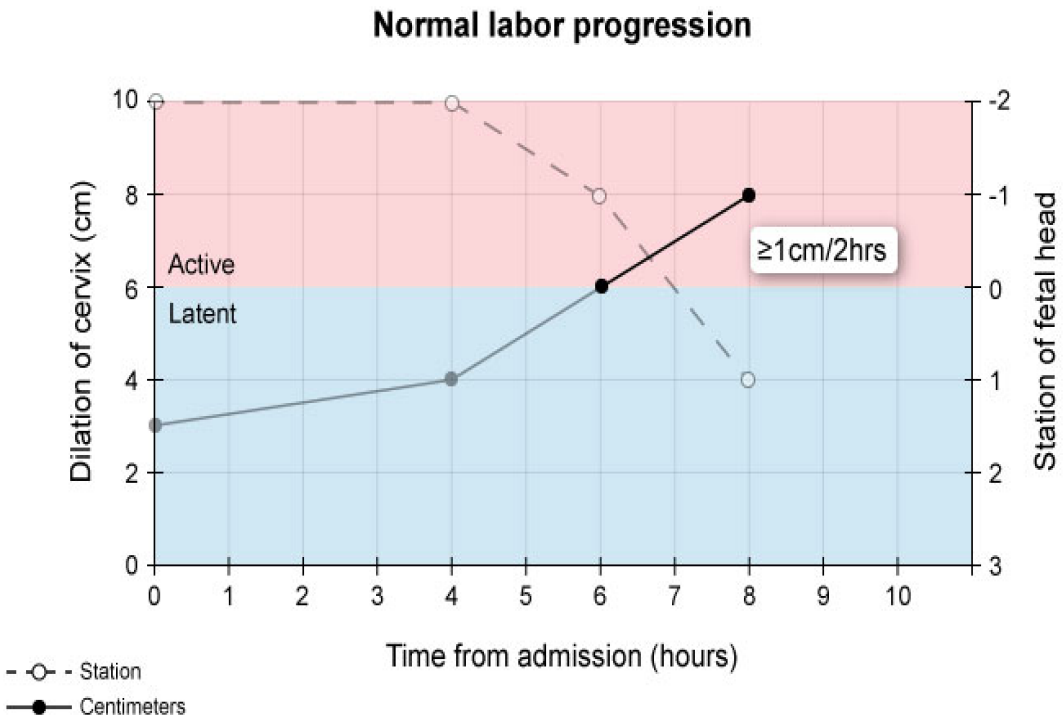
- The transition between the latent and active phase typically occurs at 6 cm dilation.

A. Latent phase (0-6 cm):

- Begins with onset of regular contractions and ends with the acceleration of cervical dilation.
- Its purpose is to soften and efface the cervix preparing it for rapid dilation.
- Minimal descent of the fetus through the birth canal occurs.
- Although the upper limit of latent phase duration may be up to 20 h in a primipara and up to 14h in a multipara, this is never an indication for cesarean section.

B. Active phase (≥ 6 cm -10 cm):

- Begins with cervical dilation acceleration ending with complete cervical dilation.
- Cervical dilation of 6 cm should be considered the threshold for active phase.
- The active phase of labor has an expected, predictable rate of cervical dilation of ≥ 1 cm every 2 hours.
- Cardinal movements of labor occur, with beginning descent of the fetus in the latter part of this phase.
- Slow but progressive labor in first stage of labor is normal and should not be indication for cesarean delivery.
- Main abnormality is arrest of active phase (reserve this diagnosis for women ≥6 cm of dilation with ruptured membranes who show no cervical change despite 4 hours of adequate uterine activity or ≥6 hours of oxytocin administration with inadequate uterine activity).



- Stage 2:

- Begins with complete cervical dilation and ends with delivery of the fetus.

- Its purpose is descent of the fetus through the birth canal.

- Whereas in stage 1 uterine contractions are the only force that acts on cervical dilation, in stage 2 maternal pushing efforts are vitally important to augment the uterine contractions to bring about descent of the fetal presenting part.

- Duration of stage 2 may be up to 3 h in a primipara (4 h with epidural) or 2 h in a multipara (3 h with epidural).

- Main abnormality is prolonged second stage.

- Stage 3:

- Begins with delivery of the fetus and ends with expulsion of the placenta.

- The mechanism of placental separation from the uterine wall is dependent on myometrial contractions shearing off the anchoring villi.

- This is usually augmented with IV oxytocin infusion.

- Duration may be up to 30 minutes in all women.

- Main abnormality is prolonged third stage.

- Stage 4:

- Is not an official stage of labor but rather a critical 2-h period of close observation of the parturient immediately after delivery.

- Vital signs and vaginal bleeding are monitored to recognize and promptly treat preeclampsia and postpartum hemorrhage.

❖ N.B:

1. False labor is mild, irregular contractions that cause no cervical change (Braxton Hicks contractions).

- Latent labor is regular contractions with increasing frequency and intensity that cause gradual cervical change.
- Patients who present with false labor can resume routine prenatal care.

False labor versus latent labor		
Contractions	**False labor**	**Latent labor**
Timing	Irregular, infrequent	Regular, increasing frequency
Strength	Weak	Increasing intensity
Pain	None to mild	Yes
Cervical change	No	Yes

2. Oxytocin is a potent uterotonic hormone secreted by the posterior pituitary gland.

- A synthetic analog of oxytocin is used in labor induction and augmentation as well as in the prevention and management of postpartum hemorrhage.
- Because oxytocin is similar to antidiuretic hormone, prolonged administration of high doses of oxytocin can cause water retention, hyponatremia, and resultant seizures.
- All agents used for labor induction, including oxytocin, can cause uterine tachysystole, which refers to abnormally frequent contractions (>5 contractions in 10 minutes averaged over a 30-minute period). Induction drugs also increase the risk of tetanic (intense or prolonged) contractions, particularly at higher doses.
- Although many fetuses tolerate tachysystole with no adverse outcome, fetal heart rate tracing abnormalities are more common with tachysystole due to insufficient uterine relaxation between contractions, causing placental spiral artery constriction, a decrease in placental blood flow, and fetal hypoxia.
- Consequently, tachysystole is associated with an increased risk for cesarean delivery, low umbilical cord pH, and neonatal intensive care unit admission.

Oxytocin	
Indications	• Induction or augmentation of labor • Prevention & management of postpartum hemorrhage
Adverse effects	• Hyponatremia • Hypotension • Tachysystole

Abnormal labor

A. Prolonged Latent Phase:

- Diagnosis:

- Cervical dilation is <6 cm, and the acceleration phase of dilation has not been reached.

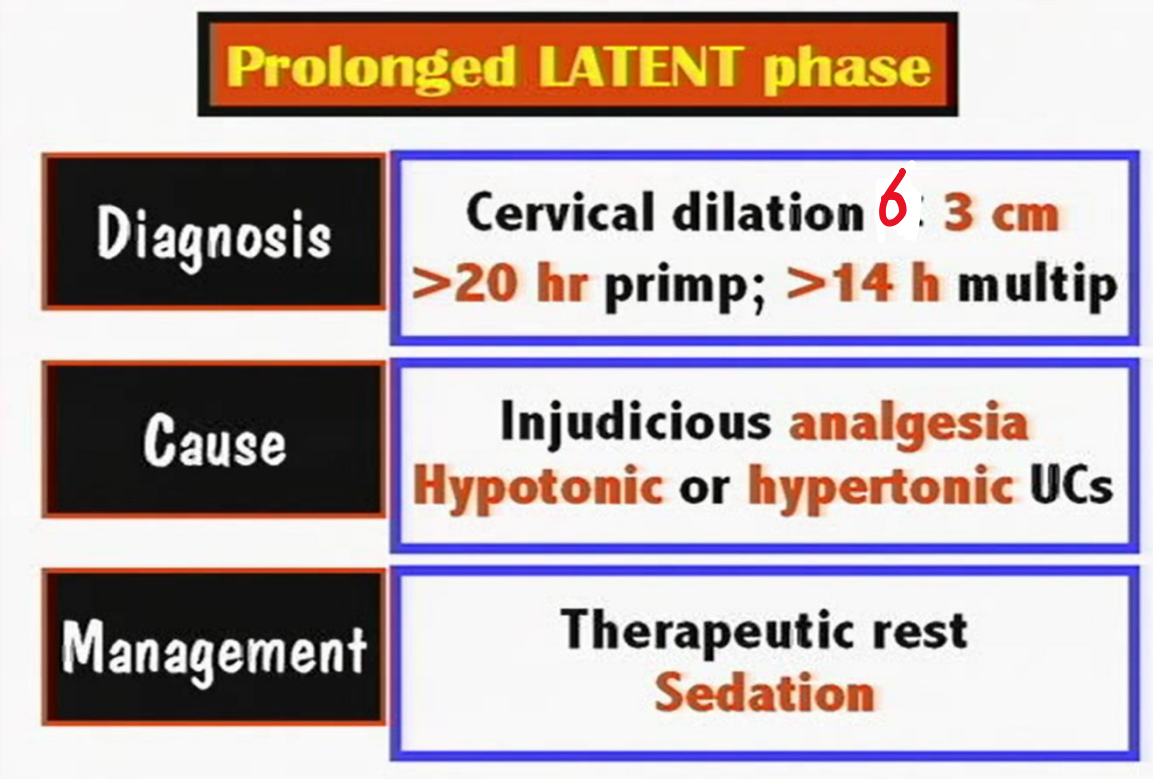
- Duration has extended to >20 h in a primipara or to >14 h in a multipara.

- Cause:

- Latent-phase abnormalities are most commonly caused by injudicious analgesia.

- Other causes are contractions, which are hypotonic (inadequate frequency, duration, or intensity) or hypertonic (high intensity but inadequate duration or frequency).

- Management: This involves therapeutic rest and sedation.



B. Prolonged or Arrested Active Phase:

- Diagnosis:

- Cervical dilation is >6 cm.

- Prolongation (protraction) is diagnosed if cervical dilation is < 1cm/2 hrs. Prolonged active phase is an indication for IV oxytocin but not for cesarean delivery.

- Arrest is diagnosed if membranes are ruptured and cervical dilation has not changed for ≥ 4 h with adequate uterine contractions or ≥ 6 h with inadequate uterine contractions.

Disorders of the active phase of labor		
Diagnosis	**Clinical features**	**Treatment**
Protraction	• Cervical change slower than expected • ± Inadequate contractions	Oxytocin
Arrest	• No cervical change for ≥4 hours with adequate contractions OR • No cervical change for ≥6 hours with inadequate contractions	Cesarean delivery

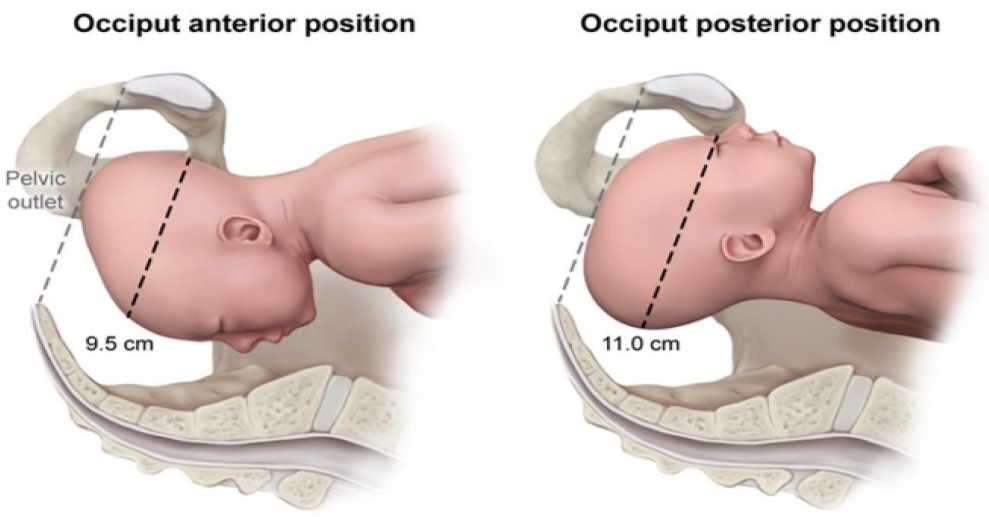
- Causes:

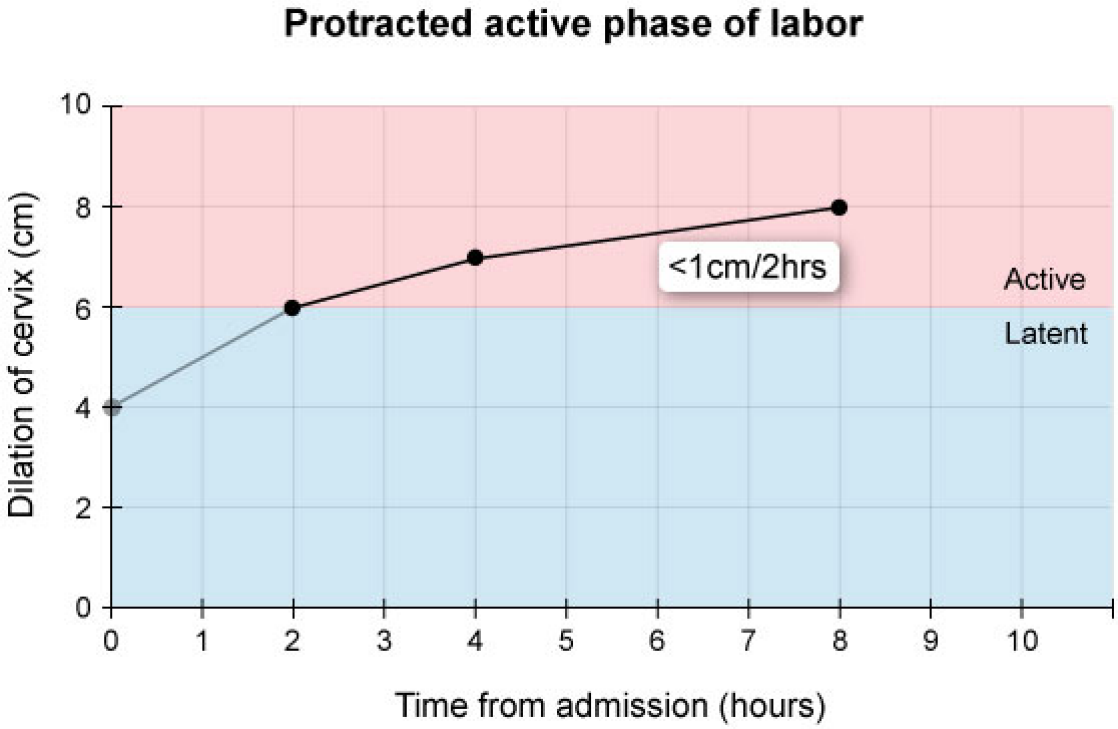
- Active-phase abnormalities may be caused by either:

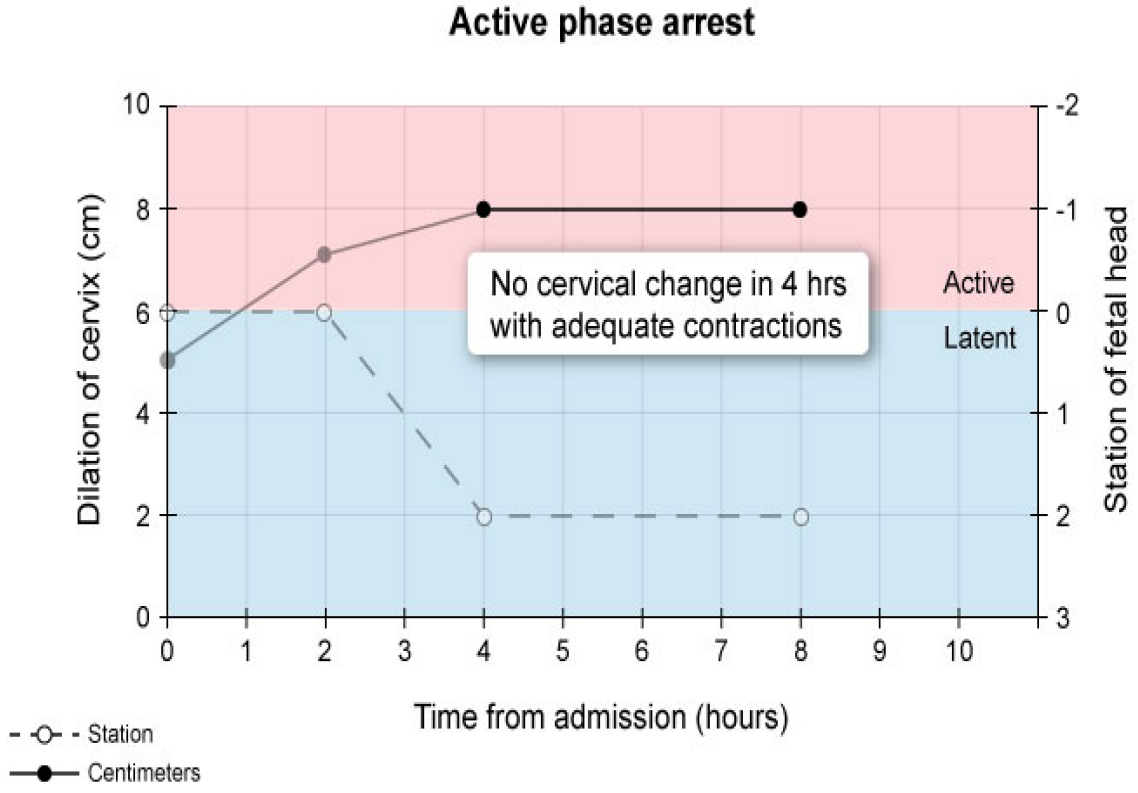
  - Abnormalities of the Passenger → cephalopelvic disproportion, in which the fetal head is too large to fit through the maternal pelvis. Cephalopelvic disproportion is more common in late-term pregnancies (>41 weeks gestation) or in cases of fetal anomaly or malposition (occiput posterior).

  - Abnormalities of the Pelvis (bony pelvis size).

  - Abnormalities of Powers (dysfunctional or inadequate uterine contractions).




Protracted active phase of labor
Dilation of cervix (cm)
Time from admission (hours)
<1cm/2hrs
Active
Latent


Active phase arrest
Dilation of cervix (cm)
Station of fetal head
Time from admission (hours)
No cervical change in 4 hrs
with adequate contractions
Active
Latent
Station
Centimeters

C. Prolonged Second Stage:

- Diagnosis:

- When there is insufficient fetal descent after pushing ≥ 3 hours in nulliparous patients or ≥ 2 hours in multiparous patients.

- With epidural analgesia add additional 1 hour.

- Cause:

- Same as active-phase abnormalities: Passenger, Pelvis, or Powers.

- The most common cause of a prolonged or arrested second stage is fetal malposition. The optimal fetal position is occiput anterior as it facilitates the cardinal movements of labor. Deviations from this position (occiput transverse, occiput posterior) can cause cephalopelvic disproportion and arrest of the second stage.

- Management:

- Involves assessment of uterine contractions and maternal pushing efforts. Use IV oxytocin or enhanced coaching as needed.

- If they are both adequate, assess whether the fetal head is engaged:
  - If the head is not engaged, proceed to emergency cesarean.
  - If the head is engaged, consider a trial of either obstetric forceps or a vacuum extractor delivery.

D. Prolonged Third Stage:

- Diagnosis:

- Failure to deliver the placenta within 30 minutes.

- Cause:

- May be inadequate uterine contractions.

- If the placenta does not separate, in spite of IV oxytocin stimulation of myometrium contractions, think of abnormal placental implantation (placenta accreta, placenta increta, and placenta percreta).

- Management:

- May require manual placental removal or rarely even hysterectomy.

Obstetric complication during labor

Prolapsed Umbilical Cord

- Umbilical cord prolapse is an obstetric emergency because if the cord gets compressed, fetal oxygenation will be jeopardized, with potential fetal death.

- Prolapse can be occult (the cord has not come through the cervix but is being compressed between the fetal head and the uterine wall), partial (the cord is between the head and the dilated cervical os but has not protruded into the vagina), or complete (the cord has protruded into the vagina).

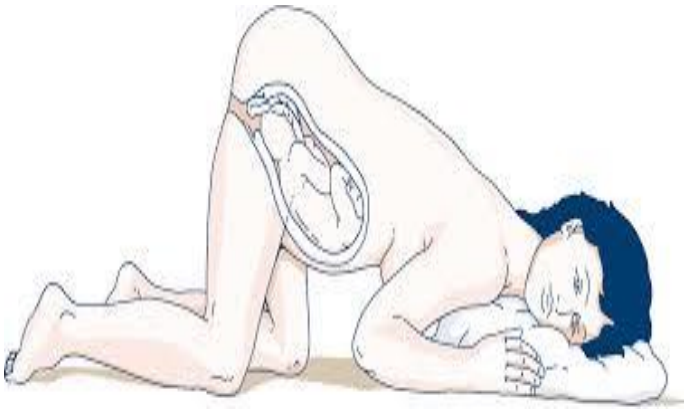
- Risk Factors:

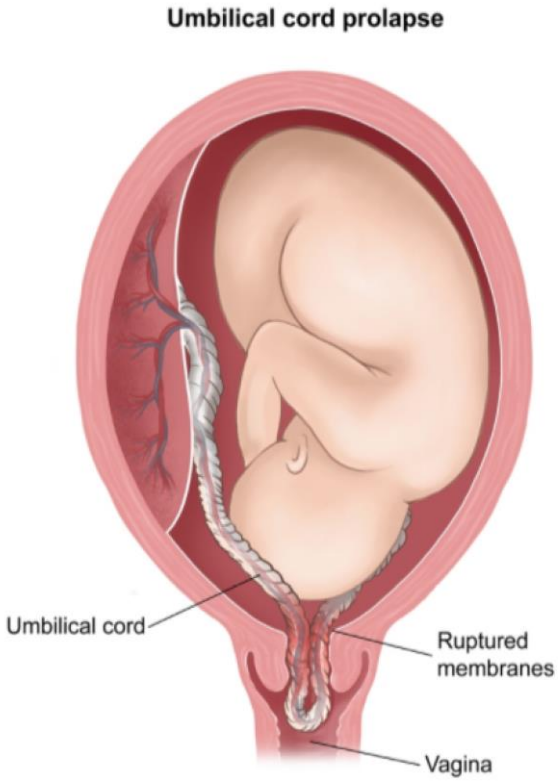
- Rupture of membranes with the presenting fetal part not applied firmly to the cervix, malpresentation.

- Management:

- Do not hold the cord or try to push it back into the uterus.

- Place the patient in knee-chest position, elevate the presenting part, avoid palpating the cord, and perform immediate cesarean delivery.



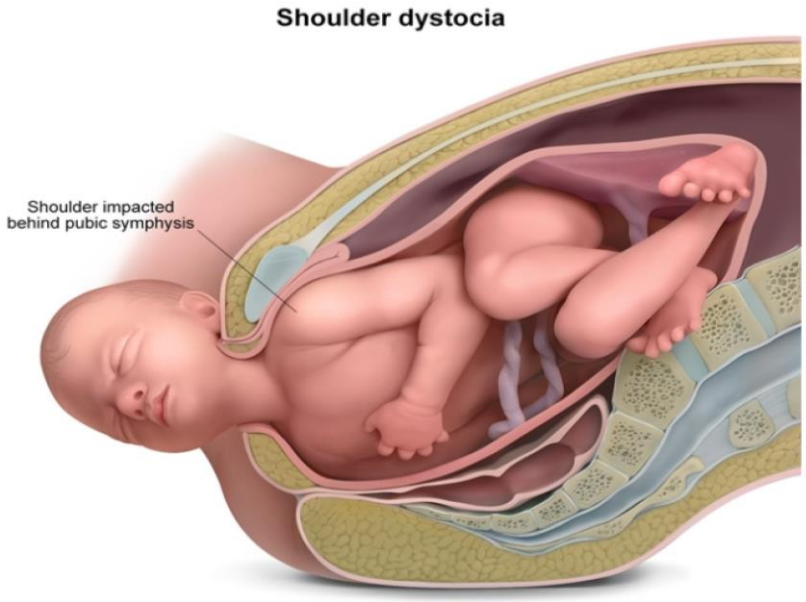


Shoulder Dystocia

- Diagnosis:

- This diagnosis is made when delivery of the fetal shoulders is delayed after delivery of the head.

- It is usually associated with fetal shoulders in the anterior-posterior plane, with the anterior shoulder impacted behind the pubic symphysis.



- Risk Factors:

- Include maternal diabetes, obesity, and postdates pregnancy, which are associated with fetal macrosomia.

- Management:

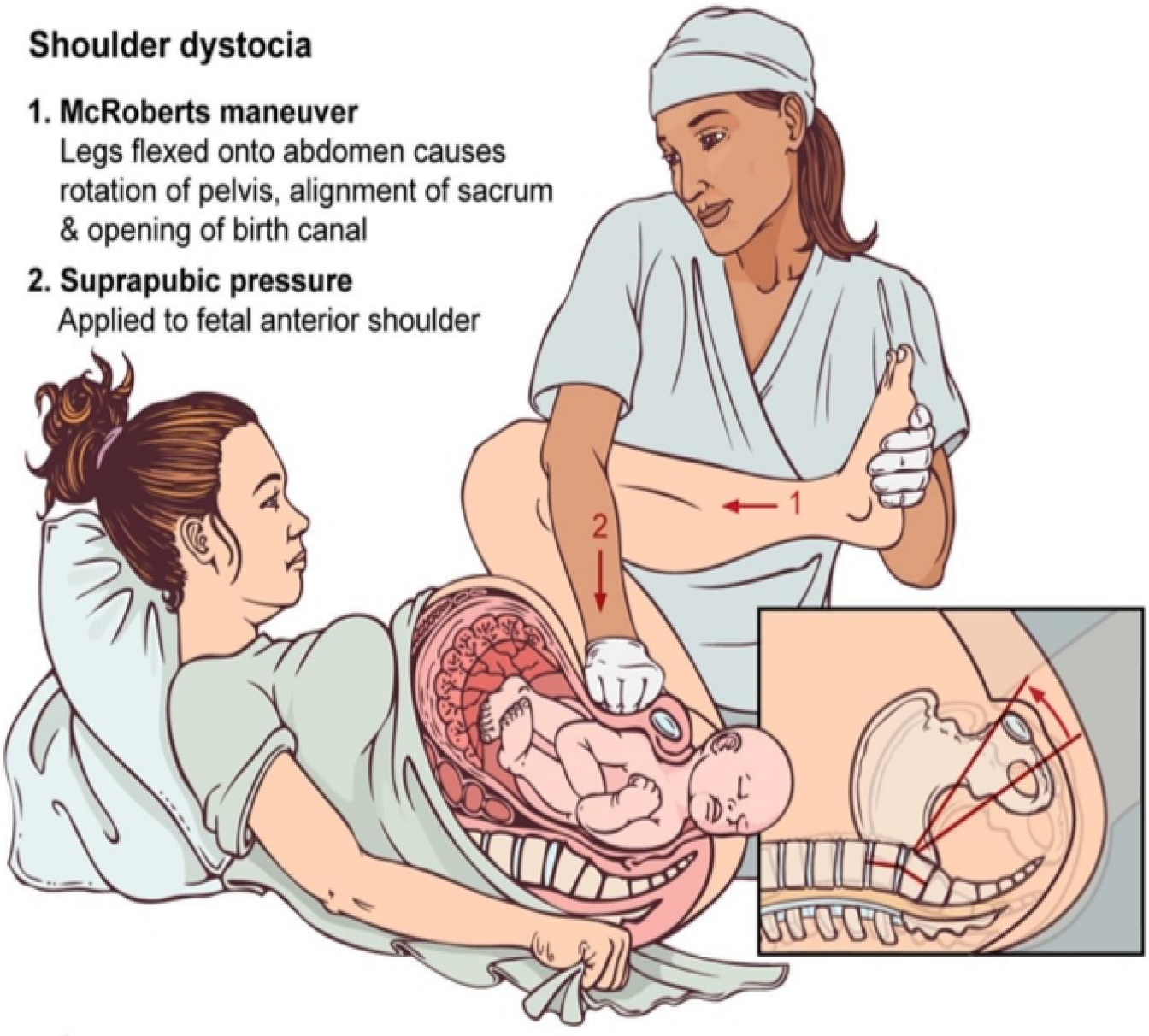
- Maneuvers help dislodge the anterior shoulder or reorient the infant to deliver through the widest diameter of the bony pelvis.

- The initial steps in relieving a shoulder dystocia are the McRoberts maneuver (flexing the hips back against the abdomen and applying suprapubic pressure).

- The McRoberts maneuver flattens the sacral promontory and decreases obstruction through the bony pelvis.

- Suprapubic pressure may dislodge the anterior shoulder and allow passage of the infant through the widest diameter of the maternal pelvis.

- The combination of these maneuvers relieves almost half of shoulder dystocias without further intervention.



Obstetric Lacerations

- Perineal lacerations are common after vaginal delivery and typically cause perineal edema and pain with urination.
- Uncomplicated perineal lacerations (no fever or purulence) are managed conservatively (nonsteroidal anti-inflammatory drugs, sitz baths).

- Perineal lacerations are classified by the extent of tissue disruption between the vaginal introitus and the anus:

A. First degree:

- Involve only the vaginal mucosa.
- Suture repair is often not needed.

B. Second degree:

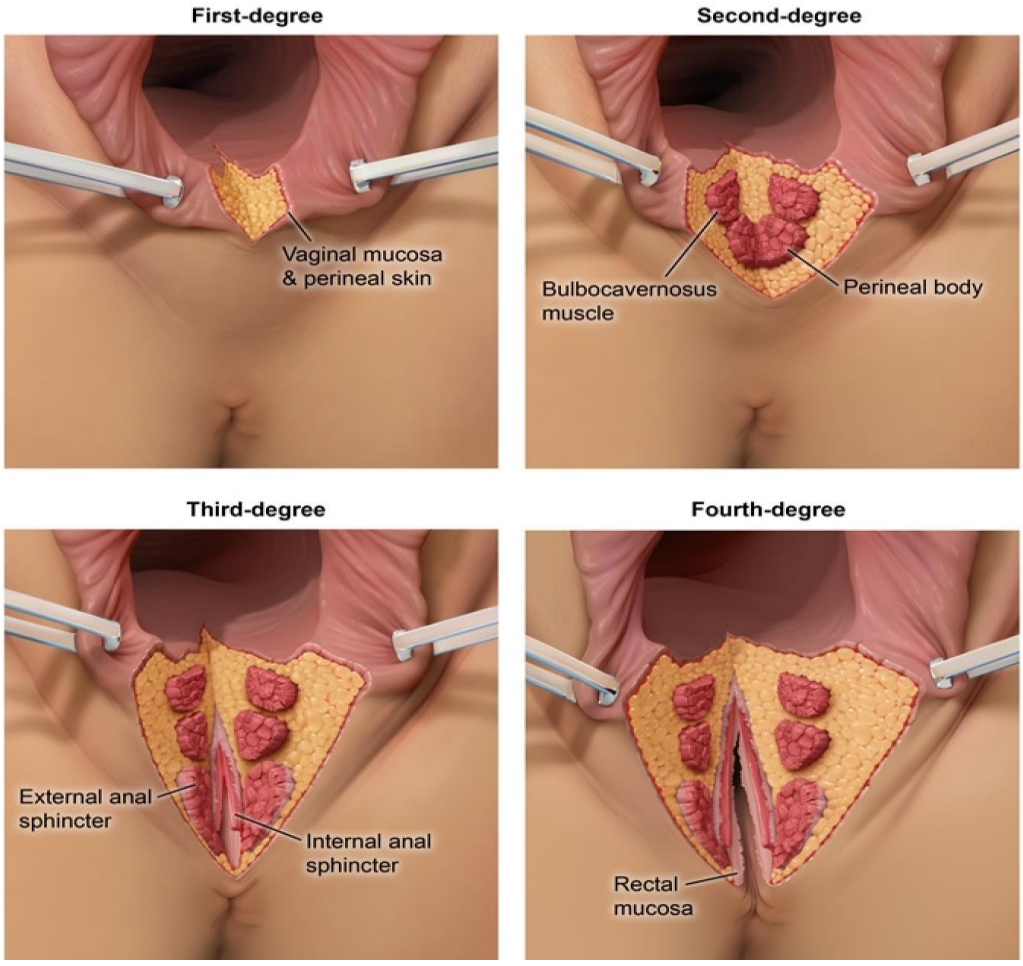
- Involve the vagina + the muscles of the perineal body but do not involve the anal sphincter.
- Suturing is necessary.

C. Third degree:

- Involve the vagina, the perineal body + anal sphincter but not the rectal mucosa.
- Suturing is necessary to avoid anal incontinence.

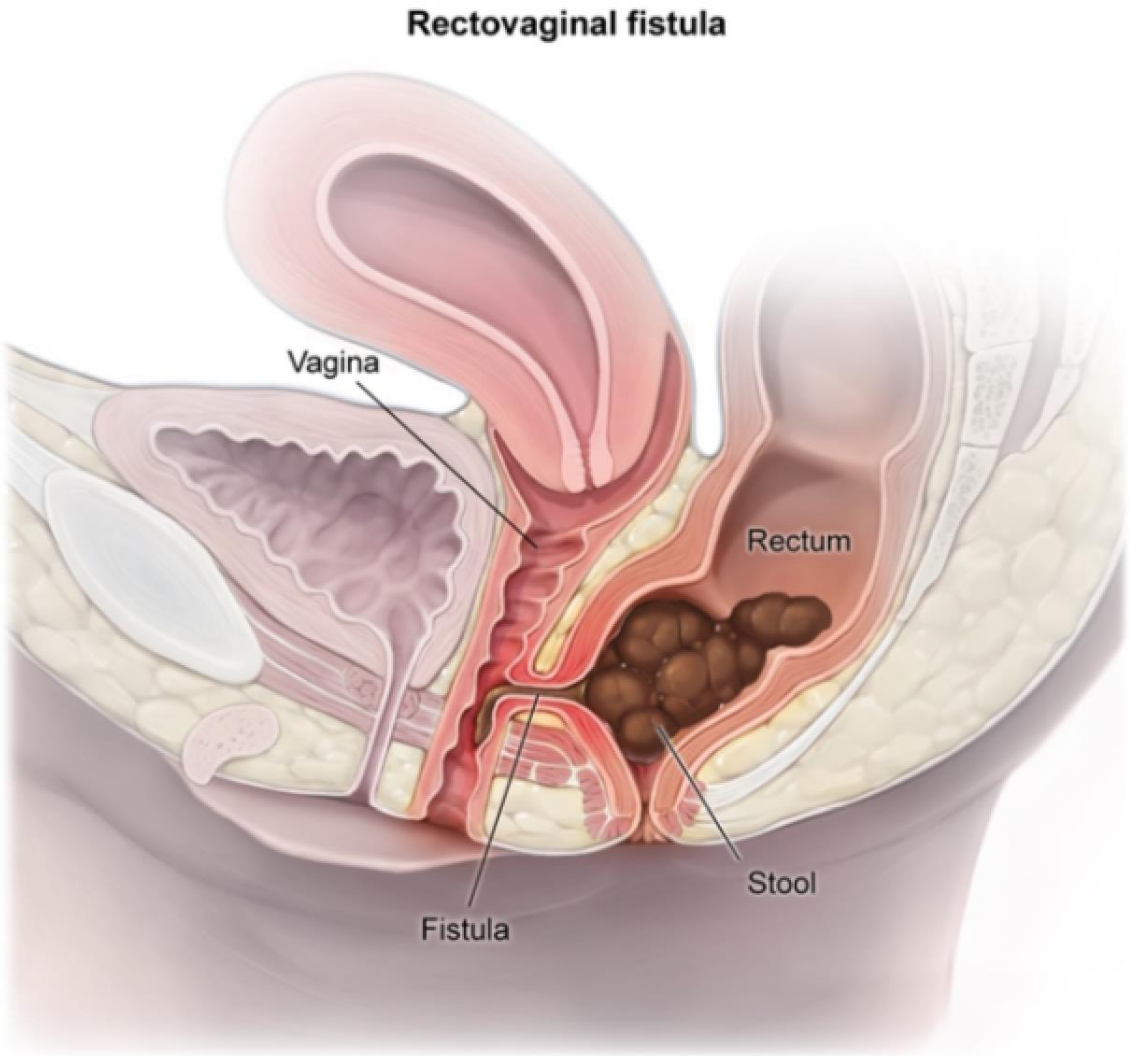
D. Fourth degree:

- Involve all the way from the vagina through to the rectal mucosa.
- Complications of faulty repair or healing include rectovaginal fistula.



❖ N.B:

- Obstetric injury is the most common cause of rectovaginal fistula (RVF), which may present within the first 2 weeks postpartum. RVFs occur most often after third- or fourth-degree laceration, inadequate wound repair or wound breakdown, and infection.
- In less industrialized countries, RVFs occur due to poor intrapartum care and a prolonged second stage of labor, which causes ischemic pressure necrosis of the rectovaginal septum from fetal head compression.
- RVF presents with incontinence of flatus or fecal material through the vagina, causing a malodorous brown/tan discharge.
- Diagnosis is usually confirmed by visual examination showing dark red, velvety rectal mucosa on the posterior vaginal wall.
- If an RVF is suspected but not clearly visible, anoscopy may help visualize the opening.
- Definitive treatment is surgical repair of the fistulous tract.



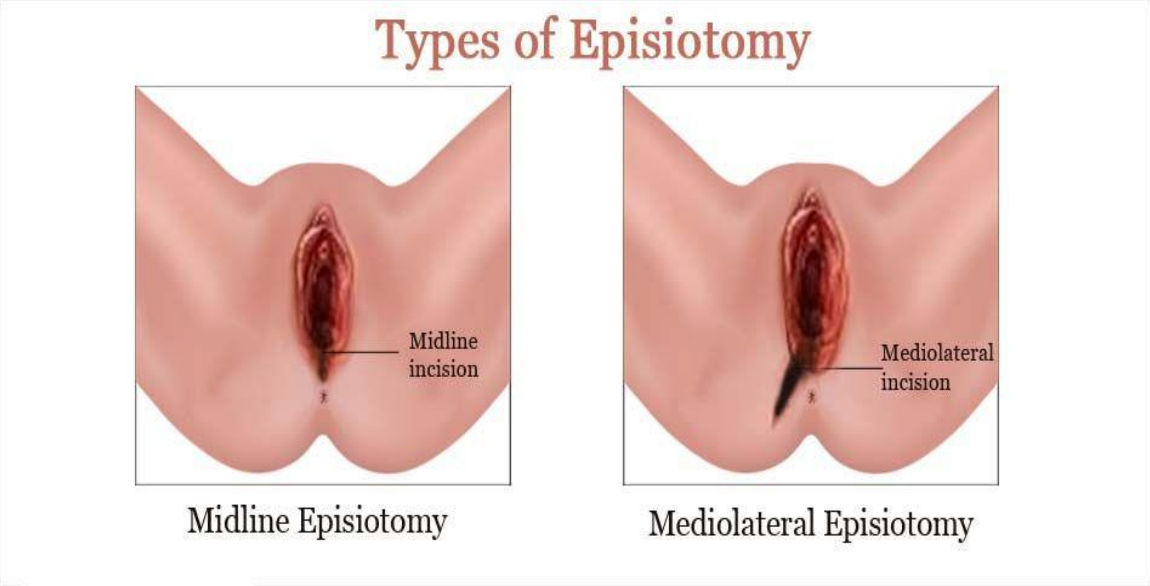
Episiotomy

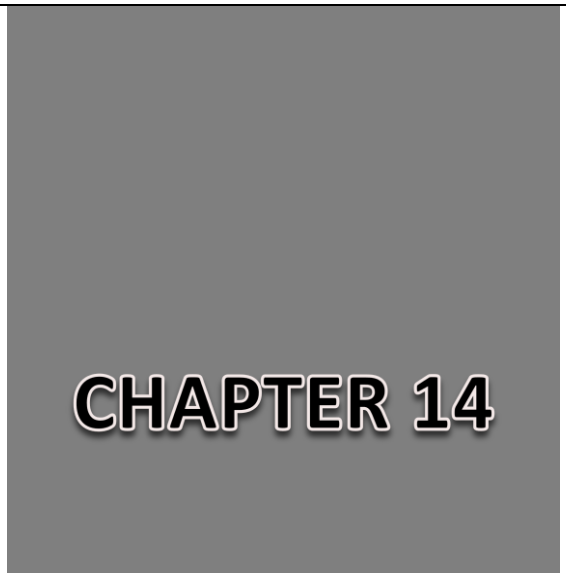
- This is a surgical incision made in the perineum to enlarge the vaginal opening and assist in childbirth.
- It is one of the most common female surgical procedures.
- It is not practiced routinely in the United States today because the arguments made in its favor have not been shown to have scientific support.
- Disadvantages:

- More perineal pain than with lacerations.
- Longer return to sexual activity.
- More extensions into the anal sphincter and rectum.

- Possible indications:

- Shoulder dystocia, non-reassuring fetal monitor tracing, forceps or vacuum extractor vaginal delivery, vaginal breech delivery, narrow birth canal.



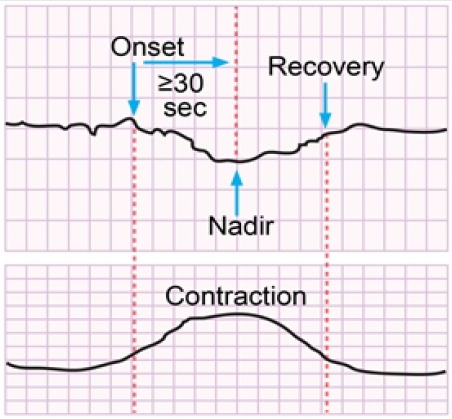
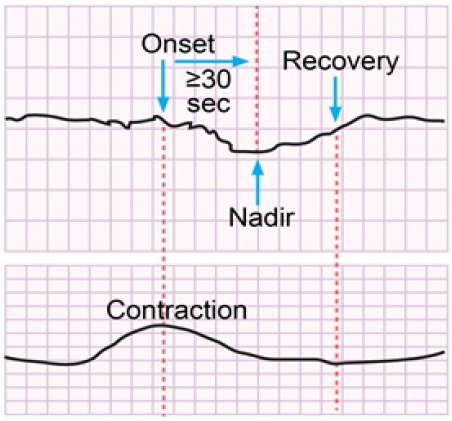
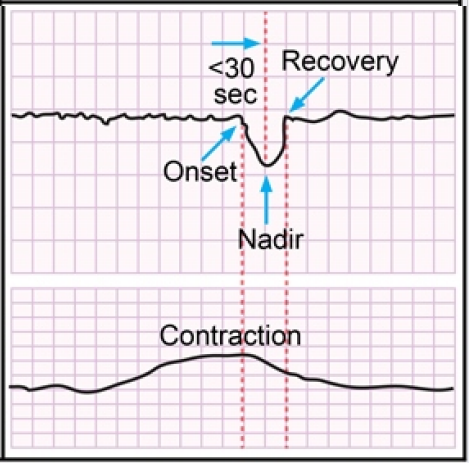


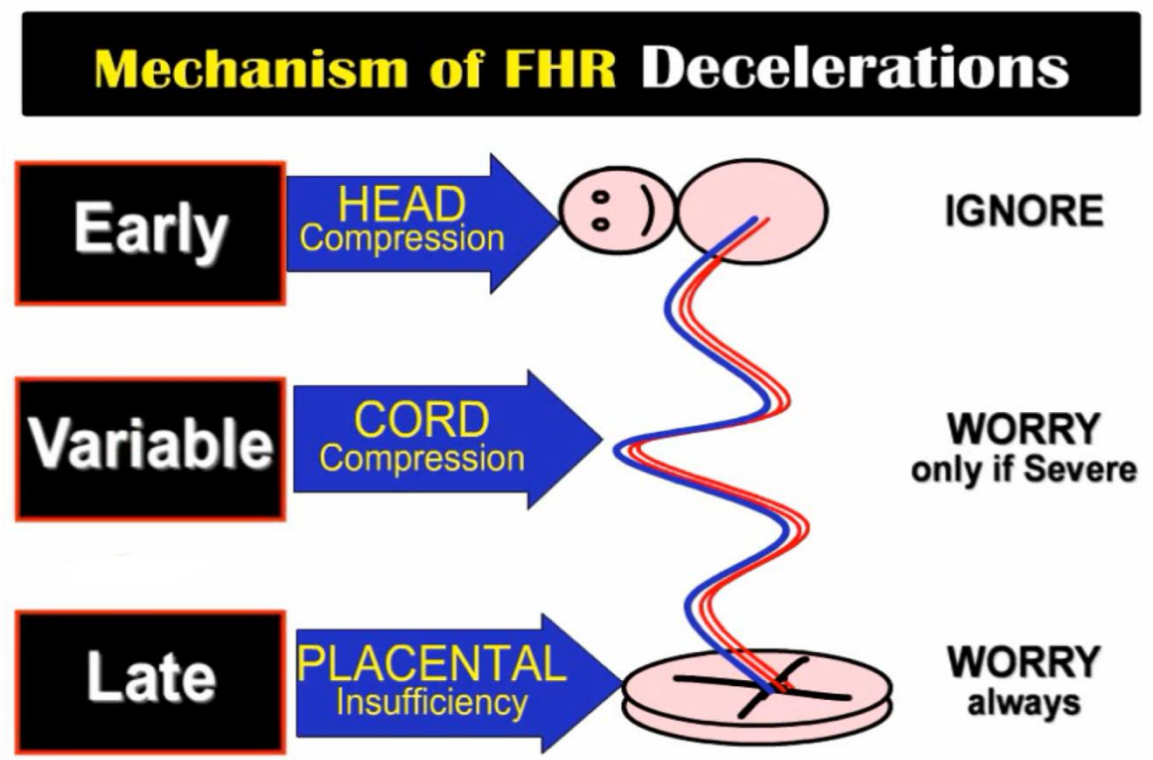
Intrapartum Fetal Monitoring

Intrapartum Fetal Monitoring

- Intrapartum electronic fetal heart rate monitoring assesses fetal oxygenation.
- A well- oxygenated fetal brain provides autonomic control to the heart, resulting in a fetal heart rate of 110-160/min with moderate variability (average amplitude 6-25/min).

Intrapartum fetal heart rate monitoring

Early	**Relationship to contraction** • Symmetric to contraction • Nadir of deceleration corresponds to peak of contraction • Gradual (≥30 sec from onset to nadir) **Etiology** • Fetal head compression • Can be normal fetal tracing	
Late	**Relationship to contraction** • Delayed compared to contraction • Nadir of deceleration occurs after peak of contraction • Gradual (≥30 sec from onset to nadir) **Etiology** • Uteroplacental insufficiency	
Variable	**Relationship to contraction** • Can be but not necessarily associated with contractions • Abrupt (<30 sec from onset to nadir) • Decrease ≥15/min; duration ≥15 sec but <2 min **Etiology** • Cord compression • Oligohydramnios • Cord prolapse	



- Early decelerations are caused by fetal head compression; these occur when the fetal head descends closer to the cervix, which contracts and causes narrowing of the fetal anterior fontanelle. The narrowed anterior fontanelle causes a transient alteration in cerebral blood flow and stimulates a vagal response, which slows the heart rate. Early decelerations are a benign, physiologic finding and do not indicate fetal hypoxia; therefore, these decelerations do not require intervention.

- Variable decelerations are an abrupt decrease in the fetal heart rate to a nadir followed by a rapid return to baseline and are not always associated with contractions. The release of amniotic fluid with rupture of membranes can result in umbilical artery compression that, in turn, can cause variable decelerations.

- Late decelerations are a sign of uteroplacental insufficiency and impending fetal hypoxemia and acidemia.

3-tiered categorization of FHR patterns

Category I NORMAL

- Baseline rate: 110-160 beats/min
- Baseline variability: moderate
- Late or Variable decelerations: absent
- Early decelerations: present or absent
- Accelerations: present or absent

INTERPRETATION:
strongly predictive of normal acid-base status at this time
ACTION: routine monitoring

Category II INDETERMINATE

- All FHR tracings not Category I or III
- May be appreciable fraction of tracings

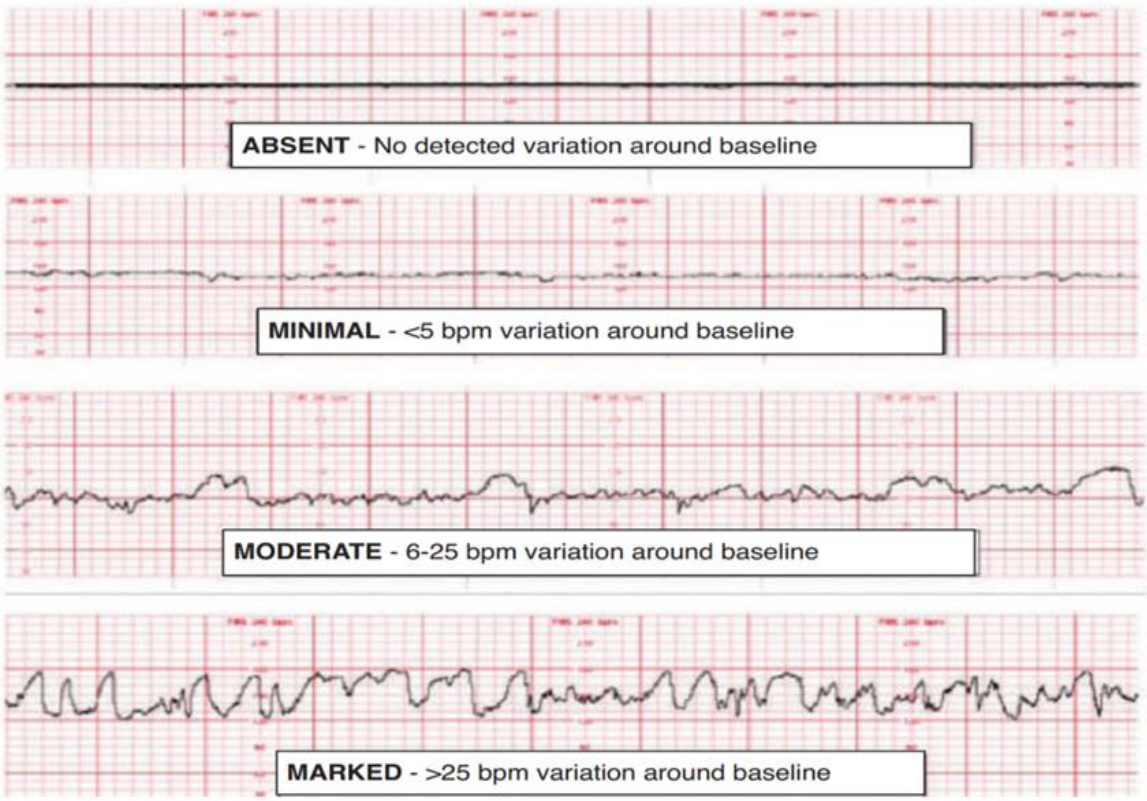
INTERPRETATION:
not predictive of abnormal acid-base status at this time
ACTION: continued surveillance & reevaluation

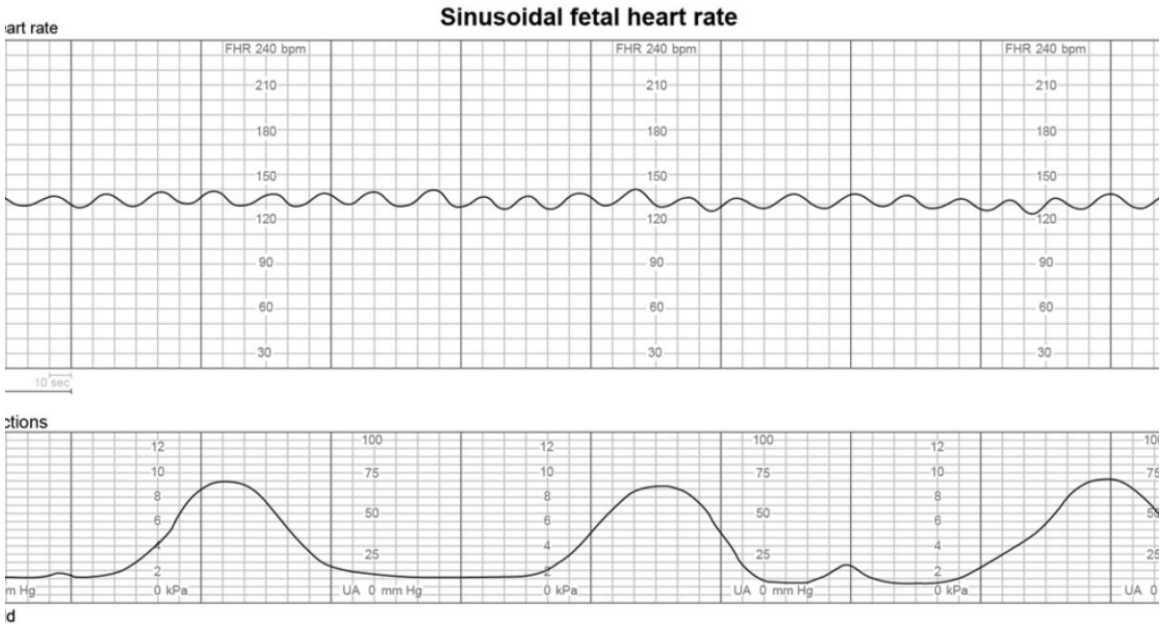
Category III ABNORMAL

ABSENT VARIABILITY plus any of following:

- Recurrent LATE decelerations
- Recurrent VARIABLE decelerations
- Bradycardia
- Sinusoidal pattern

INTERPRETATION:
strongly predictive of abnormal acid-base status at this time
ACTION: intrauterine resuscitation; if no resolution then prompt delivery





- Management:

A. Category I FHR tracing (reassuring):

- Has a low risk of fetal hypoxemia and acidemia and is managed expectantly.

B. Category II FHR tracings:

- Not predictive of abnormal acid-base status at this time and need continued surveillance and reevaluation.

C. Category III FHR tracings:

- Patients with a category III tracing have an increased risk of severe fetal hypoxia (and subsequent hypoxic brain injury or demise) which are likely due to uteroplacental insufficiency and requires urgent intervention to prevent fetal injury and demise.

- The initial management of category III tracings is with maternal repositioning and other intrauterine resuscitative interventions (oxygen administration, intravenous fluids, discontinuing uterotonics) that improve uteroplacental blood flow and fetal oxygenation.

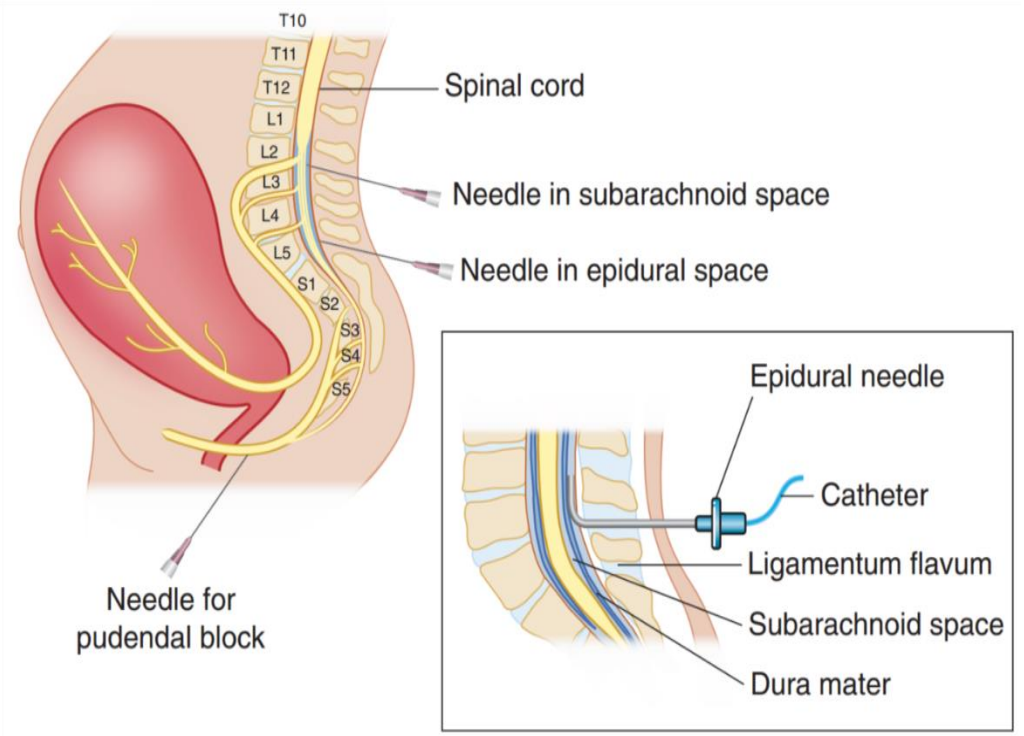
- Patients remote from delivery (not completely [10 cm] dilated) who do not improve with initial resuscitative measures require an immediate cesarean delivery.

CHAPTER 15

Obstetric Anesthesia

Obstetric Anesthesia

- Pain relief from uterine contractions and cervical dilation in stage 1 of labor involves thoracic nerve roots, T10 to T12.
- Pain relief from perineal distention in stage 2 of labor involves sacral nerve roots, S2 to S4.



Comparison OB Anesthesia

	Narcotics	Paracervical Block	Pudendal Block	Epidural Block
When?	Stage 1 Active phase	Stage 1 Active phase	Stage 2	Stage 1 & 2
Prob?	Depression Neonatal	Bradycardia Transitory	Unpredictable May be unilateral	Hypotension Sympath blockade
Mgmt?	Naloxone	Conserv	Local Anesthesia	Ephedrine L lateral

A. Intravenous Agents:

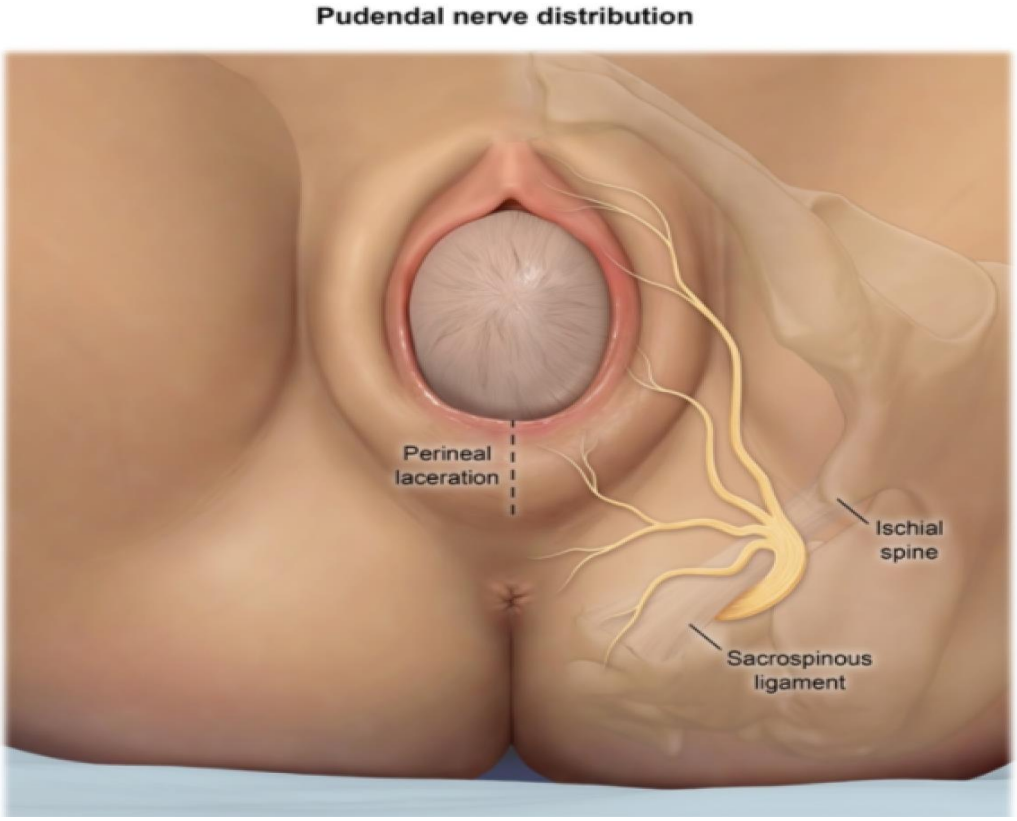
- This includes narcotics and sedatives, which are frequently given in the active phase of labor.
- Advantages include ease of administration and inexpensive cost.
- Disadvantages include neonatal depression if given close to delivery.
- The neonate may need administration of naloxone to reverse the effect.

B. Paracervical Block:

- This is a mode of conduction anesthesia that involves bilateral transvaginal local anesthetic injection to block Frankenhauser's ganglion lateral to the cervix.
- It is administered in the active phase of labor.
- Disadvantages include temporary high levels of local anesthetic in the uterus which may lead to transitory fetal bradycardia, which is managed conservatively.

C. Pudendal Block:

- This is a mode of conduction anesthesia that involves bilateral transvaginal local anesthetic injection to block the pudendal nerve as it passes by the ischial spines.
- It is administered in stage 2 of labor to provide perineal anesthesia.



D. Epidural Block:

- This is a mode of conduction anesthesia that involves injection of local anesthetic into the epidural space to block the lumbosacral nerve roots during both stages 1 and 2 of labor. It is a highly effective modality for pain relief in labor.

- Advantages include use for either vaginal delivery or cesarean section.

- Disadvantages include patchy block from non-uniform spread of the local anesthetic around the nerve roots.

- Complications:

A. Hypotension from peripheral vascular dilation owing to sympathetic blockade:

- Hypotension occurs in up to 10% of epidurals given during labor and can be easily prevented and treated.

- Hypotension occurs when the sympathetic nerve fibers responsible for vascular tone are blocked, resulting in vasodilation (venous pooling), decreased venous return to the right side of the heart, and decreased cardiac output.

- Persistent, untreated hypotension can result in decreased placental perfusion and can lead to fetal acidosis.

- It can be prevented by aggressive intravenous fluid volume expansion prior to epidural placement.

- Treatment includes left uterine displacement (positioning patient on the left side) to improve venous return, additional intravenous fluid bolus, or vasopressor administration.

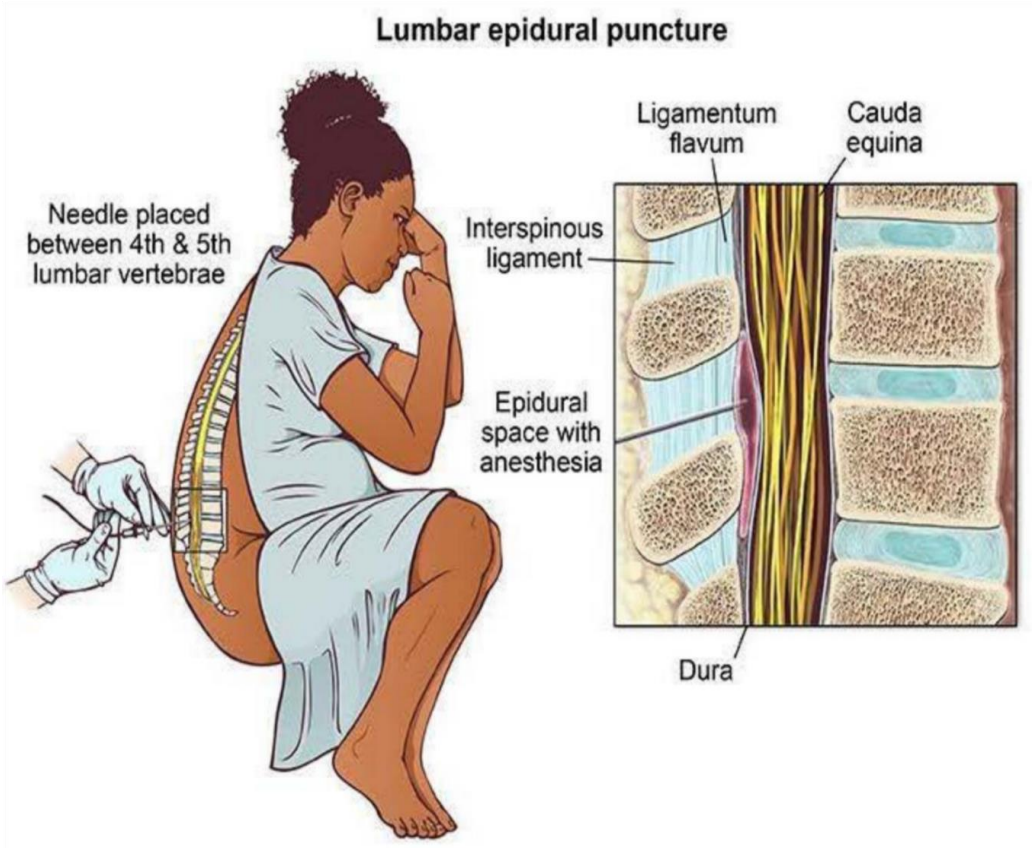
B. Postdural puncture headache:

- During placement of neuraxial anesthesia, unintentional dural puncture may occur, causing cerebrospinal fluid leakage, low cerebrospinal fluid pressure, and resultant slight herniation of the brain and brainstem.

- Therefore, patients can develop a positional headache (headache worsens when sitting or standing and improves with lying down), which correlates with the increased and decreased herniation/pressure on the brain, within 72 hours of the procedure.

- Other associated symptoms may include nausea, vomiting, and neck stiffness.

- Most postdural puncture headaches are self-limited; however, patients with severe symptoms that interfere with activities of daily living can be treated with an epidural blood patch.


Lumbar epidural puncture
Needle placed between 4th & 5th lumbar vertebrae
Ligamentum flavum
Cauda equina
Interspinous ligament
Epidural space with anesthesia
Dura

CHAPTER 16

Postpartum Issues

Postpartum Issues

Postpartum physiologic issues

- Early puerperium is characterized by several physiologic processes that can be mistaken for signs of pathology.

- Immediately after placental delivery, Rigors/shivering occurs commonly and is theorized to be due to thermal imbalance.

- The uterus contracts and becomes firm and globular with the fundus typically 1-2 cm above or below the umbilicus.

- Lochia:

- These are superficial layers of the endometrial decidua that are shed through the vagina during the first 3 postpartum weeks.

- For the first few days the color is red (lochia rubra), changing during the next week to pinkish (lochia serosa), ending with a whitish color (lochia alba) by the end of the second week.

- Cramping:

- The myometrial contractions after delivery constrict the uterine venous sinuses, thus preventing hemorrhage.

- These lower midline cramps may be painful and are managed with mild analgesics.

- Acute postpartum urinary retention (inability to void, urinary dribbling) results from prolonged labor, perineal trauma, and regional analgesia (Regional anesthesia reduces sensory and motor impulses of the sacral spinal cord, which suppresses the micturition reflex and decreases detrusor tone). The condition is typically related to bladder atony, which is temporary and reversible.

- If postpartum examination is normal, only routine postpartum care is indicated. This includes perineal care, pain management, a voiding trial, and lactation support. Fundal and perineal pad checks should be performed to screen for signs of postpartum hemorrhage.

- Breast engorgement is common 3-5 days after delivery when colostrum is replaced by milk. Symptoms include breast fullness, tenderness, and warmth, without fever. Improvement is expected as breastfeeding is established.

- Breast feeding:

- Lactation is associated with temporary anovulation, so contraceptive use may be deferred for 3 months. A definitive method should be used after that time.

- Combined estrogen-progestin formulations (pills, patch, vaginal ring) should not be used in breast-feeding women because of the estrogen effect of diminishing milk production.

- In nonlactating women, they should be started after 3 weeks postpartum to allow reversal of the hypercoagulable state of pregnancy and thus decrease the risk of deep venous thrombosis.

❖ N.B:

- Rapid cessation of breastfeeding may lead to breast engorgement.
- Engorgement results when milk production exceeds release.
- Examination shows bilateral swollen, firm, painful breasts with no erythema; patients with engorgement are also afebrile.
- Patients who desire lactation suppression are advised to wear a supportive bra, avoid nipple stimulation and manipulation, and use ice packs and nonsteroidal anti-inflammatory drugs to reduce inflammation and pain.

Postpartum period	
Normal findings	• Transient rigors/chills • Peripheral edema • Lochia rubra • Uterine contraction & involution • Breast engorgement
Routine care	• Rooming-in/lactation support • Serial examination for uterine atony/bleeding • Perineal care • Voiding trial • Pain management

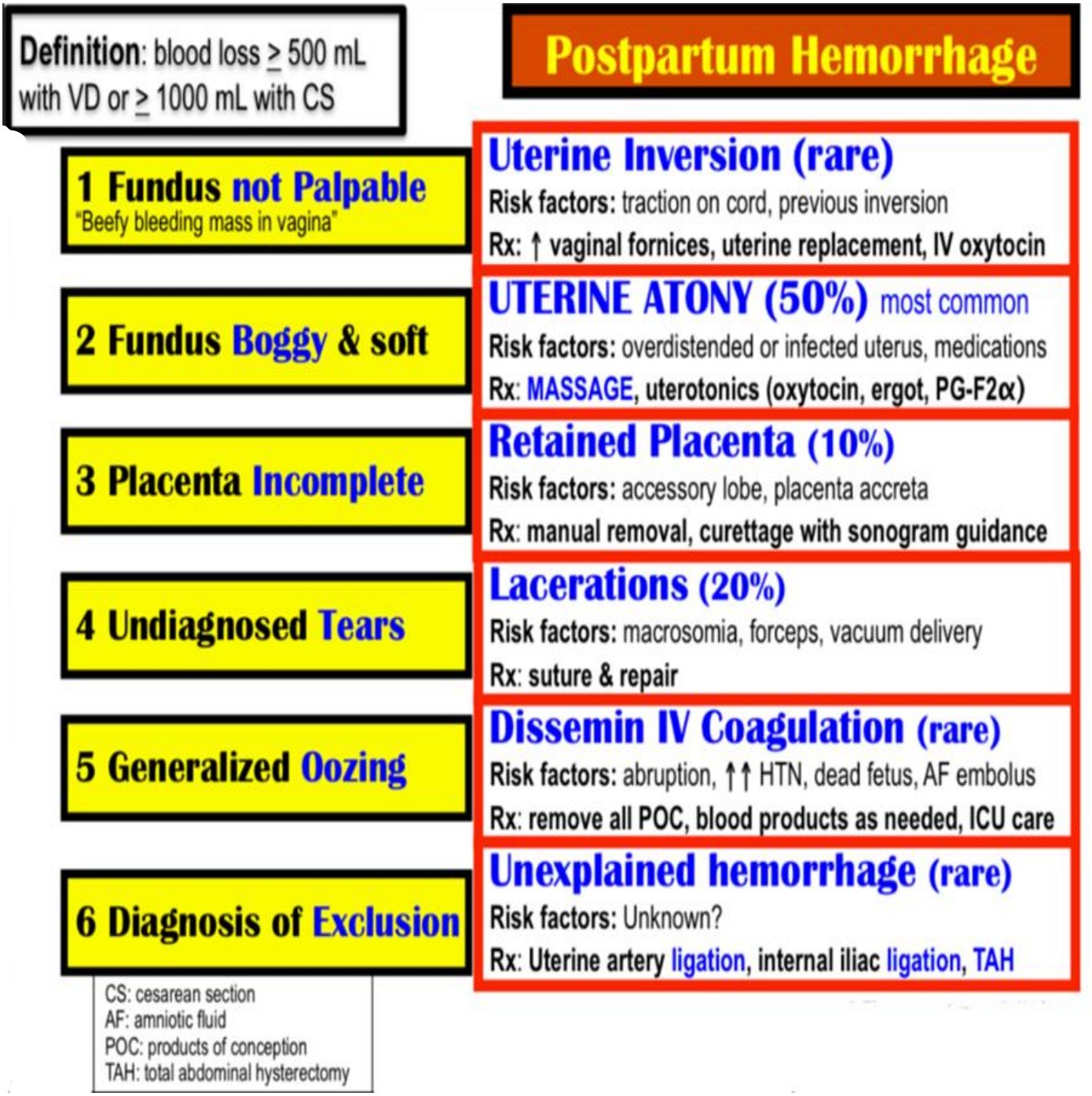
\

Postpartum hemorrhage

- Definition:

- Vaginal delivery blood loss ≥500 mL or cesarean section blood loss ≥1,000 mL.

- Postpartum hemorrhage (PPH) is an obstetrical emergency and a major cause of maternal mortality. Hemostasis after placental delivery is achieved by clotting and by compression of the placental site blood vessels by myometrial contraction. Disruption of either of these processes can lead to PPH.



A. Uterine Atony (80%):

- This is the most common cause of excessive postpartum bleeding.

- Risk Factors:

- Atony occurs when the uterus becomes fatigued (prolonged labor), over-distended (fetal weight >4000, multiple gestation), or unresponsive to oxytocin from oxytocin receptor saturation.

- Other risk factors for atony include operative (forceps-assisted) vaginal delivery and hypertensive disorders.

- Clinical Findings:

- The uterus fails to contract and is soft (boggy) and enlarged (above the umbilicus) on physical examination.

- Management:

- The management of any postpartum hemorrhage (PPH) begins with assessment of vital signs, intravenous fluids to maintain systolic blood pressure, and often transfusion of appropriate blood products.

- Treatment also begins with bimanual massage and uterotonic medications.

- Bimanual massage involves one hand massaging the uterine fundus abdominally and the other hand compressing and massaging the uterus vaginally.

- The first line uterotonic is oxytocin, which is generally administered via intravenous infusion.

- If heavy bleeding persists, additional medications are administered based on patient-specific contraindications:

A. Tranexamic acid:

- Antifibrinolytic that prevents blood clot breakdown and significantly decreases blood loss if administered within 3 hours of delivery.

- Tranexamic acid has no absolute contraindications but is used with caution in patients with hypercoagulability (inherited thrombophilia) due to the potential increased risk of thromboembolism.

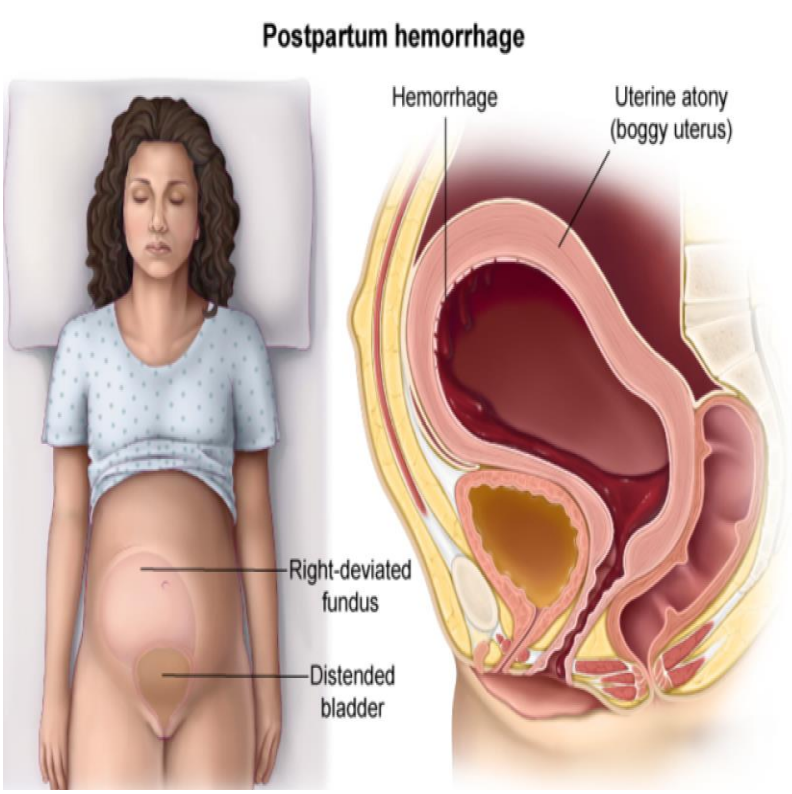
B. Carboprost tromethamine:

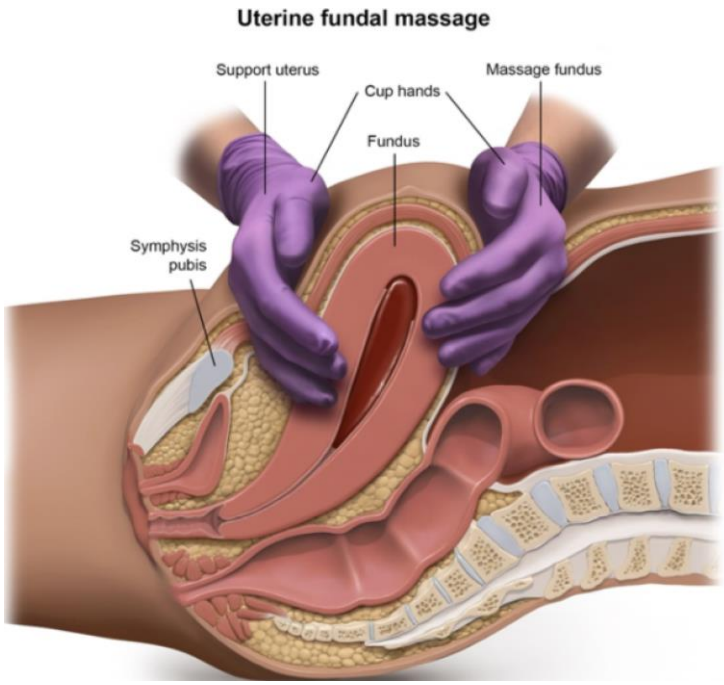
- Second-line uterotonic agent that stimulates contractions to increase uterine tone and decrease bleeding. It is a synthetic prostaglandin analog that can cause bronchospasm; therefore, it is contraindicated in patients with asthma.

C. Methylergonovine:

- Another second-line uterotonic agent that stimulates contractions.

- It is a potent vasoconstrictor and therefore contraindicated in patients with hypertensive disorders due to increased risk of stroke.





B. Lacerations (15%):

- Risk Factors:

- Uncontrolled vaginal delivery (most common), difficult delivery, and operative vaginal delivery.

- Clinical Findings:

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

- Management: Surgical repair.

C. Retained Placenta (5%):

- Risk Factors: Accessory placental lobe (most common) and abnormal trophoblastic uterine invasion (cervix, vagina, perineum).

- Clinical Findings: Missing placental cotyledons in the presence of a contracted uterus.

- Management: Manual removal or uterine curettage under ultrasound guidance.

D. Disseminated Intravascular Coagulation (rare):

- Risk Factors:

- Abruptio placentae (most common), severe preeclampsia, amniotic fluid embolism, and prolonged retention of a dead fetus.

- Clinical Findings:

- Generalized oozing or bleeding from IV sites or lacerations in the presence of a contracted uterus.

- Management:

- Removal of pregnancy tissues from the uterus, intensive care unit (ICU) support, and selective blood-product replacement.

E. Uterine Inversion (rare):

- Uterine inversion is an uncommon but potentially fatal cause of postpartum hemorrhage.

- Risk Factors:

- Myometrial weakness (most common), previous uterine inversion, placenta accrete, and a rapid labor and delivery.

- Uterine inversion can result from excessive fundal pressure and traction on the umbilical cord before placental separation.

- Clinical Findings:

- Beefy-appearing bleeding mass in the vagina and failure to palpate the uterus abdominally.
- The fundus collapses into the endometrial cavity and prolapses through the cervix, resulting in a smooth, round mass protruding through the cervix or vagina. The uterine fundus is no longer palpable transabdominally.

- Management:

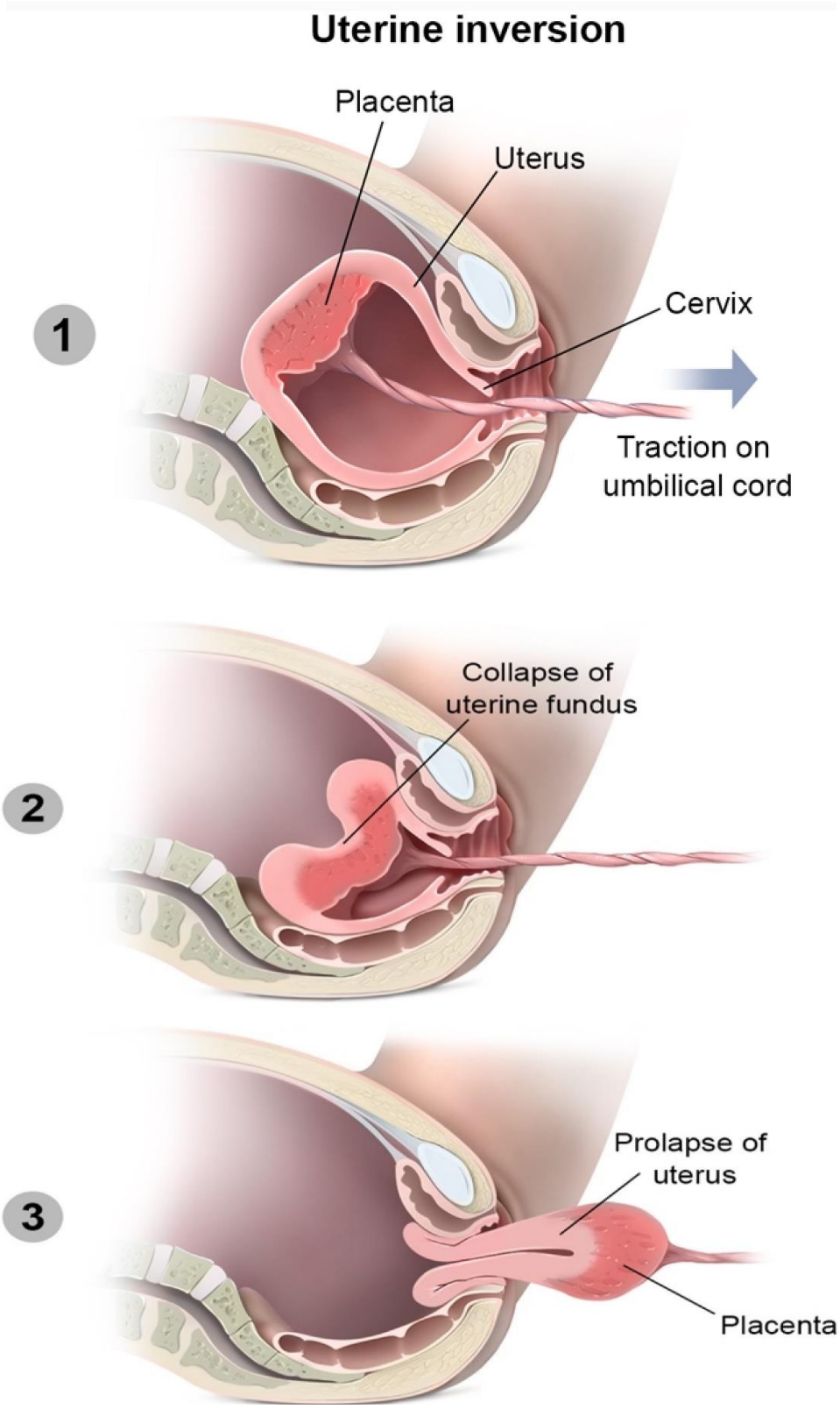
- Uterine inversion is treated with immediate manual replacement of the uterus by placing a hand in the vagina and pushing along the axis of the vagina towards the cervix.

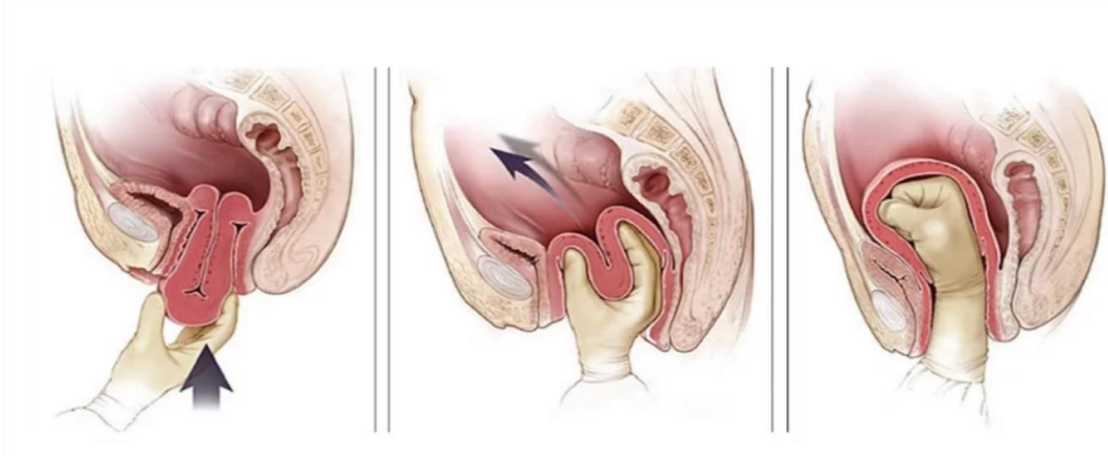
- Delay in reduction of the prolapse can make uterine replacement more difficult as the uterus can become edematous and the cervix can contract around the inverted uterus.

- If the placenta is still attached to the uterus, it should not be removed until after the uterus is replaced due to risk of massive hemorrhage.

- Uterine atony is commonly encountered after the uterine replacement and subsequent placental removal. Uterotonics (oxytocin, misoprostol) cause uterine contraction and should be administered after uterine replacement to prevent further hemorrhage and recurrence of the prolapse.

- As uterine relaxation is necessary for uterine replacement, uterotonic administration prior to replacement may make uterine replacement impossible to perform.


Uterine inversion
Placenta
Uterus
Cervix
1
Traction on
umbilical cord
Collapse of
uterine fundus
2
Prolapse of
uterus
3
Placenta



F. Unexplained:

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

- Hysterectomy would be a last resort.

❖ N.B:

- Patients with von Willebrand disease may present with a postpartum hemorrhage and prolonged bleeding time.
- Treatment of acute bleeding includes desmopressin.

Sheehan's Syndrome

- During pregnancy, the pituitary enlarges due to estrogen-induced hyperplasia of the lactotrophs. However, the blood supply to the pituitary does not increase proportionally.

- As a result, the enlarged pituitary is vulnerable to ischemia in case of systemic hypotension due to peripartum hemorrhage.

- The most common manifestation of Sheehan syndrome is failure of lactation due to prolactin deficiency.

- Cortisol deficiency manifests rapidly, however, with nausea, postural hypotension, fatigue, and weight loss.

- It also commonly causes hypocortisolism and hypothyroidism. Manifestations of thyroid deficiency may take a few weeks to develop due to the long circulating half-life of thyroxine (5-7 days) and peripheral conversion of thyroxine (T_4) to T_3.

Postpartum fever

- Definition: Fever ≥38 C (≥100.4 F) on ≥2 occasions ≥6 hours apart, excluding first 24 hours post-partum.

Definition: T > 100.4 F (38 C) on ≥ 2 occasions, ≥ 6 hrs apart (not 1st 24 hr).

Postpartum Fever

PPD #0 Lung Crackles
Don't get CXR

PPD #1-2 Flank pain, dysuria
Urinalysis; culture & sensitivity

PPD #2-3 Tender Uterus
Don't get cultures – polymicrobial flora

PPD #4-5 Wound Purulence
Get wound culture

PPD #5-6 Pelvic Mass
Pelvic CT or sonogram

PPD #5-6 Diag of Exclusion
Doppler often false negative

Atelectasis
Risk factors: emerg cesarean under general anesthetic
Rx: ambulation, deep breaths

UTI – Pyelonephritis
Risk factors: ↑ labor, ↑ vaginal exams ↑ catheterizations
Rx: single agent IV antibiotic (cefotetan)

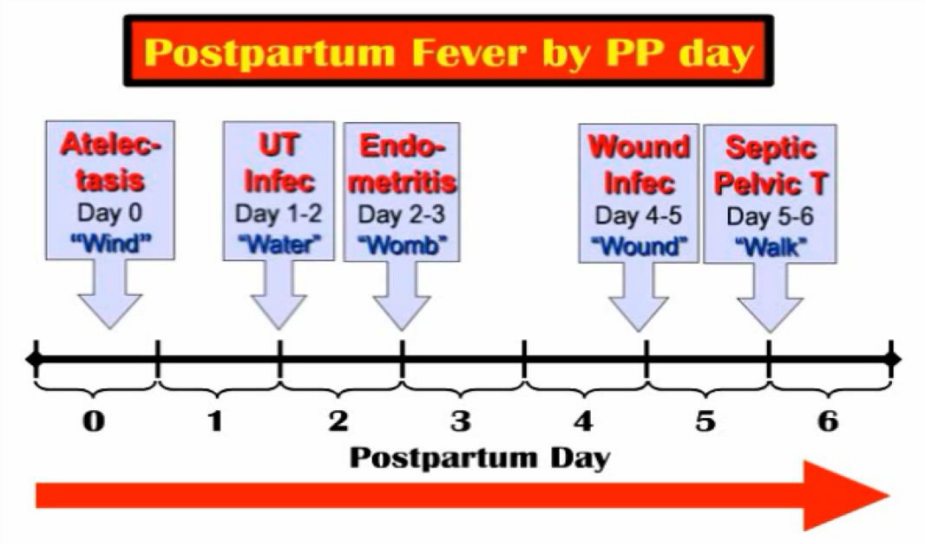
ENDOMETRITIS
Risk factors: ↑ labor, ↑ ROM, ↑ vaginal exams, emerg CS
Rx: IV gentamicin & IV clindamycin until afebrile x24 hrs

Wound Infection
Risk factors: ↑ labor, ↑ ROM, ↑ vaginal exams, emerg CS
Rx: open wound then wet-to-dry packing

Pelvic Abscess
Risk factors: ↑ labor, ↑ ROM, ↑ vaginal exams, emerg CS
Rx: percutaneous drainage by interventional radiology

Septic Pelvic Thrombophlebitis
Risk factors: ↑ labor, ↑ ROM, ↑ vaginal exams, emerg CS
Rx: IV heparin to double baseline PTT

CXR: chest X-ray
CS; cesarean section
ROM: rupture of membranes



A. PP Day 0: Atelectasis

- Risk Factors:

- General anesthesia with incisional pain (most common) and cigarette smoking.

- Clinical Findings:

- Mild fever with mild rales on auscultation.

- Patient is unable to take deep breaths.

- Chest x-rays are unnecessary.

- Management:

- Pulmonary exercises (deep breaths, incentive spirometry) and ambulation.

B. PP Day 1-2: Urinary Tract Infection

- Risk Factors:

- Multiple intrapartum catheterizations and vaginal examinations due to prolonged labor.

- Clinical Findings:

- High fever, costovertebral flank tenderness, positive urinalysis (WBC, bacteria) and urine culture.

- Management:

- Single-agent intravenous antibiotics.

C. PP Day 2-3: Endometritis

- Most common cause of postpartum fever.

- Postpartum endometritis is the result of the inoculation of the uterine cavity by vaginal flora during labor or delivery and is a polymicrobial infection.

- Risk Factors:

- Emergency cesarean section after prolonged membrane rupture and prolonged labor.

- Clinical Findings:

- Moderate-to-high fever with exquisite uterine tenderness.

- Peritoneal signs should be absent and peristalsis should be present.

- Management:

- Treatment of this polymicrobial infection requires broad-spectrum antibiotics: the most appropriate therapy is clindamycin plus gentamicin.

- Treatment should be continued until the patient is afebrile for >24 hours.

- Neither blood nor endometrial cultures are required for diagnosis, but further evaluation is indicated if there is no clinical improvement after 48 hours of antibiotic therapy.

Postpartum endometritis	
Risk factors	• Cesarean delivery • Chorioamnionitis • Group B *Streptococcus* colonization • Prolonged rupture of membranes • Operative vaginal delivery
Clinical features	• Fever >24 hours postpartum • Uterine fundal tenderness • Purulent lochia
Etiology	• Polymicrobial infection
Treatment	• Clindamycin & gentamicin

D. PP Day 4-5: Wound Infection

▪ Risk Factors:

- Emergency cesarean section after prolonged membrane rupture and prolonged labor.

▪ Clinical Findings:

- Persistent spiking fever despite antibiotics, along with wound erythema, fluctuance, or drainage.

▪ Management:

- Intravenous antibiotics for cellulitis.

- Wound drainage with twice-daily, wet-to dry wound packing used for an abscess, anticipating closure by secondary intention.

E. PP Day 5-6: Septic Thrombophlebitis

▪ SPT is a thrombosis of the deep pelvic or ovarian veins that becomes infected.

▪ Several factors predispose postpartum patients to thrombosis:

- Hypercoagulable state of pregnancy.
- Pelvic venous stasis and dilation.
- Endothelial damage from infection and/or trauma during delivery.

▪ Risk Factors:

- Emergency cesarean section after prolonged membrane rupture and prolonged labor.

▪ Clinical Findings:

- Persistent wide fever swings despite broad-spectrum antibiotics with normal pelvic and physical examination.

- Management:

- Because the most common etiology for puerperal fever is endometritis, patients are initially treated empirically with antibiotics. Persistent fever unresponsive to broad-spectrum antibiotic therapy and a negative infectious evaluation (blood and urine cultures, urinalysis) suggest SPT, which is a diagnosis of exclusion.

- Treatment is with anticoagulation and broad-spectrum antibiotics.

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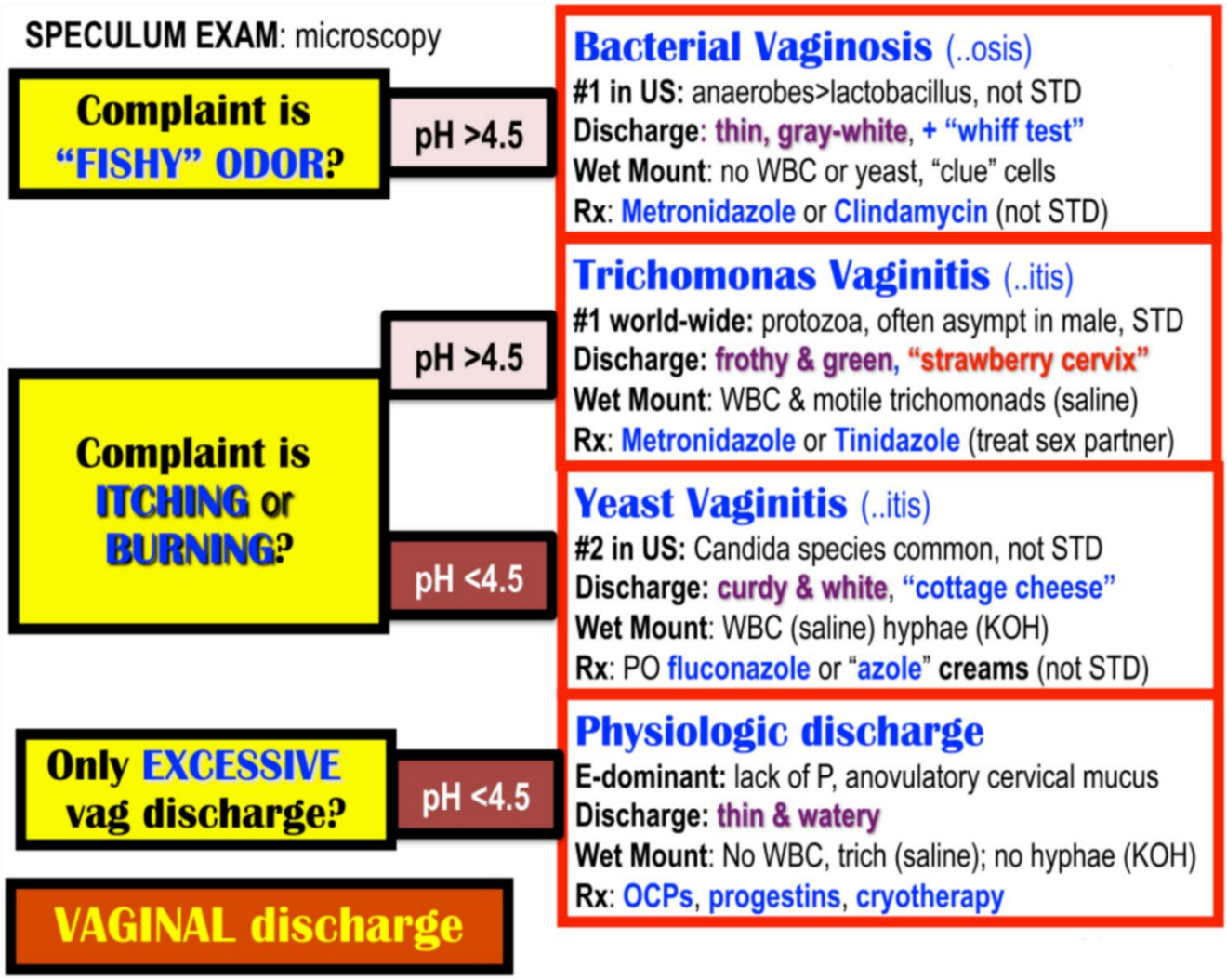
CHAPTER 1

Disorders of the Vagina

Disorders of the Vagina

Vaginal discharge



A. Bacterial Vaginosis:

- This is the most common (50%) cause of vaginal complaints in the United States.
- It is not a true infection but rather an alteration in concentrations of normal vaginal bacteria.
- The normal predominant lactobacilli are replaced by massive increases in concentrations of anaerobic species and facultative aerobes.
- It is not sexually transmitted, but it is associated with sexual activity.

- Symptoms:

- The most common patient complaint is a fishy odor.

- Itching and burning are not present.

- Speculum Examination:

- The vaginal discharge is typically thin, grayish-white.

- No vaginal inflammation is noted (osis not itis).

- The vaginal pH is elevated above 4.5.

- A positive "whiff" test is elicited when KOH is placed on the discharge, releasing a fishy odor.

- Wet Mount:

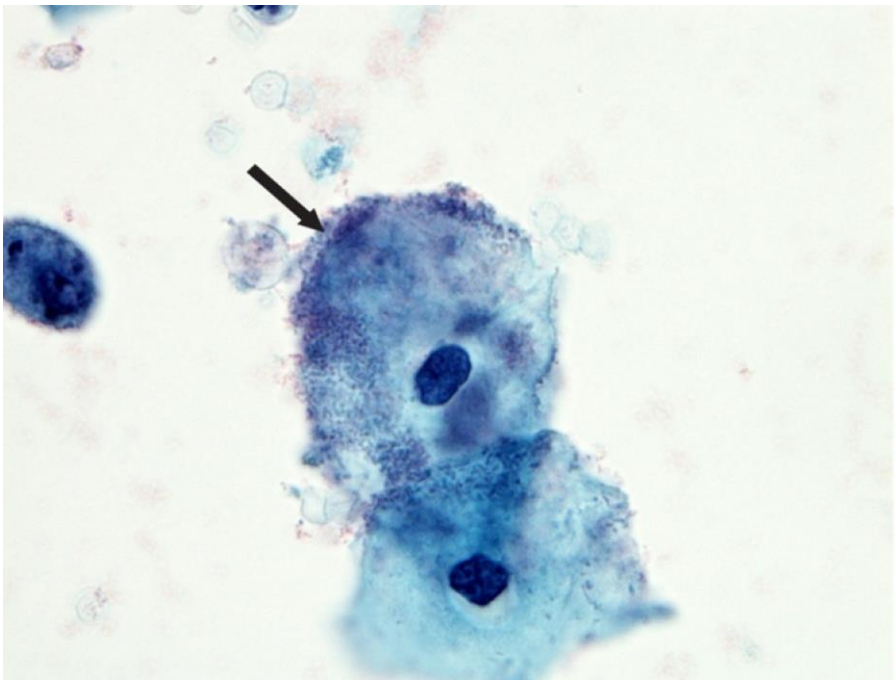
- Microscopic examination reveals "clue cells" on a saline preparation.

- These are normal vaginal epithelial cells with the normally sharp cell borders obscured by increased numbers of anaerobic bacteria.

- Management:

- The treatment of choice is metronidazole or clindamycin administered either orally or vaginally.

- Metronidazole is safe to use during pregnancy, including the first trimester.



B. Trichomonas Vaginitis:

- This is the most common cause of vaginal complaints worldwide and is the second most common sexually transmitted disease (STD) in the United States.

- It is caused by a flagellated pear-shaped protozoan that can reside asymptomatically in male seminal fluid.

- Symptoms:

- The most common patient complaint is vaginal discharge associated with itching, burning, and pain with intercourse.

- Speculum Examination:

- Vaginal discharge is typically frothy and green.

- The vaginal epithelium is frequently edematous and inflamed.

- The erythematous cervix may demonstrate the characteristic "strawberry" appearance. Vaginal pH is elevated >4.5.

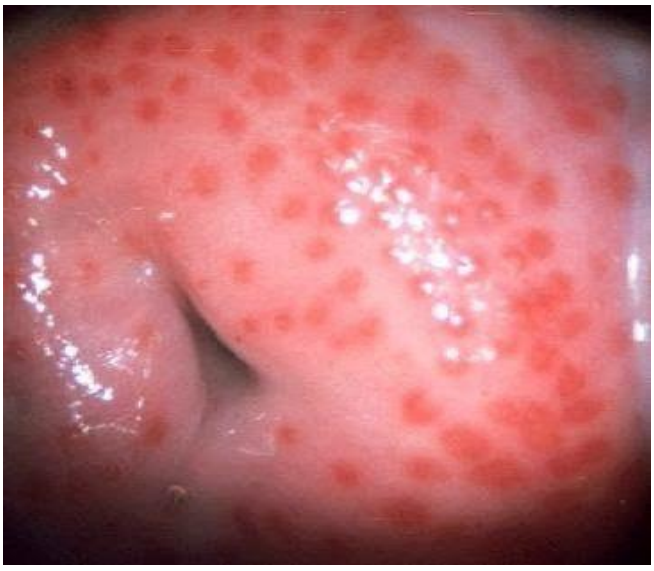
- Wet Mount:

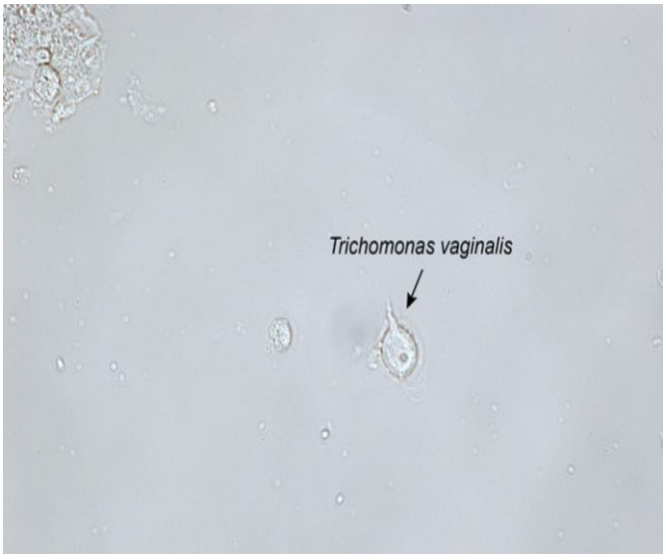
- Microscopic examination reveals flagellated, motile organisms "trichomonads" on a saline preparation.

- WBCs are seen.

- Management:

- The treatment of choice is oral metronidazole for both the patient and her sexual partner.





C. Candida (Yeast) Vaginitis:

- This is the second most common vaginal complaint in the United States.

- The most common organism is Candida albicans.

- It is not transmitted sexually.

- Risk Factors:

- These include diabetes mellitus, systemic antibiotics, pregnancy, obesity, and decreased immunity.

- Symptoms:

- The most common patient complaint is itching, burning, and pain with intercourse.

- Speculum Examination:

- The vaginal discharge is typically thick and white ("cottage cheese" appearance) and adheres to the vaginal walls but may be scant in some patients.

- The vaginal epithelium is frequently edematous and inflamed.

- Vaginal pH is normal <4.5.

- Wet Mount:

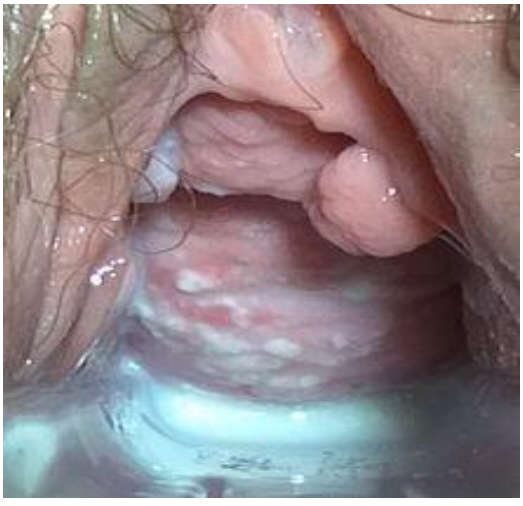
- Microscopic examination reveals pseudohyphae on a KOH prep.

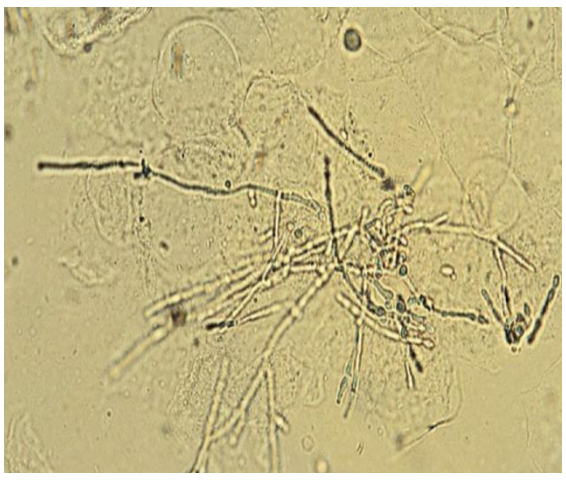
- WBCs are frequently seen.

- Management:

- The treatment of choice is either a single oral dose of fluconazole or vaginal “azole” creams.

- An asymptomatic sexual partner does not need to be treated.





D. Physiologic Discharge:

- This condition is the result of the thin, watery cervical mucus discharge seen with estrogen dominance.

- It is a normal phenomenon and becomes a complaint with prolonged anovulation, particularly in patients with wide eversion of columnar epithelium.

- Risk factors:

- These include chronic anovulatory conditions such as polycystic ovarian syndrome (PCOS).

- Symptoms:

- The most common patient complaint is increased watery vaginal discharge.

- There is no burning or itching.

- Speculum Exam:

- Vaginal discharge is typically thin and watery.

- The vaginal epithelium is normal appearing with no inflammation.

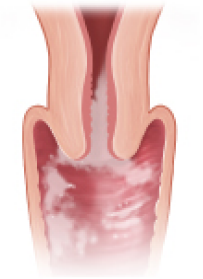
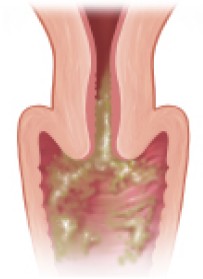
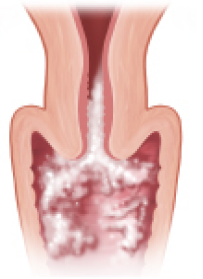
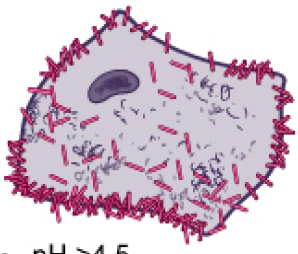
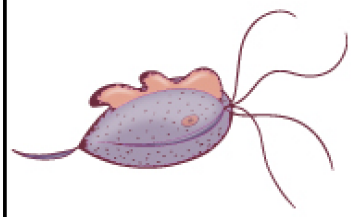
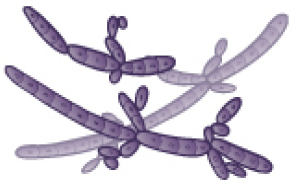
- Vaginal pH is normal (<4.5).

- Wet Mount:

- Microscopic examination reveals an absence of WBCs, “clue cells,” trichomonads, or pseudohyphae.

- Management:

- The treatment of choice is steroid contraception with progestins, which will convert the thin, watery, estrogen-dominant cervical discharge to a thick, sticky progestin-dominant mucus.

Differential diagnosis of vaginitis			
Diagnosis	**Bacterial vaginosis** (*Gardnerella vaginalis*)	**Trichomoniasis** (*Trichomonas vaginalis*)	**Candida vaginitis** (*Candida albicans*)
Examination	 • Thin, off-white discharge with fishy odor • No inflammation	 • Thin, yellow-green, malodorous, frothy discharge • Vaginal inflammation	 • Thick, "cottage cheese" discharge • Vaginal inflammation
Laboratory findings	 • pH >4.5 • Clue cells • Positive whiff test (amine odor with KOH)	 • pH >4.5 • Motile trichomonads	 • Normal pH (3.8-4.5) • Pseudohyphae
Treatment	Metronidazole or clindamycin	Metronidazole; treat sexual partner	Fluconazole

KOH = potassium hydroxide.

CHAPTER 2

Vaginal cancer

Vaginal cancer

Squamous cell carcinoma (SCC)

- Metastatic disease to the vagina is more common than primary disease, with the most common mode of spread being direct extension from the cervix, vulva, or endometrium.
- Women with primary vaginal cancer most commonly have squamous cell carcinoma (SCC).
- The risk factors for primary SCC of the vagina are very similar to those for cervical cancer, most significantly smoking and human papillomavirus (HPV) infection.
- The most common symptoms of vaginal cancer are vaginal bleeding and malodorous vaginal discharge.
- A SCC lesion is generally seen in the upper third of the posterior vagina.
- The definitive diagnosis is made by biopsy of the lesion, and treatment is determined after staging.

Vaginal cancer		
Type	**Squamous cell**	**Clear cell adenocarcinoma**
Epidemiology	Age > 60	Age <20
Risk factors	• HPV 16 or 18 • History of cervical dysplasia or cancer • Cigarette use	In utero exposure to diethylstilbestrol
Location of cancer	Upper 1/3 of the posterior vaginal wall	Upper 1/3 of anterior vaginal wall
Clinical features	• Malodorous vaginal discharge • Postmenopausal or postcoital vaginal bleeding • Irregular mass, plaque, or ulcer on vagina	
Diagnosis	Biopsy	

❖ N.B:

1. Diethylstilbestrol (DES) is a synthetic estrogen that was widely used from 1938-1971 for prevention of spontaneous abortion, premature delivery, and postpartum lactation suppression.

- DES was subsequently banned in the United States due to its lack of efficacy and its potential for carcinogenic and teratogenic effects in offspring.
- Daughters of women who used DES during their pregnancy are at a 40-fold increased risk of developing clear cell adenocarcinoma (CCA) of the vagina and cervix.
- Many of these women have cervical or uterine malformations as well as difficulty conceiving and maintaining pregnancy.
- Males exposed in utero are at risk of cryptorchidism, microphallus, hypospadias, and testicular hypoplasia.

2. Vaginal foreign bodies are a common cause of vulvovaginitis in prepubertal children.

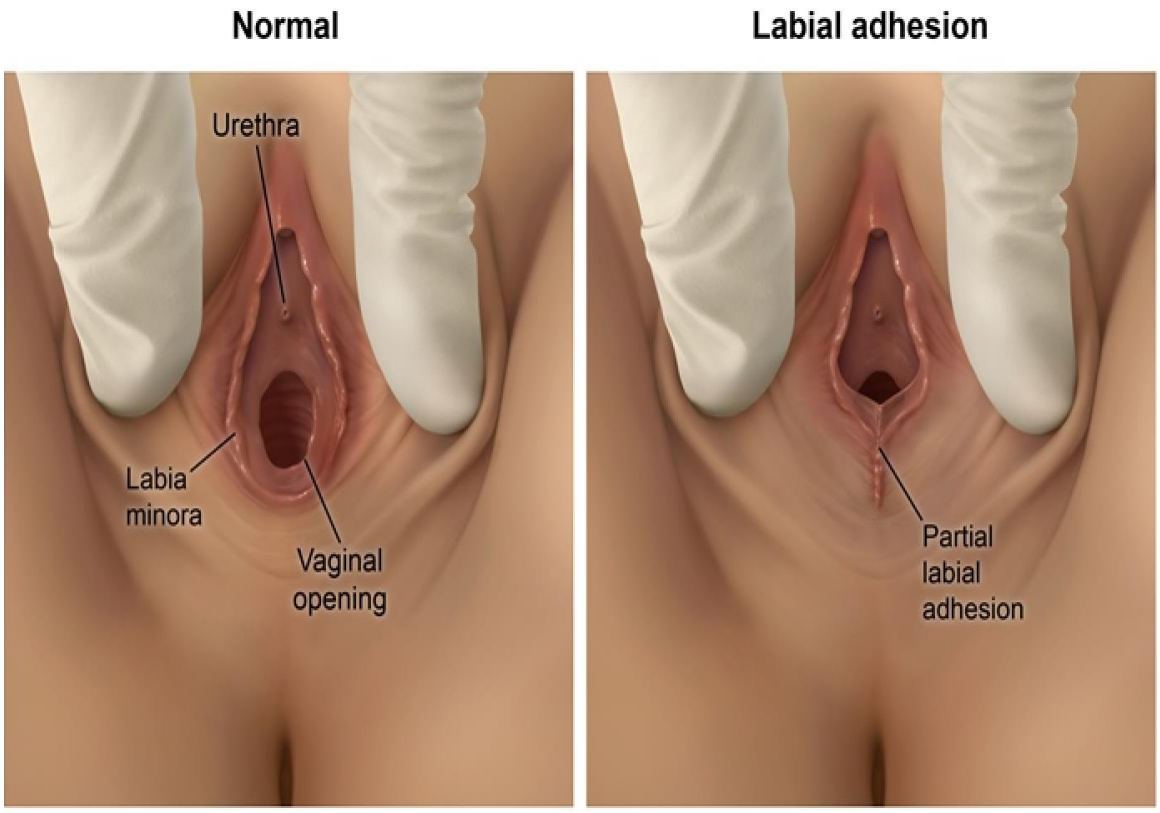
- Toilet paper is the most common vaginal foreign body, although small toys and other objects may be seen.
- Presenting symptoms include foul-smelling vaginal discharge, intermittent vaginal bleeding or spotting, and occasionally, urinary complaints.
- When a vaginal foreign body is suspected, an external examination of the genitalia should be performed with the child in either the knee-to-chest or frog-leg position to minimize discomfort.
- Depending on the age of the child and the size and type of foreign body, sedation or general anesthesia may be required for both the examination and foreign body removal.
- Small foreign bodies such as toilet paper and small toys, can often be removed easily with a calcium alginate swab or irrigation with warmed fluids after a topical anesthetic has been applied.
- If these techniques are unsuccessful or if a large foreign body is noted, examination under anesthesia may be necessary.

3. Atrophic vaginitis is a clinical diagnosis based on history and examination findings.

- Etiology is reduced estrogen support of vulvovaginal tissue from either natural or induced menopause.
- Typical symptoms include vaginal dryness, pruritus and dyspareunia.
- Pelvic examination is characterized by pale, dry, and smooth vaginal epithelium, scarce pubic hair, and loss of the labial fat pad.
- Use of moisturizers and lubricants is an appropriate first step in management of mild atrophic vaginitis; for moderate to severe cases, the first-line treatment is local low-dose vaginal estrogen therapy.

4. Labial adhesions is most commonly seen in prepubertal girls due to low estrogen production. Inflammation from poor hygiene, infection (vaginitis), irritation (diaper rash), or trauma (straddle injury) also contributes to the development of adhesions.

- Labial adhesions can be partial (involving a portion of the labia) or complete.
- Partial adhesions are often asymptomatic; however, some individuals may experience vaginal pain or pulling.
- Adhesions covering the urethral meatus can also cause an abnormal urinary stream and an increased risk for recurrent urinary tract infections due to urine accumulation.
- Although mild, asymptomatic adhesions require no treatment, topical estrogen is first-line therapy for those with symptoms.


Normal
Labial adhesion
Urethra
Labia minora
Vaginal opening
Partial labial adhesion

CHAPTER 3

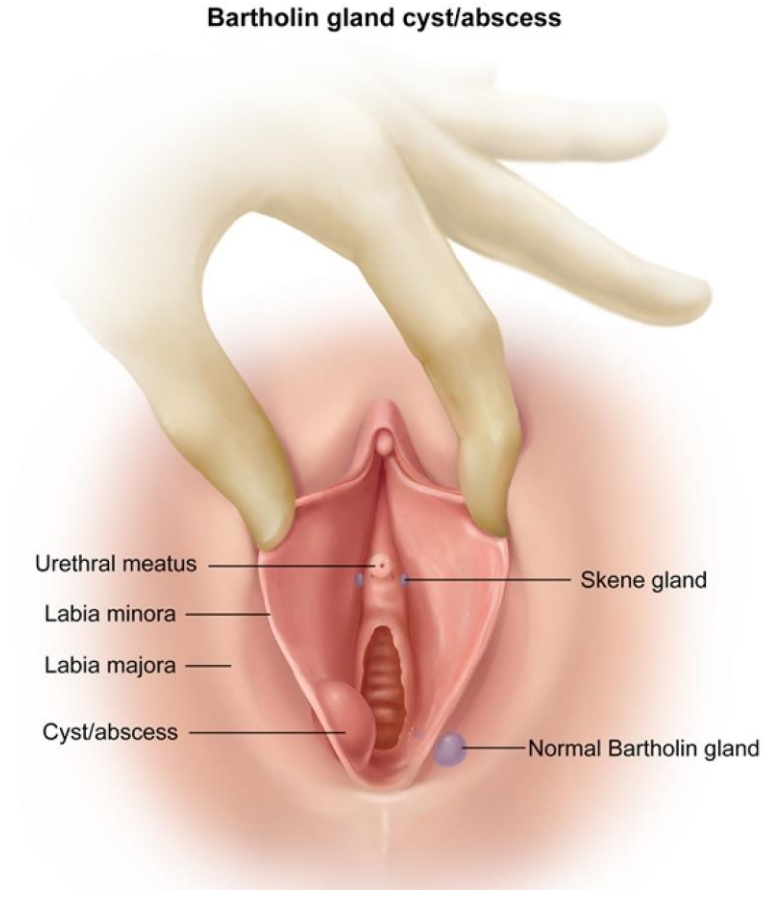
Disorders of the Vulva

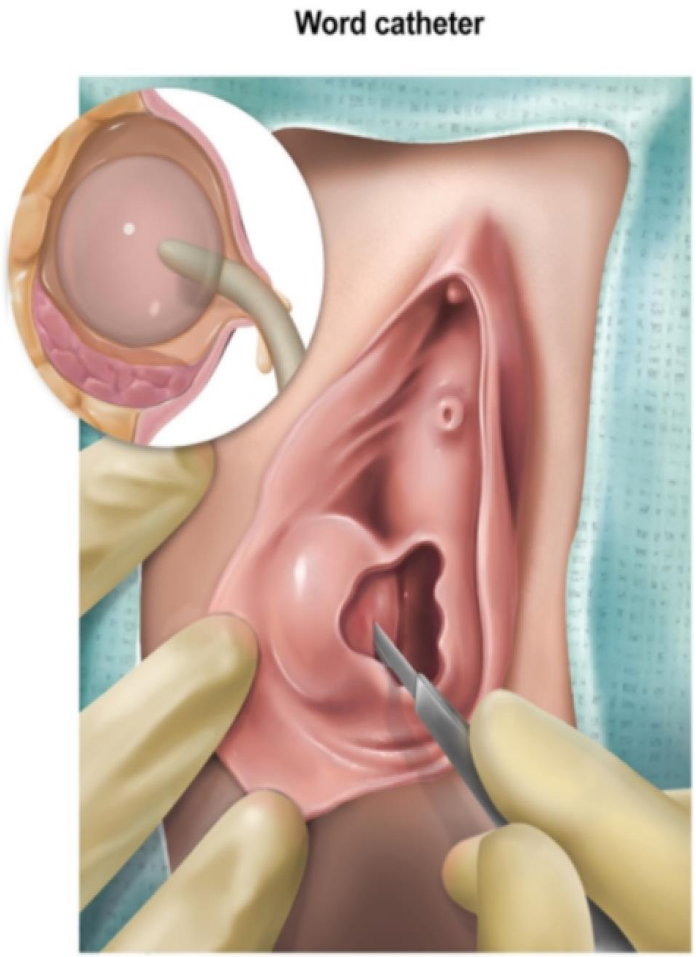
Disorders of the Vulva

Benign Vulvar Lesions

A. Bartholin cyst:

- Bartholin glands are located bilaterally at the posterior introitus and drain through ducts into the vestibule at the 4 and 8 o'clock positions.
- These pea-sized glands provide lubrication to the vestibule and are not palpable unless ductal blockage occurs resulting in fluid buildup and cyst formation.
- Small cysts may be diagnosed incidentally on routine examination, or a partner may discover it during sexual activity. Larger cysts may cause discomfort during sexual activity, walking, sitting, or exercise.
- Management is conservative unless pressure symptoms occur due to size. Symptomatic cysts require incision and drainage, followed by Word catheter placement. Placement of a Word catheter after drainage reduces the risk of recurrence.





B. Bartholin abscess:

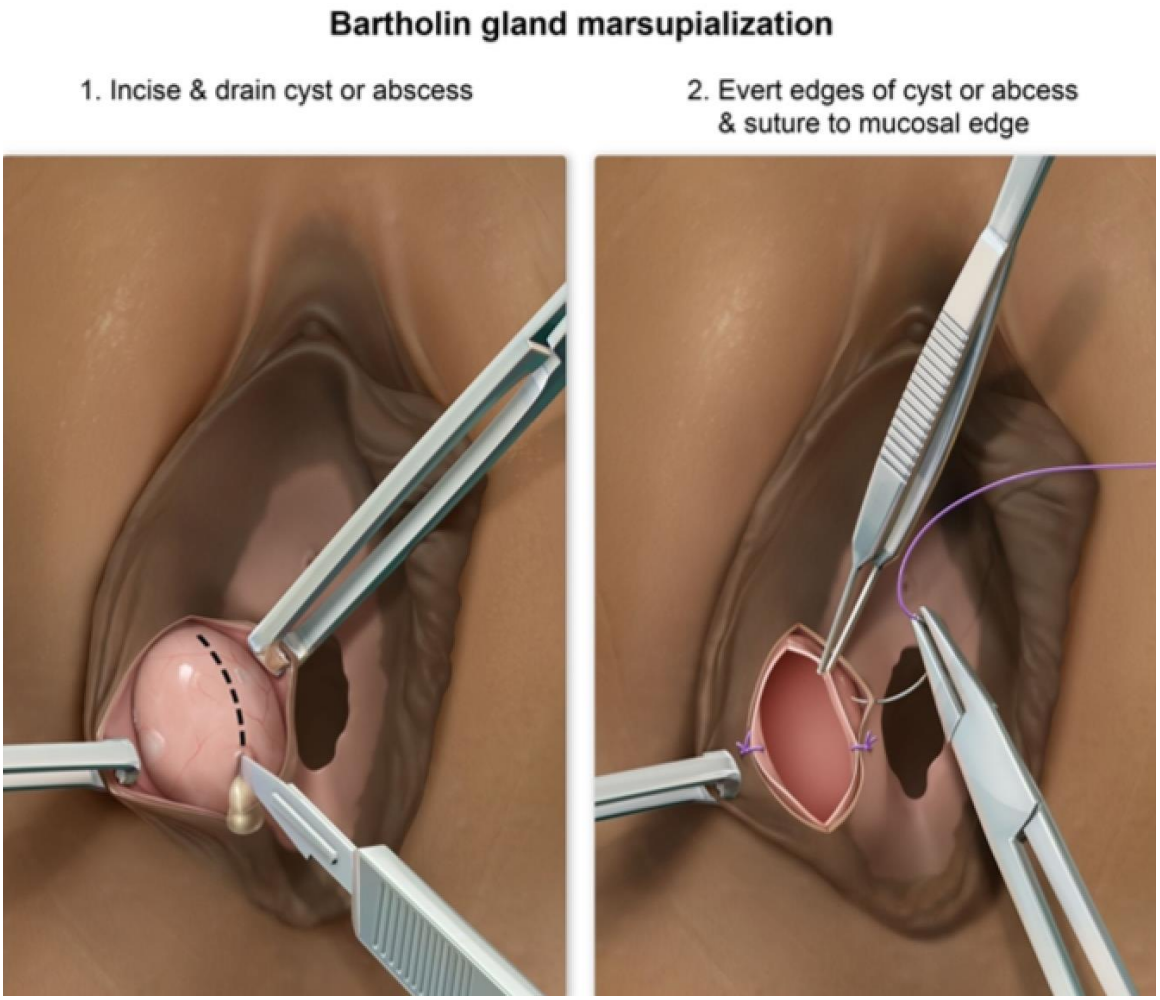
- An abscess of the Bartholin gland may occur due to infection (mostly caused by E. coli and anaerobic Bacteroides species, and seldom due to gonococcus).

- Management:

- Outpatient treatment is I&D with placement of a Word catheter under local anesthesia.

- The balloon is inflated and left in place for a month to allow a drainage tract to form. Antibiotic treatment is usually not needed.

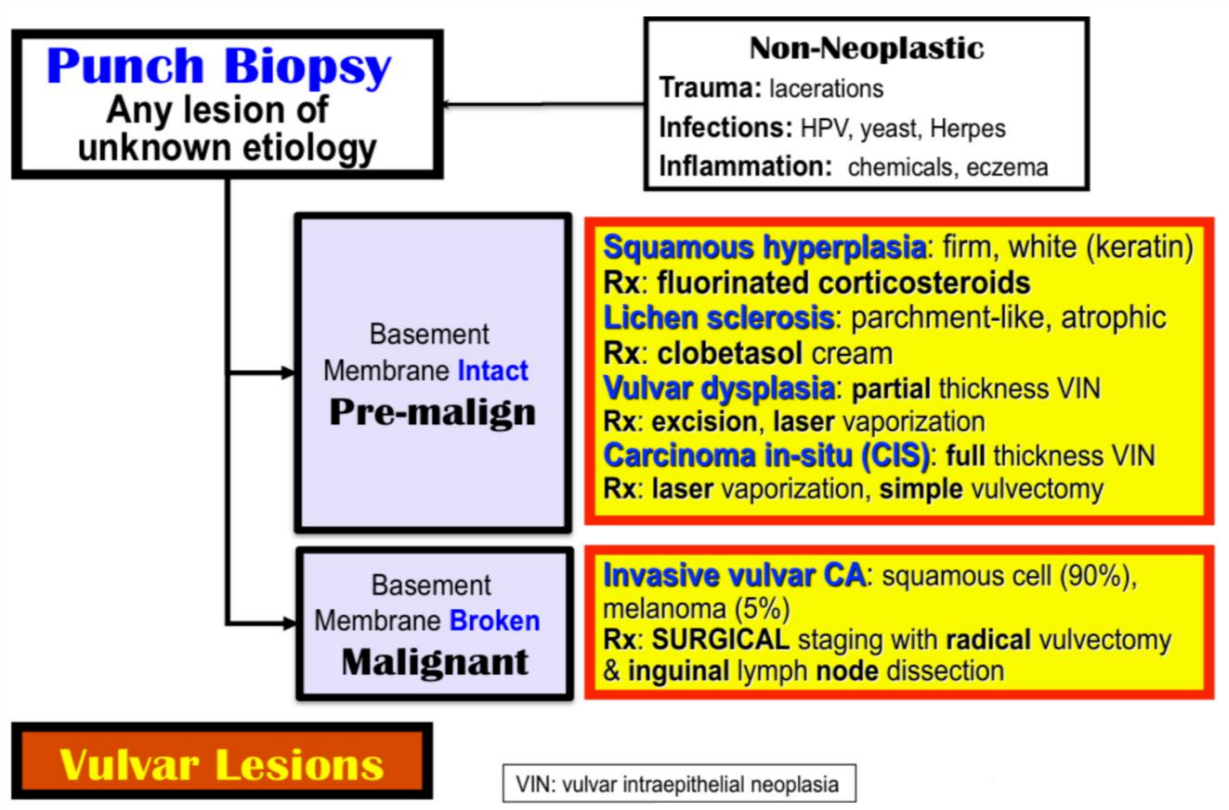
- Some women develop recurrent Bartholin cysts or abscesses and undergo a marsupialization procedure, which creates another point of drainage for the Bartholin gland.

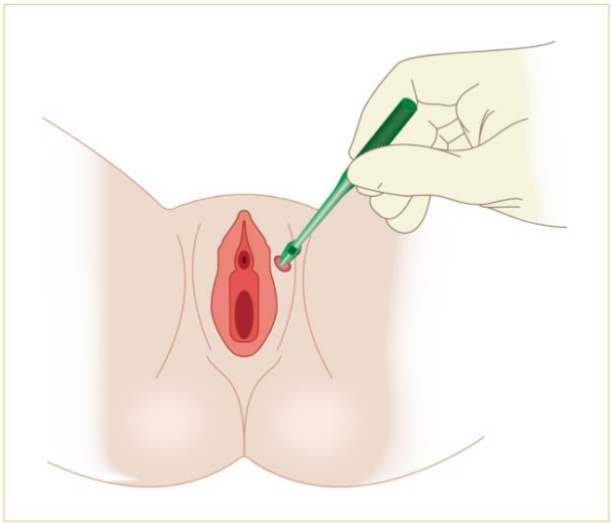


Vulvar Lesion with Pruritus/Neoplasia

- Clinical Presentation: The most common symptom of both benign as well as malignant lesions is vulvar itching resulting in scratching.

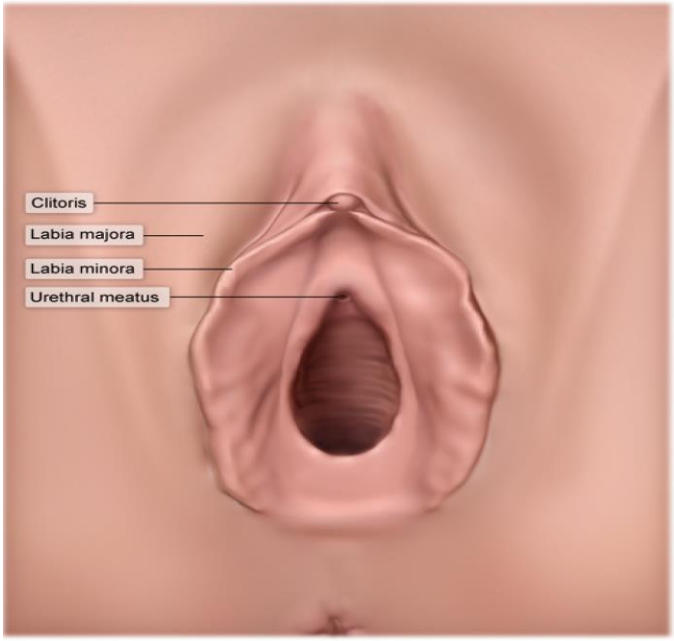
- Differential Diagnosis: This includes sexually transmitted diseases, benign vulvar dermatosis, or cancers.





Vulvar Biopsy

Vulvar anatomy



1. Premalignant vulvar dermatosis:

- These are benign lesions with malignant predisposition.

- The most common symptom is vulvar itching, but most lesions are asymptomatic.

A. Squamous hyperplasia:

- These lesions appear as whitish focal or diffuse areas that are firm and cartilaginous on palpation.

- Histologically, they show thickened keratin and epithelial proliferation.

- Management is fluorinated corticosteroid cream.

B. Lichen sclerosus:

- Lichen sclerosus is a chronic inflammatory disease common in postmenopausal women, particularly in those with an autoimmune disease (type 1 diabetes mellitus).

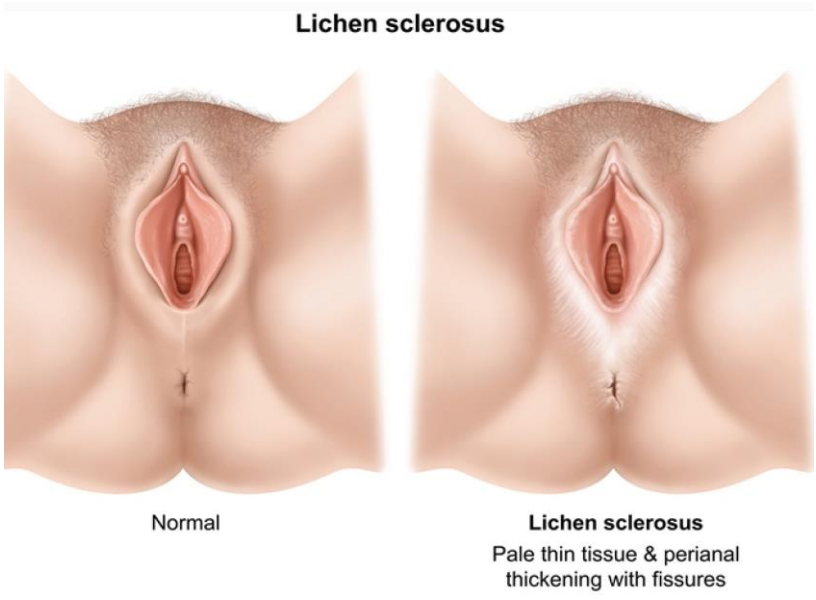
- In early stages of the disease, the vulva thins, causing hypopigmented (white) areas and increasing skin sensitivity that results in intense vulvar itching and burning (and associated erosions and excoriations).

- On palpation they feel thin and parchment-like.

- Chronic irritation and scratching transform the thinned skin to thickened, white vulvar plaques (lichenification), often with perianal skin thickening in a classic figure-eight pattern.

- Punch biopsy confirms the diagnosis and rules out vulvar squamous cell carcinoma. Histologically, they show epithelial thinning.

- High-potency topical steroids (Clobetasol cream) are considered first-line therapy for vulvar lichen sclerosus. They are highly effective in providing relief from itching and dyspareunia.



C. Squamous dysplasia:

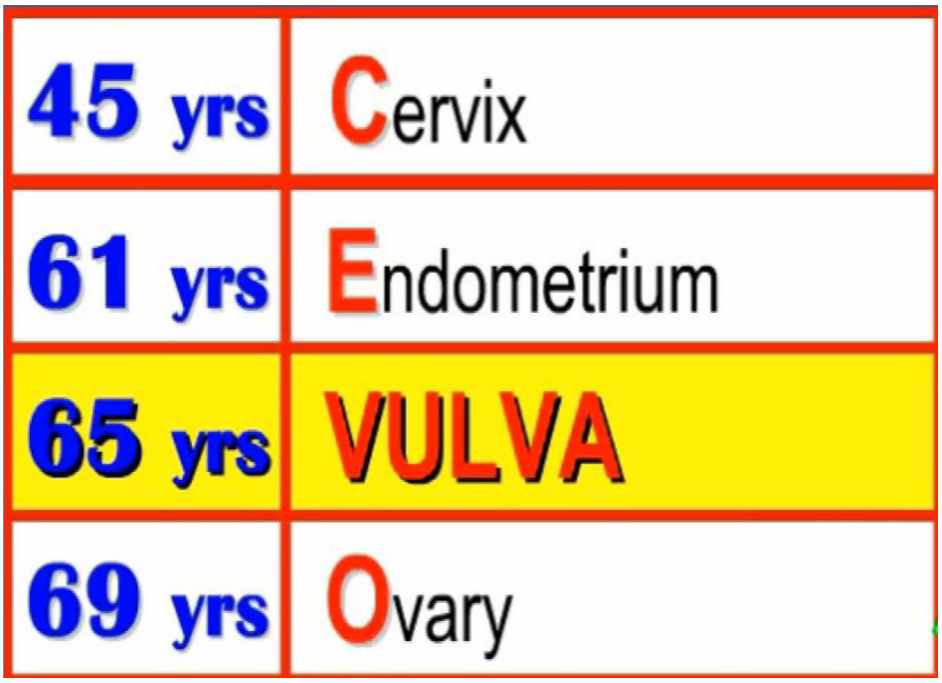
- These lesions appear as white, red, or pigmented, often multifocal in location.
- Histologically, they show cellular atypia (partial thickness) restricted to the epithelium without breaking through the basement membrane.
- Management is surgical excision.

D. CIS:

- The appearance is indistinguishable from vulvar dysplasia.
- Histologically, the cellular atypia is full thickness but does not penetrate the basement membrane.
- Management is laser vaporization and vulvar wide local excision.

2. Malignant vulvar lesions:

- Vulvar carcinoma is an uncommon gynecologic malignancy, with a mean age at diagnosis of 65 years.
- It is the fourth most common gynecologic malignancy.
- Risk factors include older age, cigarette smoking, HIV, premalignant vulvar dermatosis.



A. Squamous cell (90%):

- The most common type of invasive vulvar cancer is squamous cell carcinoma, which has been associated with HPV.

- The most common stage at diagnosis is Stage 1.

B. Melanoma (5%):

- The second most common histologic type of vulvar cancer is melanoma of the vulva.

- Any dark or black lesion in the vulva should be biopsied and considered for melanoma.

C. Paget disease: An uncommon histologic lesion is Paget disease of the vulva.

- Screening: There is no screening test.

- Diagnosis:

- Punch Biopsy.

- All vulvar lesions of uncertain etiology should be biopsied.

- Pattern of spread:

- It starts with local growth and extension that embolizes to inguinal lymph nodes and finally, hematogenous spread to distant sites.

- Staging: Staging is surgical.

- Stage 0: CIS (basement membrane is intact).

- Stage I: Tumor confined to the vulva with size ≤2 cm; nodes not palpable.
  - IA: Invasion ≤1 mm deep.
  - IB: Invasion >1 mm deep.

- Stage II: Tumor confined to the vulva with size >2 cm; nodes not palpable.

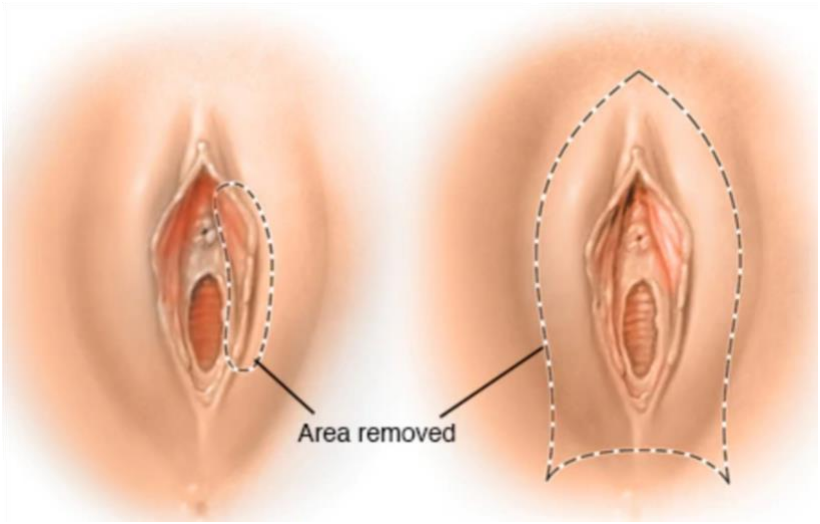
- Stage III: Tumor any size with spread to lower urethra, vagina, or anus; unilateral nodes.

- Stage IV: Widespread metastases.
  - IVA: Involves upper urethra, bladder or rectum, pelvic bone, bilateral nodes.
  - IVB: Distant metastasis.

- Management:

Management of Vulvar Carcinoma

Radical vulvectomy	Removes entire vulva (subcutaneous and fatty tissue, labia minora and majora, perineal skin, clitoris)	Sexual dysfunction
Modified radical vulvectomy	Wide local excision (for **unilateral** labial lesions that do not cross the midline)	Less sexual morbidity
Lymphadenectomy	Inguinal node dissection (**bilateral** if midline lesions >1 mm invasion; **unilateral** selectively)	Lower-extremity edema



❖ N.B:

- Lichen planus is a chronic inflammatory condition that typically occurs in postmenopausal women.
- The most common type of vulvar lichen planus is the erosive variant, in which chronic inflammation causes desquamation and erosion of mucosal surfaces, including the vulva, vagina, and oral cavity.
- Clinical features of patients with erosive lichen planus affecting the mucosal surfaces include:
  - Glazed, brightly erythematous vulvar erosions with a border of serpentine-appearing white striae (Wickham striae) that cause vulvar pain, pruritus, and dyspareunia.
  - Acute vaginal inflammation that causes a friable mucosa and a serosanguinous vaginal discharge; chronic vaginal inflammation can eventually result in stenosis of the vaginal introitus.
  - Lace-like reticular erosions on the gingiva and palate that cause painful oral ulcers and plaque formation on the tongue.
- Diagnosis may be made clinically but should be confirmed with a vulvar punch biopsy because the clinical features of lichen planus may overlap with those of vulvar cancer.
- Patients with lichen planus require evaluation of all mucosal surfaces because erosions may occur in the absence of other symptoms.
- First-line treatment is with high-potency topical corticosteroids.

Vulvar lichen planus	

Clinical features	• Women age 50-60
	• Vulvar pain or pruritus
	• Dyspareunia
	• Erosive variant (most common):
	  ◦ Erosive, glazed lesions with white border
	  ◦ Vaginal involvement ± stenosis
	  ◦ Associated oral ulcers
	• Papulosquamous variant:
	  ◦ Small pruritic papules with purple hue

Diagnosis	Vulvar biopsy
Treatment	High-potency topical corticosteroids

CHAPTER 4

Disorders of the Cervix

Disorders of the Cervix

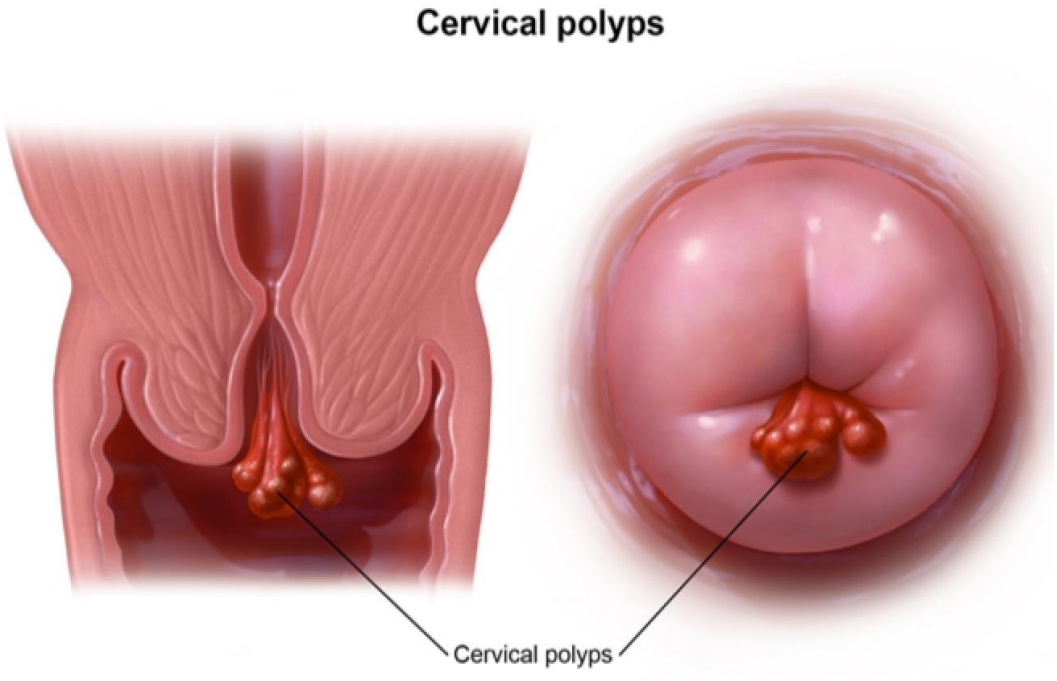
Cervical Polyps

- Cervical polyps are fingerlike growths that start on the surface of the cervix or endocervical canal.
- These small, fragile growths hang from a stalk and push through the cervical opening.
- The cause of cervical polyps is not completely understood.
- They may be associated with chronic inflammation, an abnormal response to increased levels of estrogen, or thrombosed cervical blood vessels.
- Findings:

- The history is usually positive for vaginal bleeding, often after intercourse. This bleeding occurs between normal menstrual periods.
- Speculum examination reveals smooth, red or purple, fingerlike projections from the cervical canal.

- Management:

- Polyps can be removed by gentle twisting or by tying a surgical string around the base and cutting it off. Removal of the polyp's base is done by electrocautery or with a laser.
- Because many polyps are infected, an antibiotic may be given after the removal even if there are no or few signs of infection.



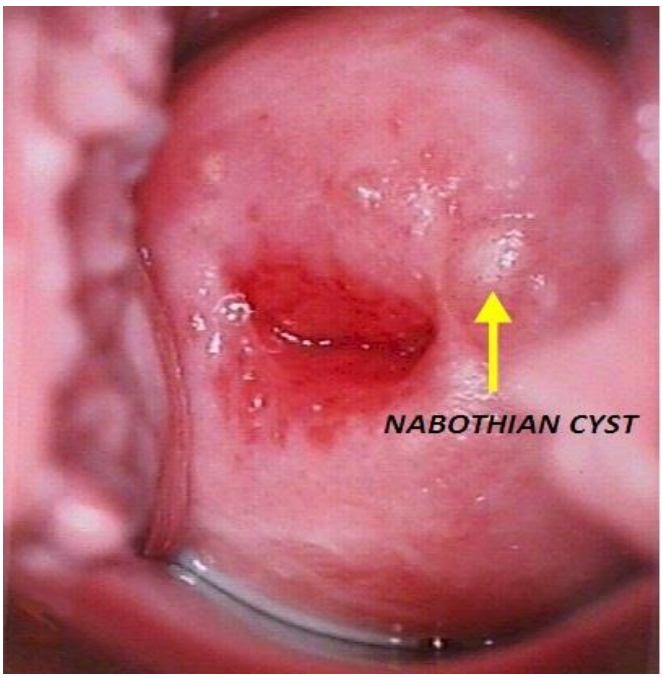
Nabothian Cysts

- A nabothian cyst is a mucus-filled cyst on the surface of the uterine cervix.
- The cervical canal is lined by glandular cells that normally secrete mucus. These endocervical glands can become covered by squamous epithelium through metaplasia.
- These nests of glandular cells (nabothian glands) on the cervix may become filled with secretions.
- As secretions accumulate, a smooth, rounded lump may form just under the surface of the cervix and become large enough to be seen or felt upon examination.
- Findings:

- Pelvic examination reveals a small, smooth, rounded lump (or collection of lumps) on the surface of the cervix.

- Management:

- No treatment is necessary.
- However, nabothian cysts do not clear spontaneously. They can be easily cured through electrocautery or cryotherapy.



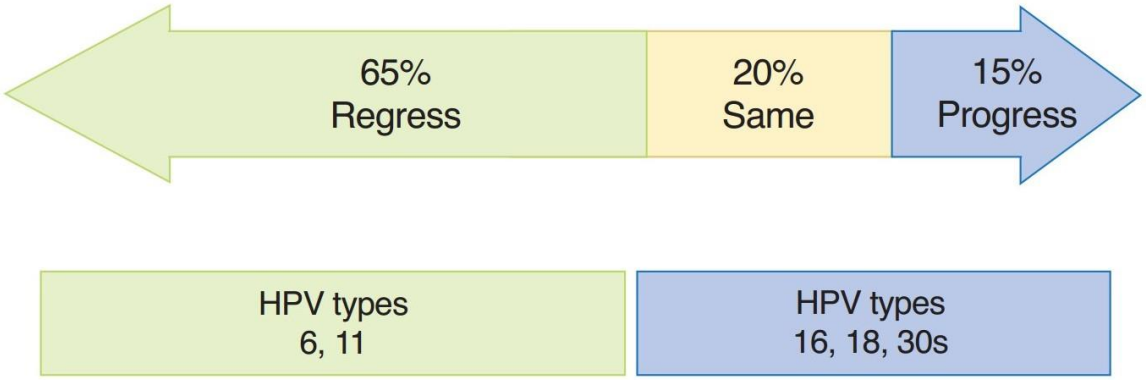
Cervical neoplasia (Abnormal Pap smear)

- Presentation:

- Premalignant lesions of the cervix are usually asymptomatic.

- The progression from premalignant to invasive cancer has been reported to be approximately 8-10 years.

- Most lesions will spontaneously regress; others remain static, with only a minority progressing to cancer.



- Etiology:

- The most common etiology of cervical cancer is the human papilloma virus (HPV).

- HPV 16, 18, 30s are the most common HPV types associated with premalignant and cancerous lesions of the cervix.

- HPV 6 and 11 are the most common HPV types associated with benign condyloma acuminata.

- Risk Factors:

- These include early age of intercourse, multiple sexual partners, cigarette smoking, and immunosuppression.

- Screening and Performing a Pap Smear:

- The best screening test for premalignant lesions is cytology. Cytologic screening uses the Pap test.

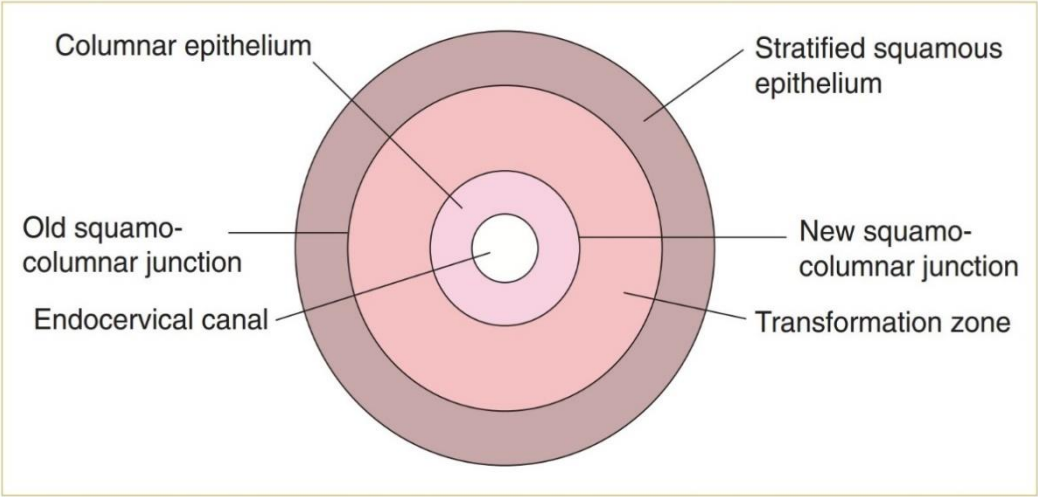
- The most common site for cervical dysplasia is the transformation zone (T-zone).

- What cytologic screening methods can be used?

- With the conventional method, the specimens are smeared onto a glass slide, which is placed in fixative and then microscopically examined.

- With the thin-layer, liquid-based cytology, the specimens are rinsed into a preserving solution and are then deposited on a slide as a thin layer of processed cells.

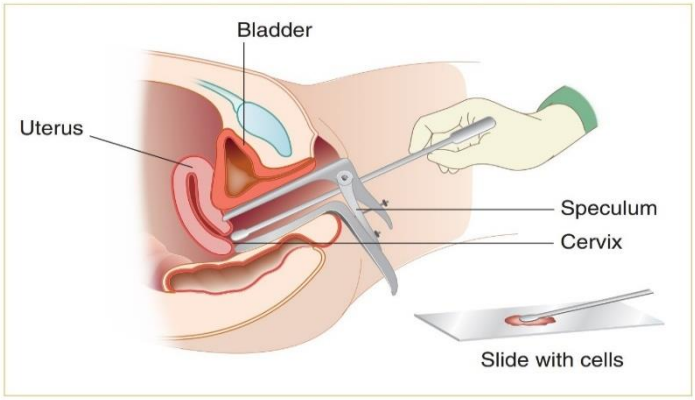
- Both methods are equivalent for cancer screening, but the liquid-based method has the advantage of doing HPV-DNA typing.



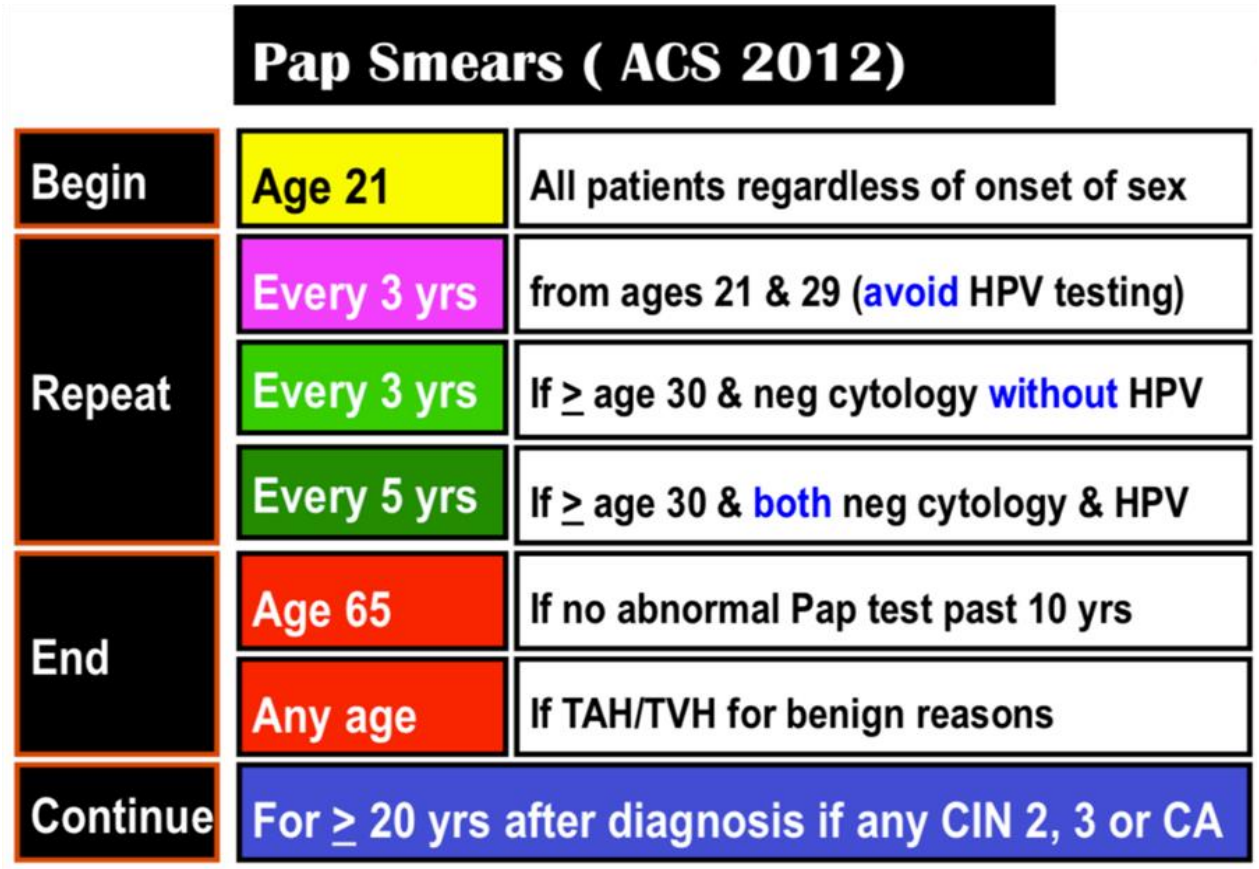
Development of T-Zone

- Pap smear should include cytologic specimens from 2 areas: stratified squamous epithelium of transformation zone (TZ) of the ectocervix and columnar epithelium of the endocervical canal (EGG).

- The TZ is the location where 95% of cervical dysplasia and cancer develop.



Taking a Sample of Cells during Pap Smear



- Pap smear should be started at the following ages:

- Age <21: no Pap test or screening for HPV, regardless of sexual activity.

- Age 21: Start Pap test with cytology alone without HPV testing; the recommendation is the same whether HPV vaccinated or not.

- The frequency of recommended Pap smear is as follows:

- Age 21-29: repeat Pap every 3 years with cytology alone; do not perform HPV testing in this age group

- Age 30-65: repeat Pap every 3 years with cytology but no HPV testing OR repeat Pap every 5 years if both cytology and HPV testing (the recommended option in this age group).

- Pap smears should be discontinued:

- After age 65 if negative cytology and/or HPV tests for past 10 years AND no history of CIN 2, CIN 3 or cervical carcinoma.

- Any age if total hysterectomy AND no history of cervical neoplasia.

- Pap Smear Classification:

- The Bethesda system is the current classification used in the United States.

- Negative for intraepithelial lesion or malignancy.

- Abnormal squamous cells (99% of abnormal Pap smears):

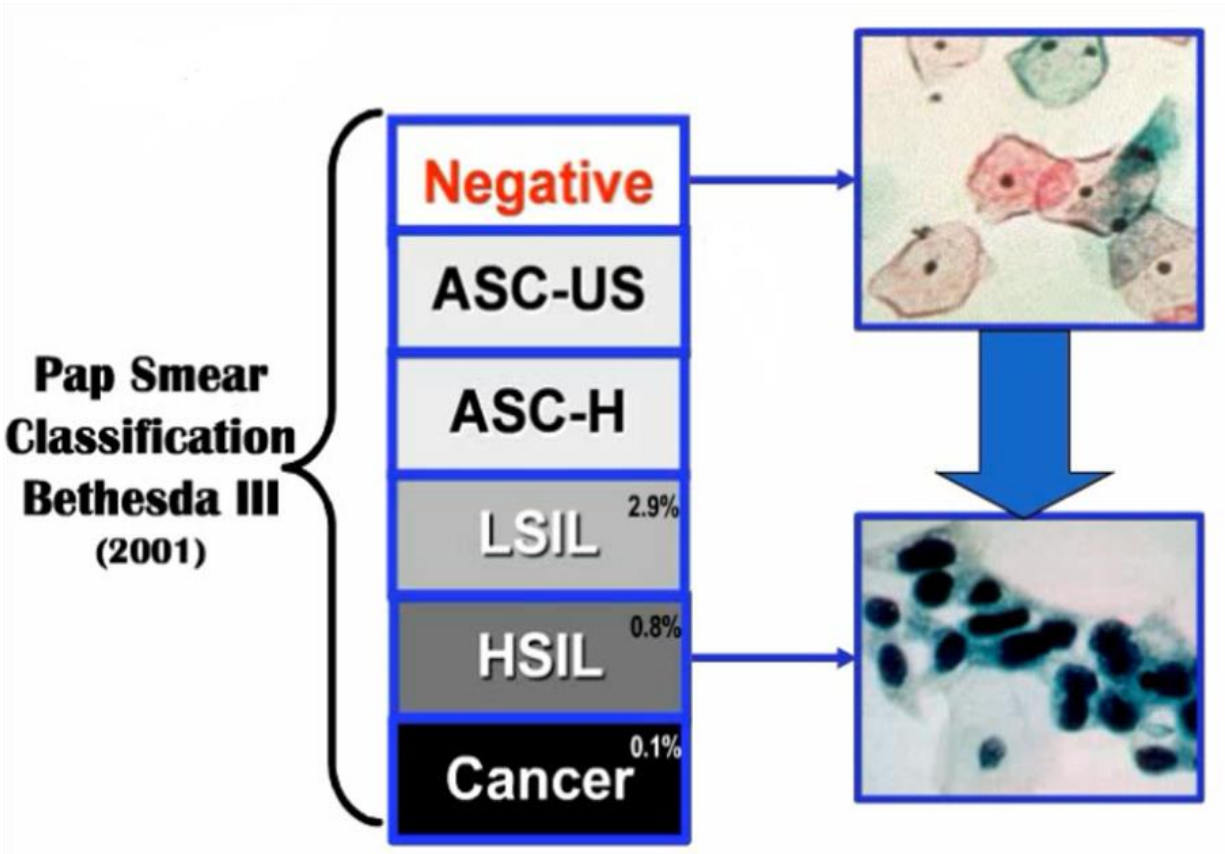
- ASC-US (atypical squamous cells of undetermined significance): changes suggestive of but not adequate to label LSIL.

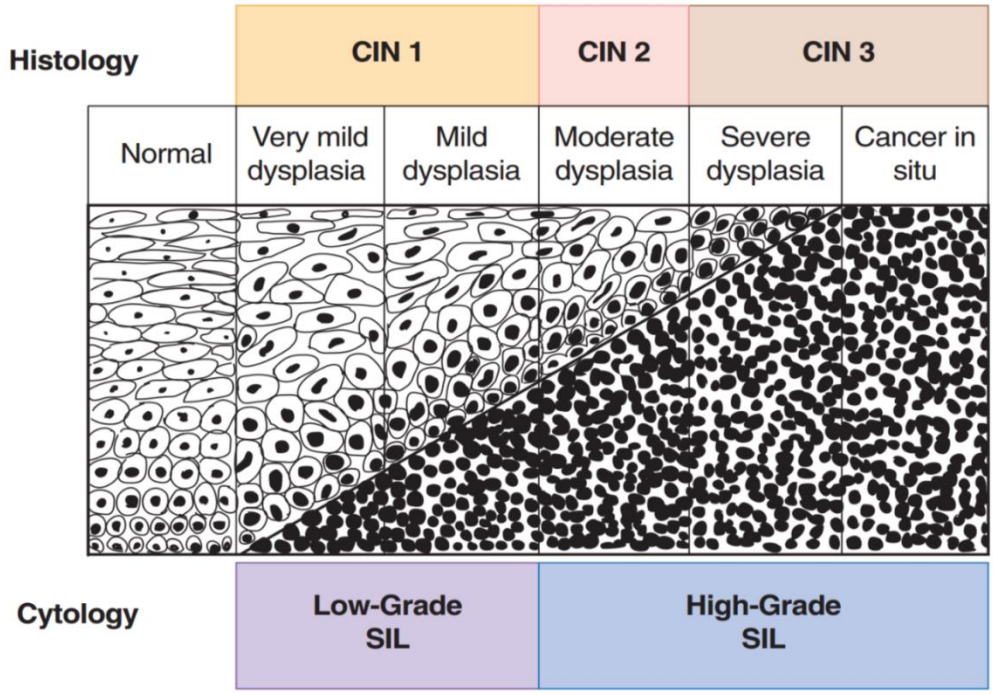
- LSIL (low-grade squamous intraepithelial lesion): biopsy is expected to show histologic findings of HPV, mild dysplasia, or CIN 1.

- ASC-H (atypical squamous cells can't rule out HSIL): changes suggestive of but not adequate to label HSIL.

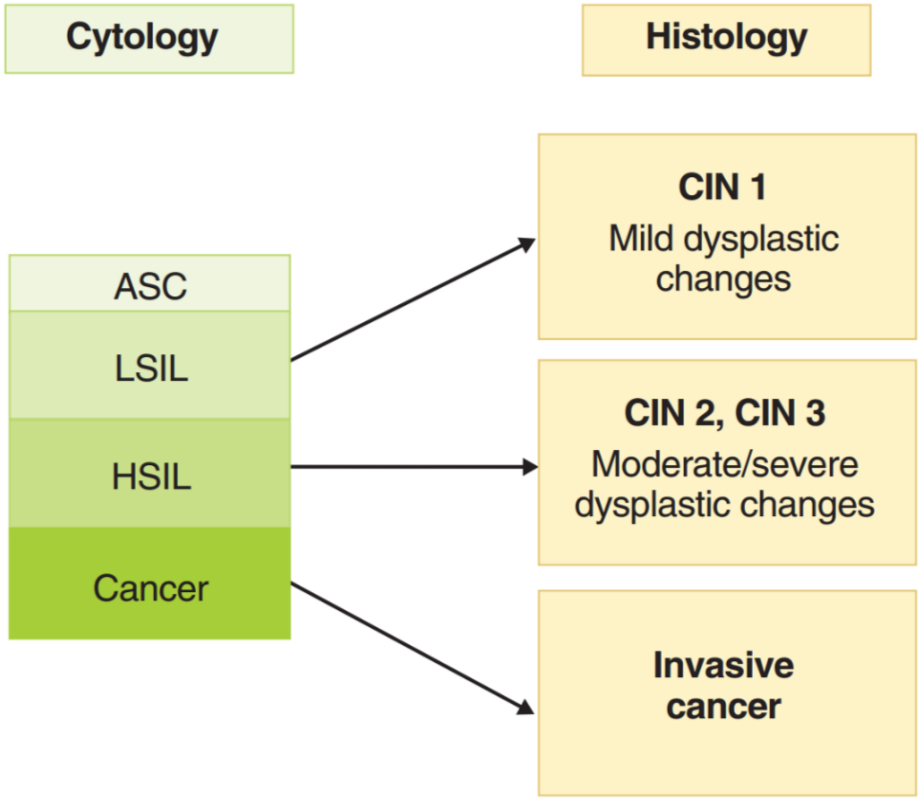
- HSIL (high-grade squamous intraepithelial lesion): biopsy is expected to show histologic findings of moderate-severe dysplasia, CIN 2, CIN 3, or CIS.

- Squamous cell carcinoma: biopsy is expected to show histologic findings of invasive cancer.



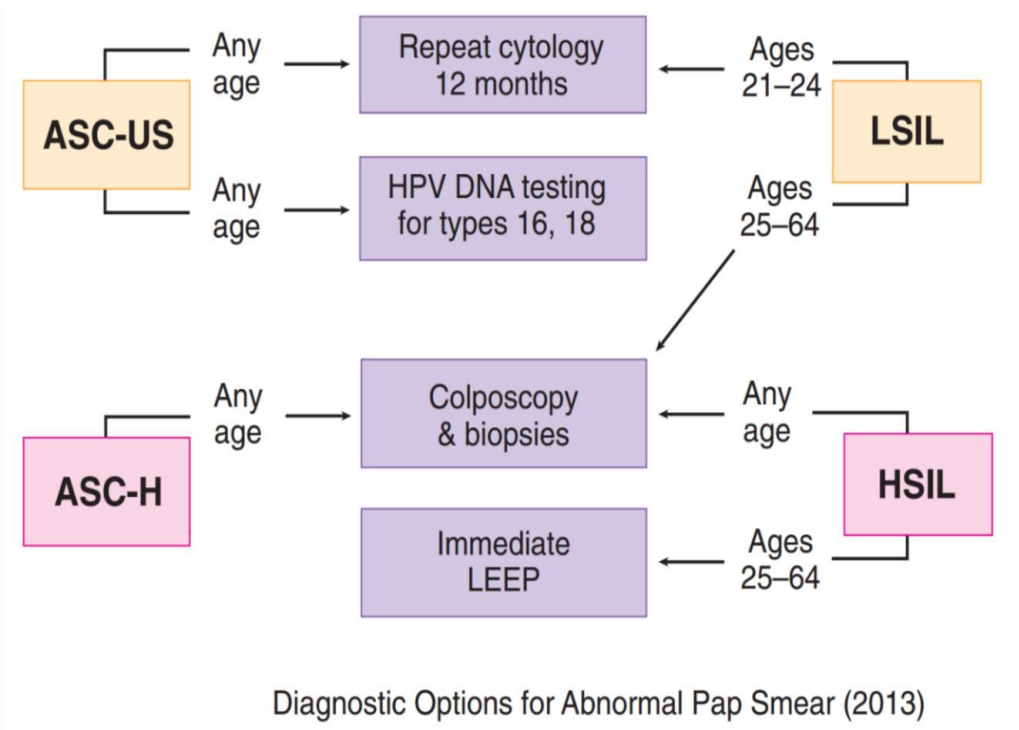


Histologic Appearance of Cervical Dysplasia with Progressive Severity



Classification of Cervical Dysplasias

- Diagnostic Approach to Abnormal Pap Smears:



Diagnostic Options for Abnormal Pap Smear (2013)

A. Accelerated repeat Pap:

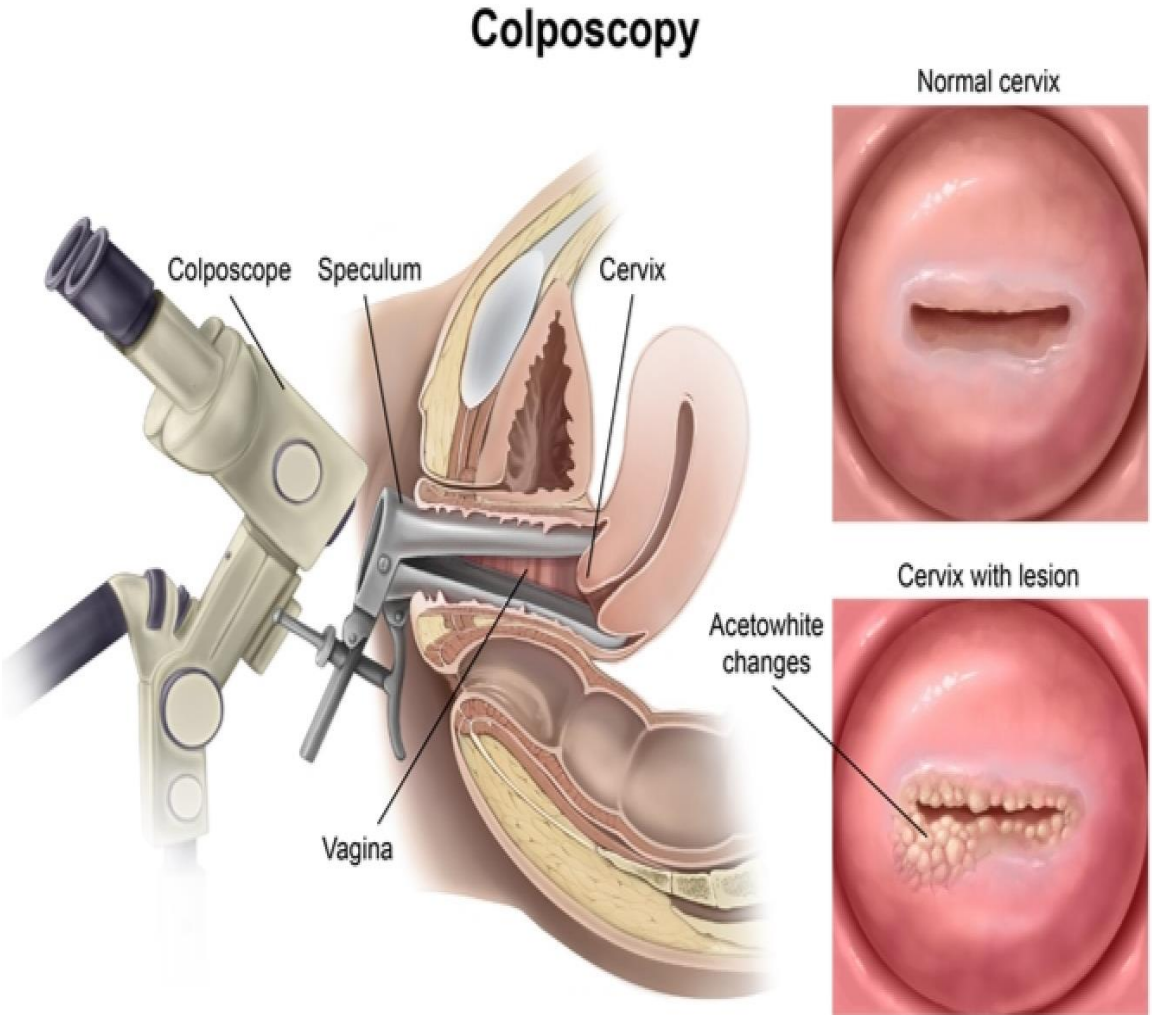
- This is an option for findings of ASC-US in patients of any age, and the preferred option with either ASC-US or LSIL in patients ages 21-24. Repeat the Pap in 12 months:
  - If repeat cytology is negative, repeat Pap in another 12 months.
  - If repeat cytology is anything other than negative, proceed to colposcopy and biopsies.

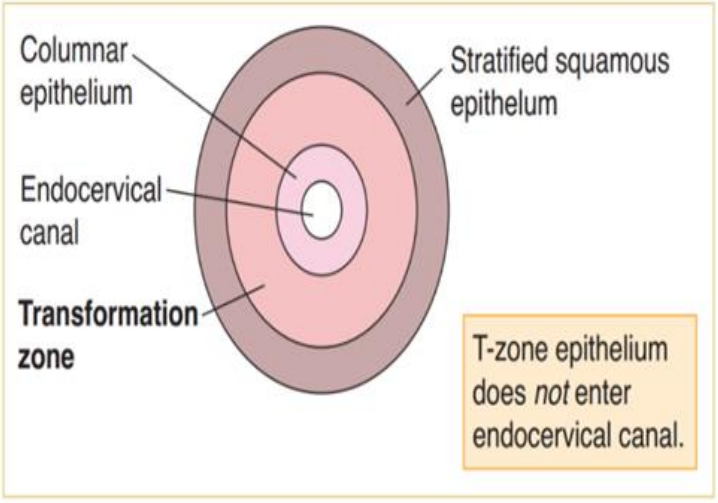
B. HPV DNA testing:

- This is the preferred option for findings of ASC-US in patients age >25.It is acceptable but not preferred in patients ages 21-24.
- If liquid-based cytology was used on the initial Pap, one can use this specimen for DNA testing.
- If conventional methods were used, repeat a second Pap.
- Perform colposcopy only if high-risk HPV DNA is identified.

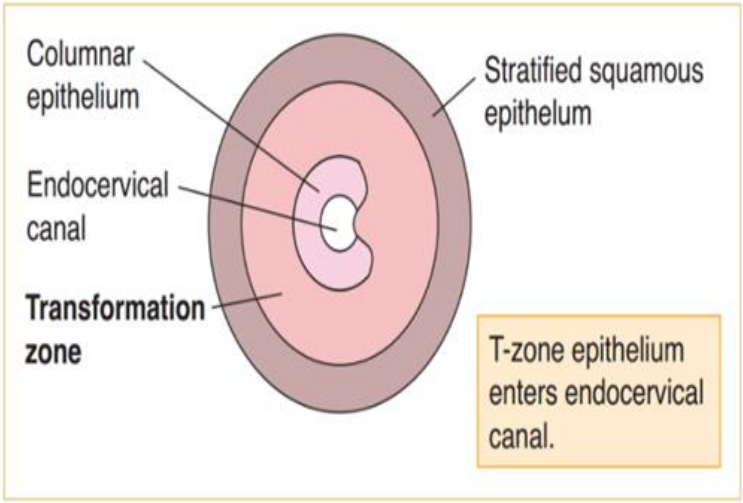
C. Colposcopy:

- This is indicated for evaluation of LSIL in patients age ≥25, and all patients with ASC-H and HSIL.
- Satisfactory or adequate colposcopy is diagnosed if the entire T-zone is visualized and no lesions disappear into the endocervical canal.
- Unsatisfactory or inadequate colposcopy is diagnosed if the entire T-zone cannot be fully visualized.

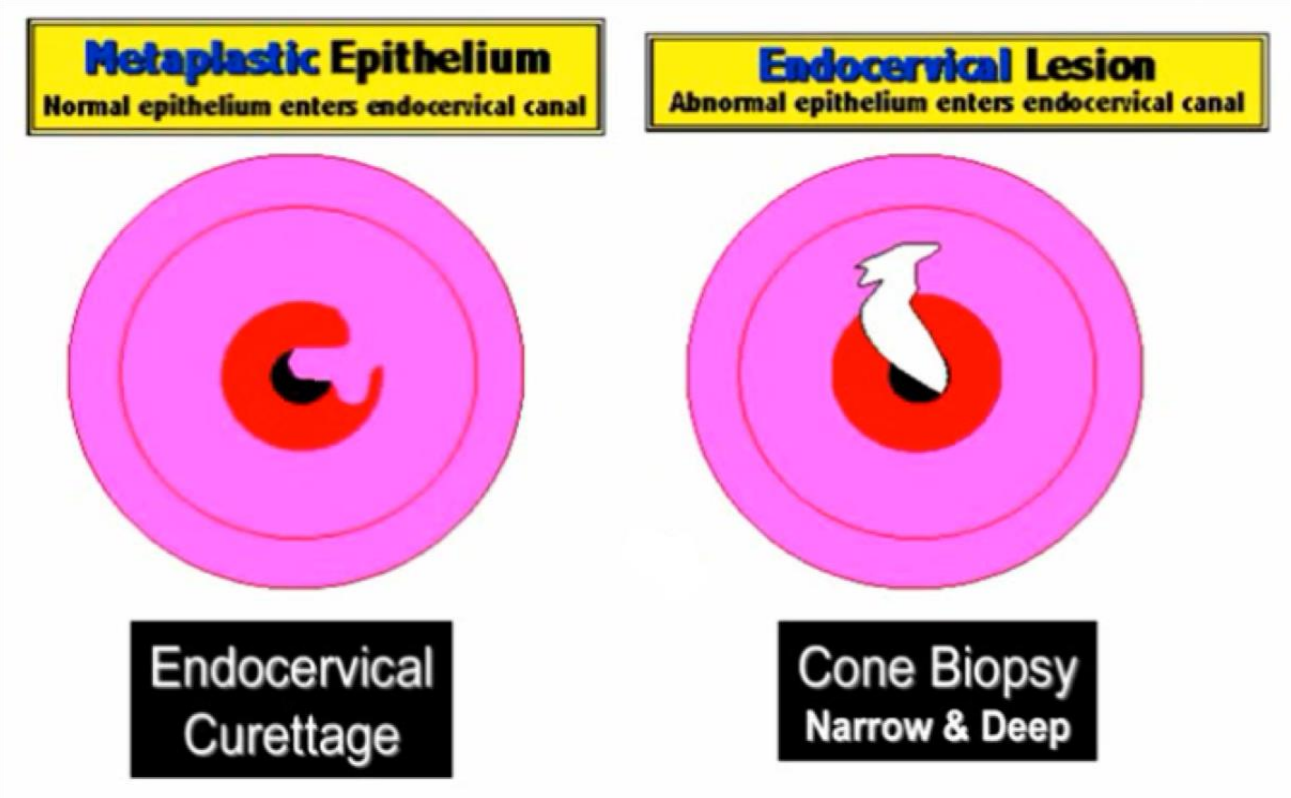




Cervical Dysplasia: Satisfactory Colposcopy

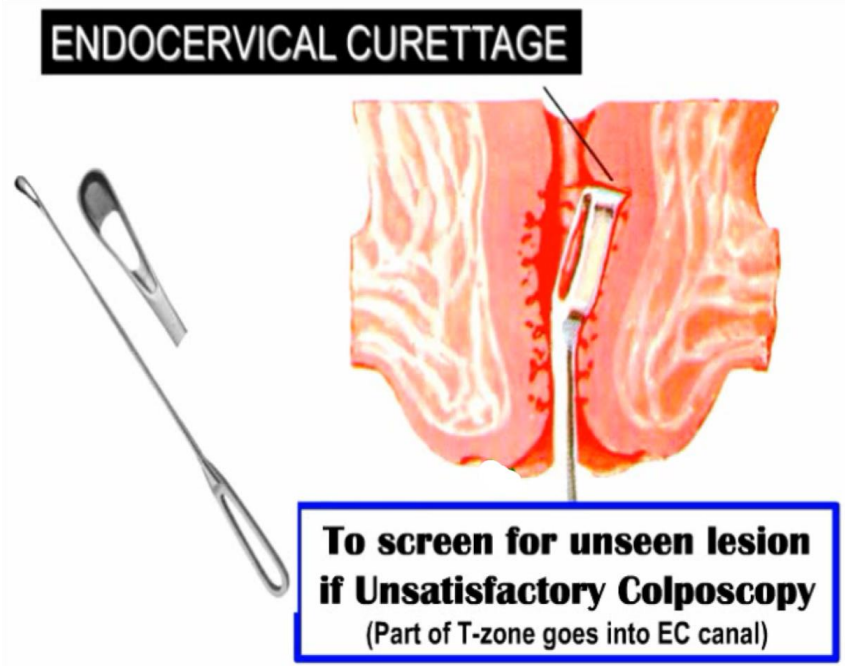


Cervical Dysplasia: Unsatisfactory Colposcopy



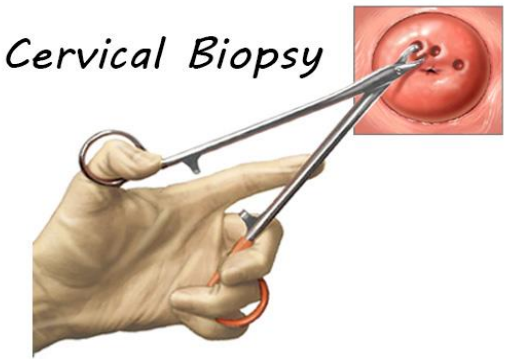
D. Endocervical curettage (ECC):

- All nonpregnant patients undergoing colposcopy which shows metaplastic epithelium entering the endocervical canal will undergo an ECC to rule out endocervical lesions.



E. Ectocervical biopsy:

- Lesions identified on the ectocervix by colposcopy (mosaicism, punctation, white lesions, abnormal vessels) are biopsied and sent for histology.



F. Compare Pap smear and biopsy:

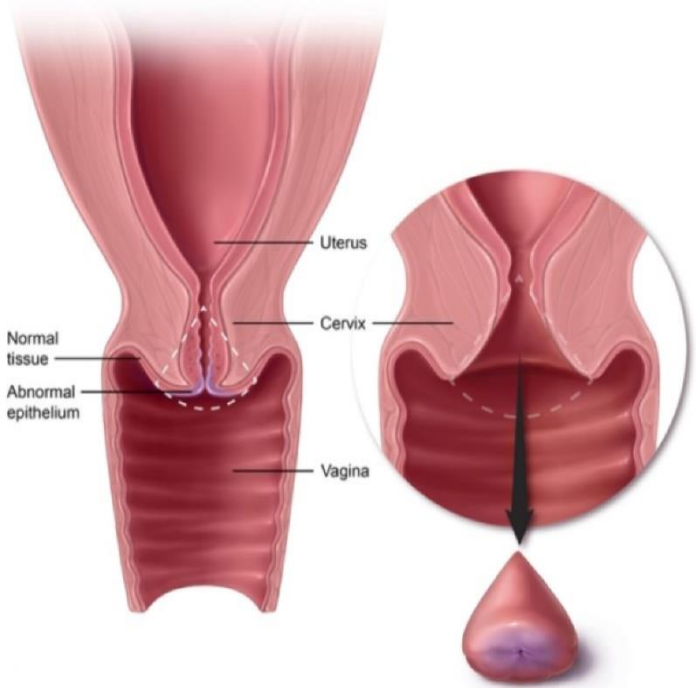
- When the biopsy histology is complete, it is compared with the level of Pap smear abnormality to ensure the level of severity is comparable.

G. Cone biopsy:

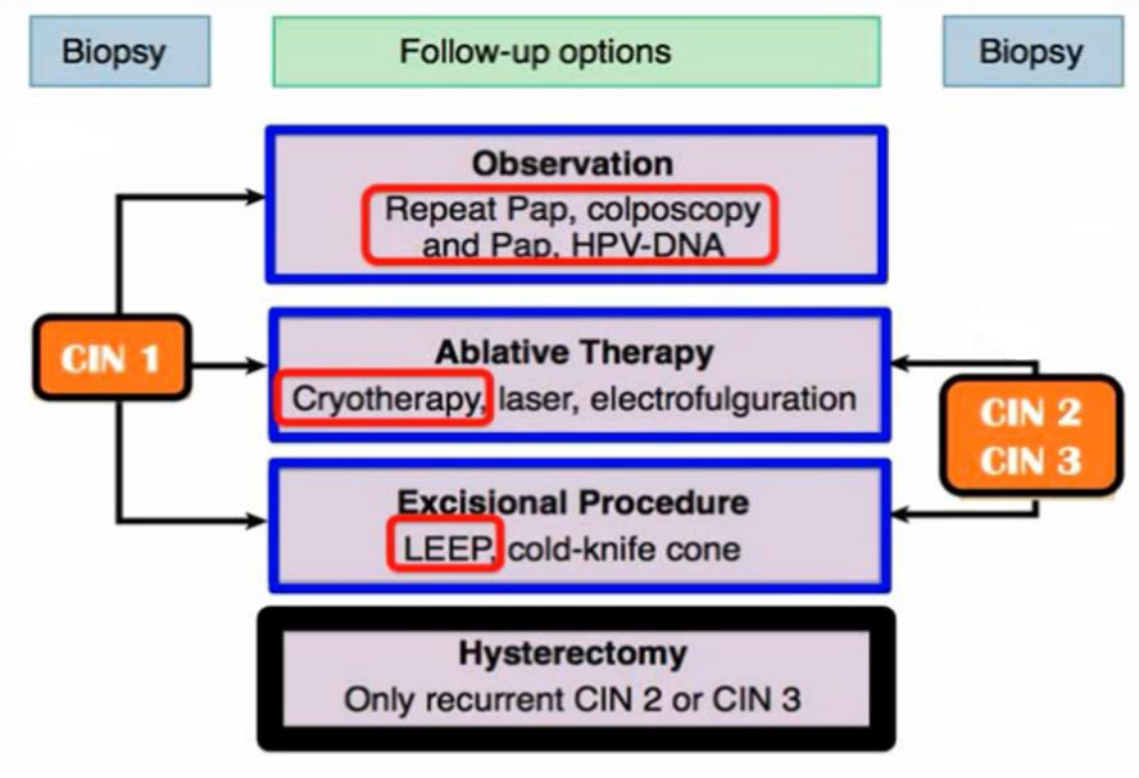
- If the Pap smear is worse than the histology (suggesting the site of abnormal Pap smear cells was not biopsied), then a cone biopsy is performed.

- Other indications for conization of the cervix include abnormal ECC histology, a lesion seen entering the endocervical canal, and a biopsy showing microinvasive carcinoma of the cervix.

- Deep cone biopsies can result in an incompetent cervix. Another risk of cone biopsy is cervical stenosis.



- Management According to Histology:



- Observation and follow-up without treatment:
  - Appropriate for CIN 1.
  - Include any of the following: repeat Pap in 6 and 12 months; colposcopy and repeat Pap in 12 months; or HPV DNA testing in 12 months.

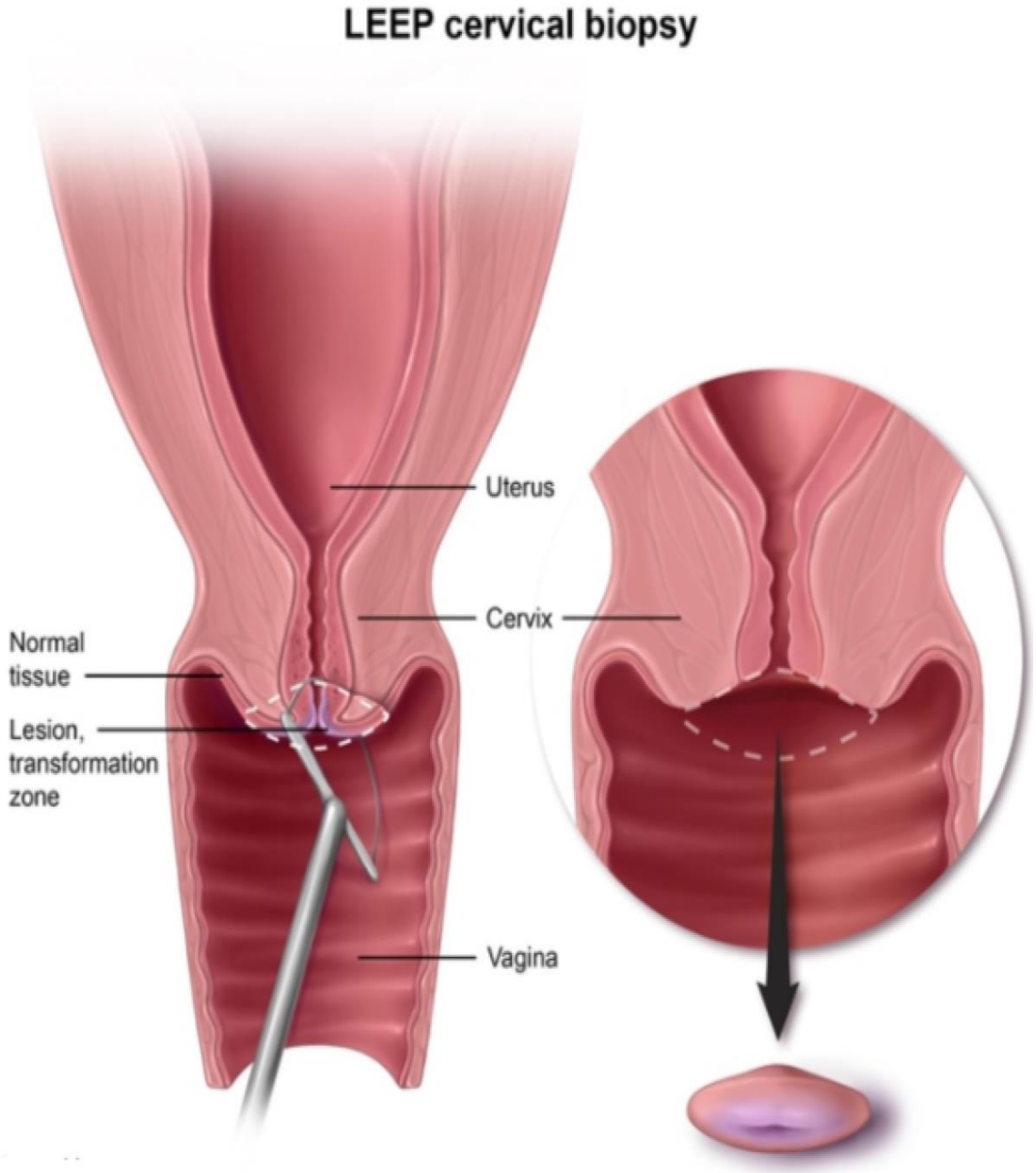
- Ablative modalities:
  - Can be used for CIN 1, 2, and 3.
  - These include cryotherapy (freezing), laser vaporization, and electrofulguration.

- Excisional procedures:
  - Can be used for CIN 1, 2, and 3.
  - These include LEEP (loop electrosurgical excision procedure) or cold knife conization.

- Hysterectomy: only acceptable with biopsy-confirmed, recurrent CIN 2 or 3.

❖ N.B:

- Cervical conization is used to treat high-grade cervical intraepithelial neoplasia.
- Potential complications include cervical stenosis, cervical incompetence, and preterm delivery.
- Cervical conization may be performed with a scalpel (cold knife conization) or via electrocautery, also known as a loop electrosurgical excision procedure (LEEP).
- Cervical stenosis an abnormal stricture of the cervical canal, is a potential complication of cervical conization due to scar tissue. Cervical stenosis may impede menstrual flow and cause secondary dysmenorrhea or amenorrhea. The obstruction of the cervical outlet may prevent sperm entry, resulting in impaired fertility.
- Cervical conization carries additional risks, including cervical incompetence and preterm delivery due to weakened cervical stroma. These risks are related directly to the amount of cervical tissue removed.



- Follow-Up:

- Patients treated with either ablative or excisional procedures require follow-up repeat Pap smears, colposcopy and Pap smear, or HPV DNA testing every 4 to 6 months for 2 years.

- Prevention of Cervical Dysplasia by Vaccination:

- The 9 valent HPV recombinant vaccine [Gardasil-9] is recommended for all females age 9-26, with target age 11-12.

- The vaccine uses noninfectious particles to protect against 9 HPV types (6, 11, 16, 18, 31, 33, 45, 52, 58).

Human papillomavirus	
Disease associations	• Cervical cancer • Vulvar & vaginal cancers • Anal cancer • Penile cancer • Oropharyngeal cancer • Genital warts
Vaccine indications	• All girls & women* age 11-26 • Boys & men age 9-21 (9-26 for men who have sex with men; individuals with HIV)

*Including those with history of genital warts, abnormal cytology, or positive humanpapillomavirus DNA test.

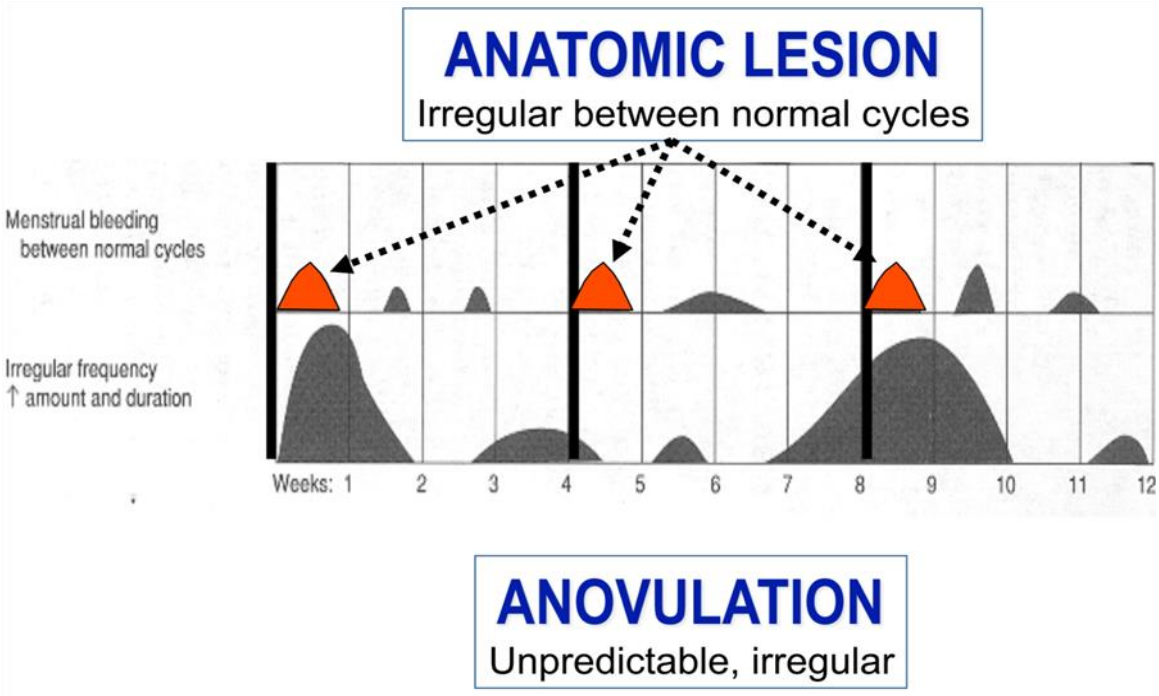
Invasive Cervical Cancer

- Definition: Cervical neoplasia that has penetrated through the basement membrane.

- Presentation:

- Patients with invasive cervical cancer can present with postcoital vaginal bleeding.

- Other symptoms of cervical cancer include irregular vaginal bleeding and, in advanced stage, lower extremity pain and edema.



- Epidemiology:

- Cervical carcinoma is the third most common gynecologic malignancy with a mean age at diagnosis of 45 years.

- Diagnostic Tests/Findings:

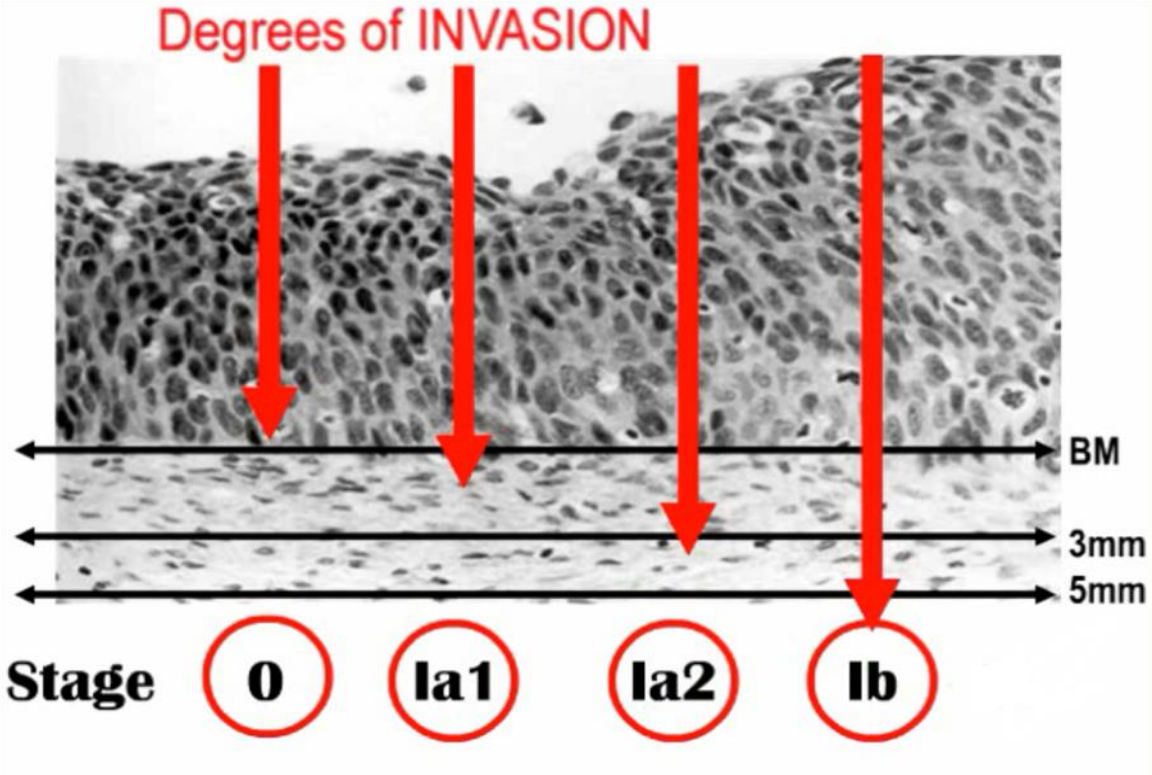
- Cervical biopsy: The initial diagnostic test should be a cervical biopsy, in which the most common diagnosis is squamous cell carcinoma.

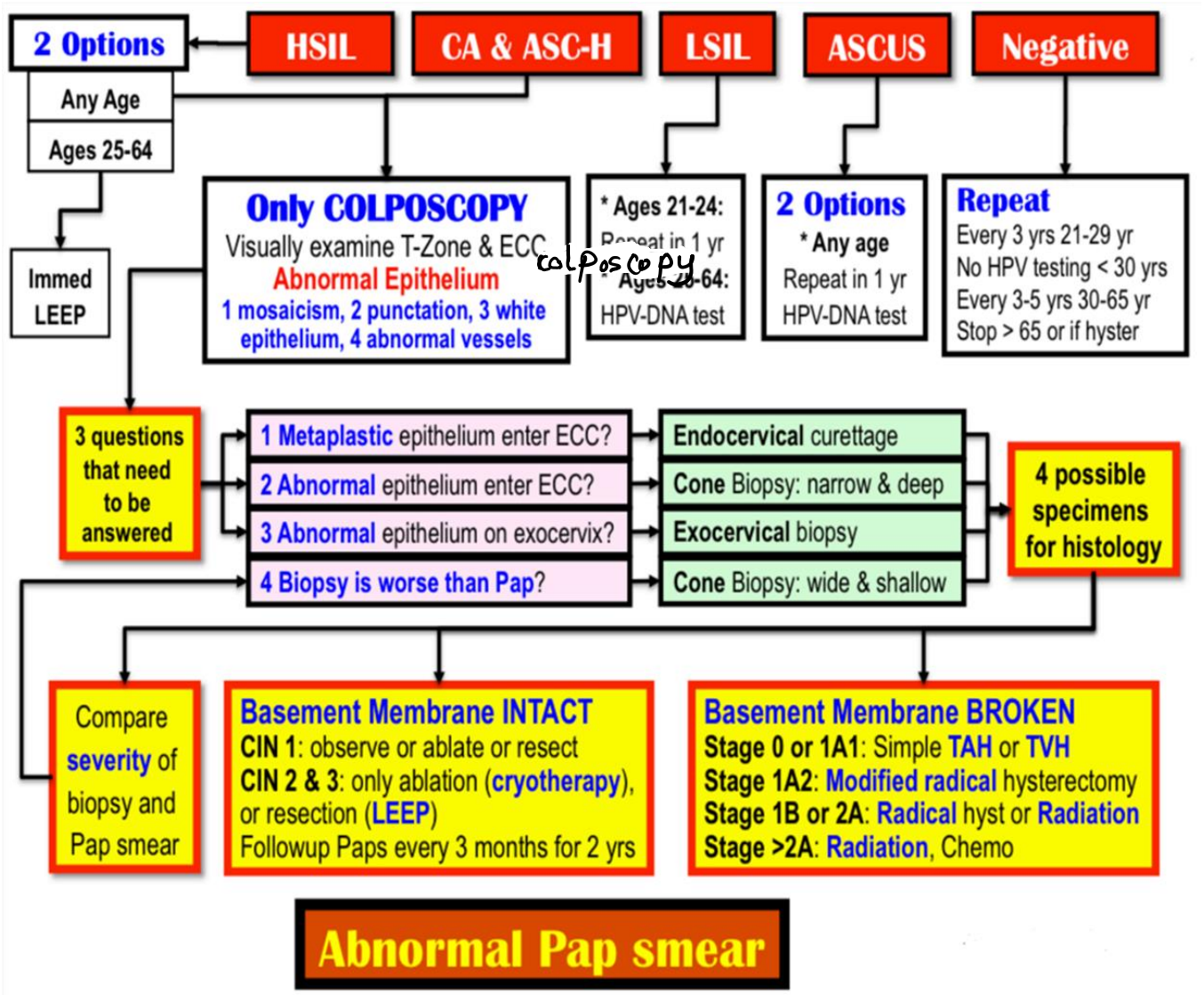
- Metastatic workup: Once a tissue diagnosis of invasive carcinoma is made, a metastatic workup should be done that includes pelvic examination, chest x-ray, intravenous pyelogram, cystoscopy, and sigmoidoscopy.

- Imaging studies: Invasive cervical cancer is the only gynecologic cancer that is staged clinically.

- Staging: Staging is clinical based on pelvic examination and may include an intravenous pyelogram (IVP).

Stage 0:	Carcinoma in-situ (CIS). The basement membrane is intact.
Stage I:	Spread **limited** to the cervix. This is the **most common** stage at diagnosis.
Ia1.	Invasion is ≤3 mm deep (minimally invasive)
Ia2.	Invasion is >3 but ≤5 mm deep (microinvasion)
IB.	Invasion is >5 mm deep (frank invasion)
Stage II:	Spread **adjacent** to the cervix
IIa.	Involves upper two thirds of vagina
IIb.	Invasion of the parametria
Stage III:	Spread **further** from the cervix
IIIA.	Involves lower one third of vagina
IIIB.	Extends to pelvic side wall or hydronephrosis
Stage IV:	Spread **furthest** from the cervix
IVA.	Involves bladder or rectum or beyond true pelvis
IVB.	Distant metastasis





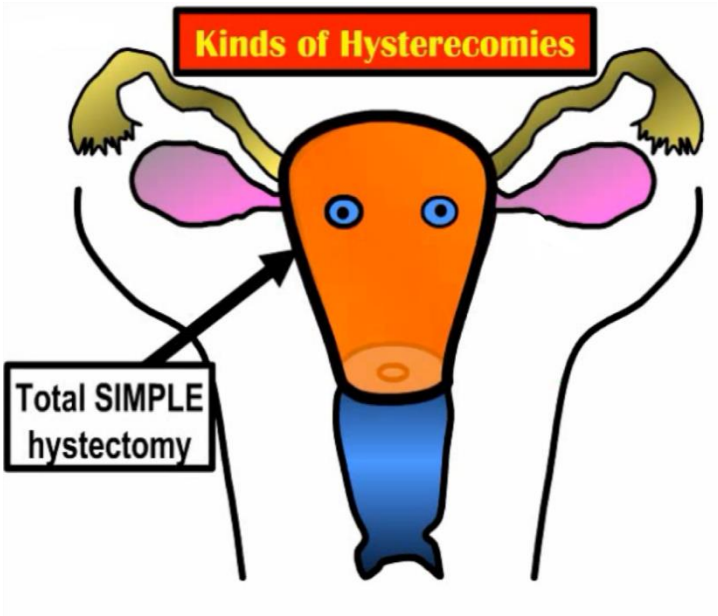
- Subtotal or supracervical hysterectomy: removes only the corpus of the uterus, leaving the cervix in place.

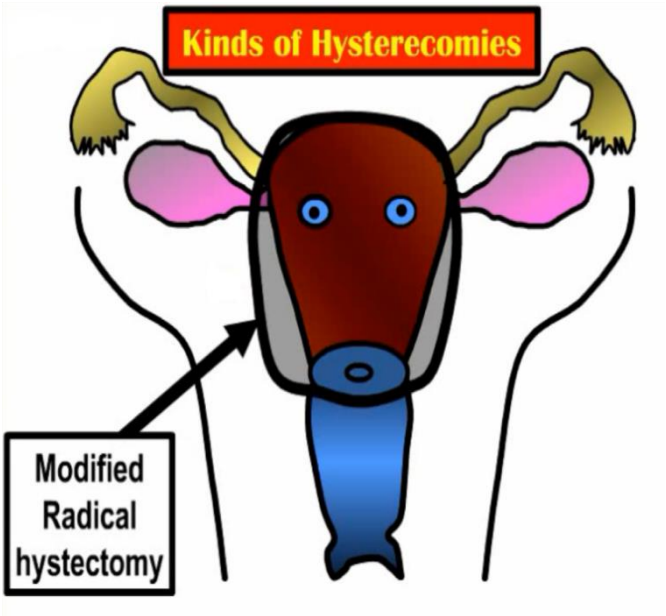
- Total hysterectomy: the most common procedure, removes both the corpus and cervix of the uterus. Total hysterectomy is also known as simple hysterectomy.

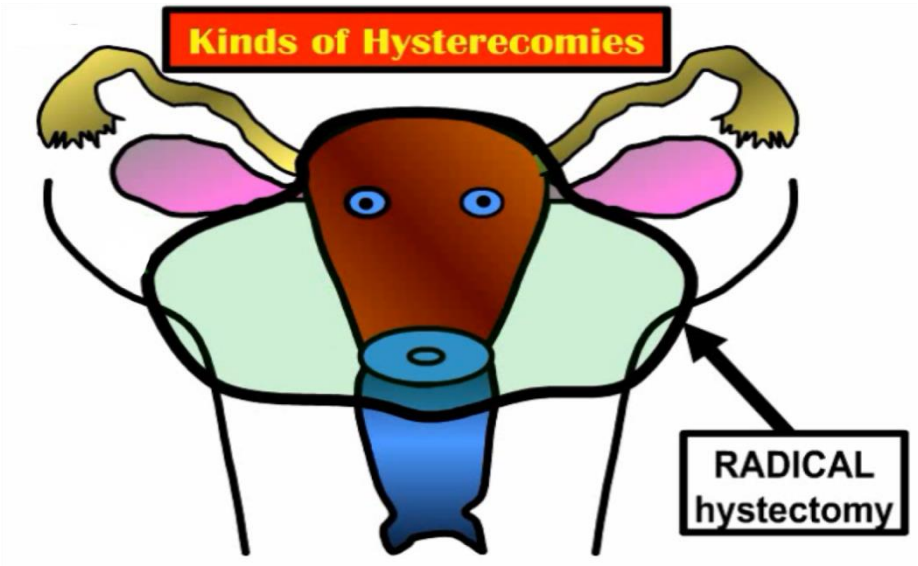
- Radical hysterectomy: performed for early-stage cervical carcinoma, involves removal of the uterus, cervix, and surrounding tissues, including cardinal ligaments, uterosacral ligaments, and the upper vagina.

- Follow-Up:

- All patients with invasive cervical cancer should be followed up with Pap smear every 3 months for 2 years after treatment, and then every 6 months for the subsequent 3 years.





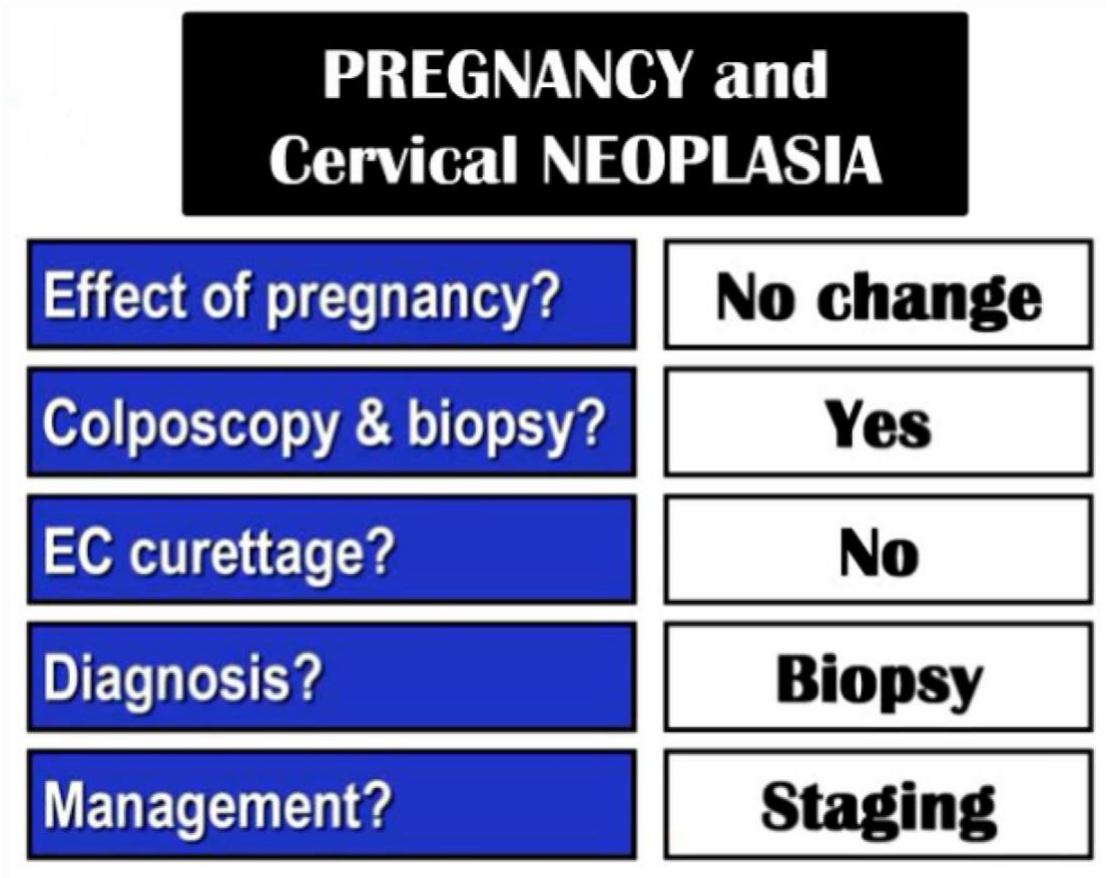


❖ N.B:

- Atypical glandular cells (AGC) on Pap testing may be due to either cervical or endometrial adenocarcinoma.
- All women age >35 with AGC or women age <35 with AGC and risk factors (obesity, anovulation) require evaluation for endometrial cancer in addition to cervical pathology. Therefore, AGC on Pap testing is investigated with colposcopy, endocervical curettage, and endometrial biopsy to evaluate the ectocervix, endocervix, and endometrium.

Cervical Neoplasia in Pregnancy

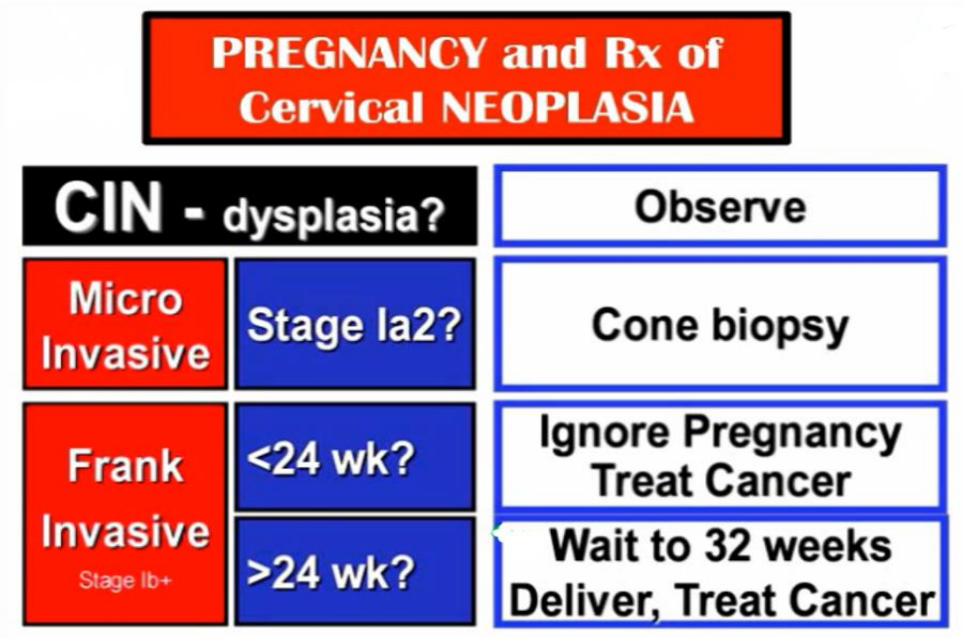
- Diagnostic Tests/Findings:



- Effect of pregnancy:
  - Pregnancy does not predispose to abnormal cytology and does not accelerate precancerous lesion progression into invasive carcinoma.

- Colposcopy and biopsy:
  - A patient who is pregnant with an abnormal Pap smear should be evaluated in the same fashion as when in a nonpregnant state.
  - An abnormal Pap smear is followed with colposcopy.
  - Any abnormal lesions of the ectocervix are biopsied.

- Perform an ECC? Owing to increased cervical vascularity, ECC is not performed during pregnancy.



- Management:

- CIN:
  - Patients with intraepithelial neoplasia or dysplasia should be followed with Pap smear and colposcopy every 3 months during the pregnancy.
  - At 6-8 weeks postpartum the patient should be reevaluated with repeat colposcopy and Pap smear.
  - Any persistent lesions can be definitively treated postpartum.

- Microinvasion:
  - Patients with microinvasive cervical cancer on biopsy during pregnancy should be evaluated with cone biopsy to ensure no frank invasion.
  - If the cone biopsy specimen shows microinvasive carcinoma during pregnancy, these patients can also be followed conservatively, delivered vaginally, reevaluated, and treated 2 months postpartum.

- Invasive cancer:
  - If the punch biopsy of the cervix reveals frankly invasive carcinoma, then treatment is based on the gestational age:

A. In general, if a diagnosis of invasive carcinoma is made before 24 weeks of pregnancy, the patient should receive definitive treatment (radical hysterectomy or radiation therapy).

B. If the diagnosis is made after 24 weeks of pregnancy, then conservative management up to about 32-33 weeks can be done to allow for fetal maturity to be achieved, at which time cesarean delivery is performed and definite treatment begun.

CHAPTER 5

Disorders of the uterus

Disorders of the uterus

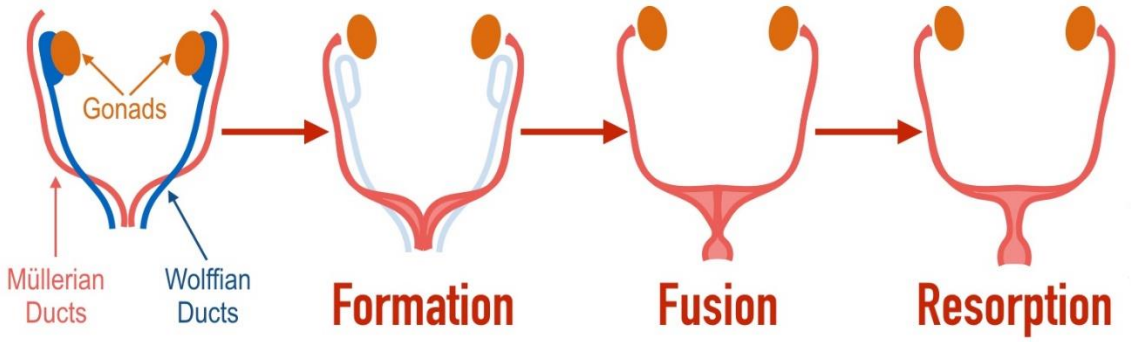
Mullerian anomalies

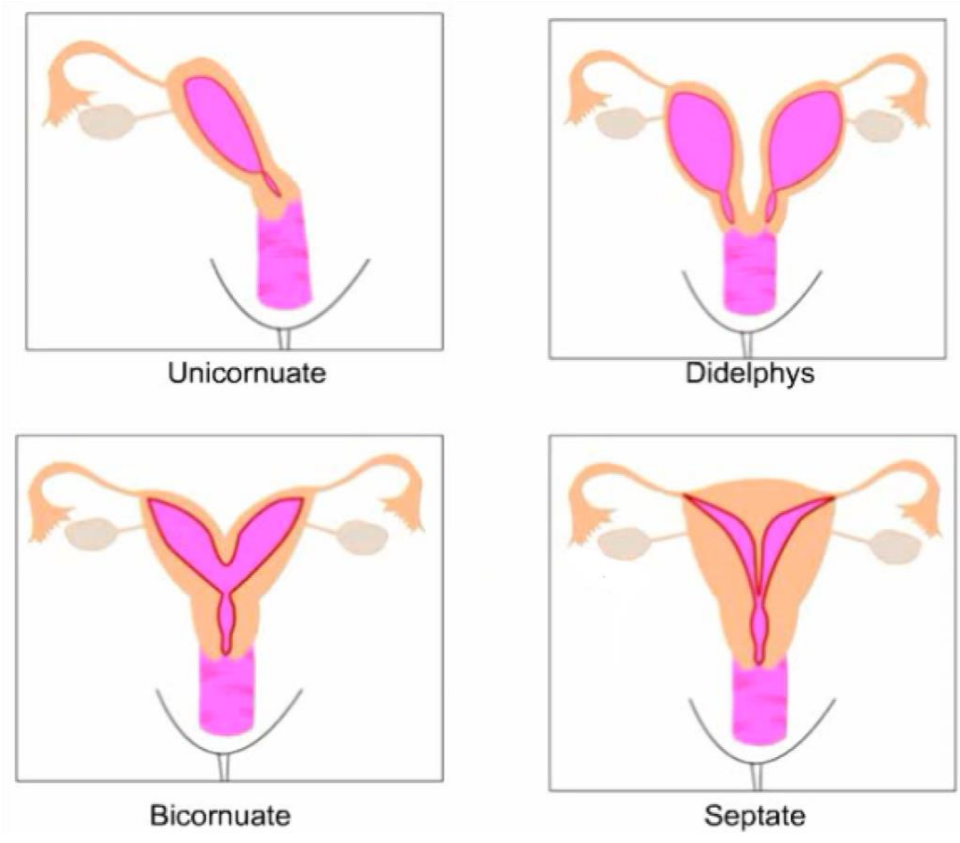
- Uterine anomalies are found in 3% of fertile women with normal reproductive outcomes. Uterine anomalies may result from 3 mechanisms:

- Stage 1: failure of one or both of the 2 Mullerian ducts to form.

- Stage 2: failure of the 2 ducts to fuse completely.

- Stage 3: failure of the 2 fused Mullerian ducts to dissolve the septum that results from fusion.





A. Failure to Form:

1. Hypoplasia/agenesis:

- Patients with Mullerian agenesis have primary amenorrhea due to an absent uterus, cervix, and upper 1/3 of the vagina (blind vaginal pouch).

- Urogenital development is from a common embryologic source: therefore, renal malformations are common and patients require evaluation with a renal ultrasound.

- May present as 1° amenorrhea (due to a lack of uterine development) in females with fully developed 2° sexual characteristics (functional ovaries).

2. Unicornuate uterus:

- When one of the Mullerian ducts fails to form, a single-horn (banana-shaped) uterus develops from the healthy Mullerian duct.

B. Failure to Fuse:

1. Didelphys uterus:

- A double uterus results from the complete failure of the 2 Mullerian ducts to fuse together. So each duct develops into a separate uterus, each of which is narrower than a normal uterus and has only a single horn.

- These 2 uteri may each have a cervix or they may share a cervix. In 67% of cases, a didelphys uterus is associated with 2 vaginas separated by a thin wall.

- Preterm delivery is common if pregnancy occurs in these patients.

2. Bicornuate uterus:

- It results from a failure of fusion between the mullerian ducts at the top (incomplete fusion).

- Thus, there is a single uterine cavity at the bottom with a single crevix, but it branches into two distinct horns at the top.

- Preterm delivery and malpresentation are common with pregnancy.

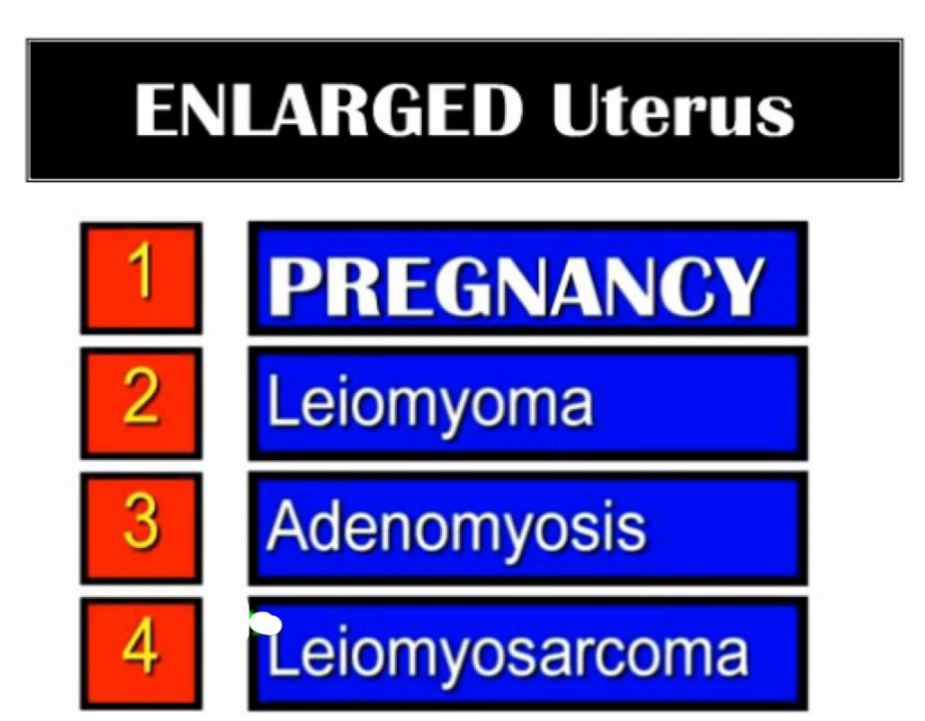
C. Failure to Dissolve Septum (Septate uterus):

- The two Mullerian ducts fused normally; however, there was a failure in degeneration of the median septum.

- Preterm delivery and malpresentation are common with pregnancy.

- Treat with septoplasty.

Enlarged uterus



Leiomyoma Uteri

- Location:

- It is a benign smooth muscle growth of the myometrium.

- It is the most common benign uterine tumor.

- It is 5 times more common in black women than white women.

- It can develop in a number of anatomic locations:

A. Intramural:

- The most common location of a leiomyoma is within the wall of the uterus.

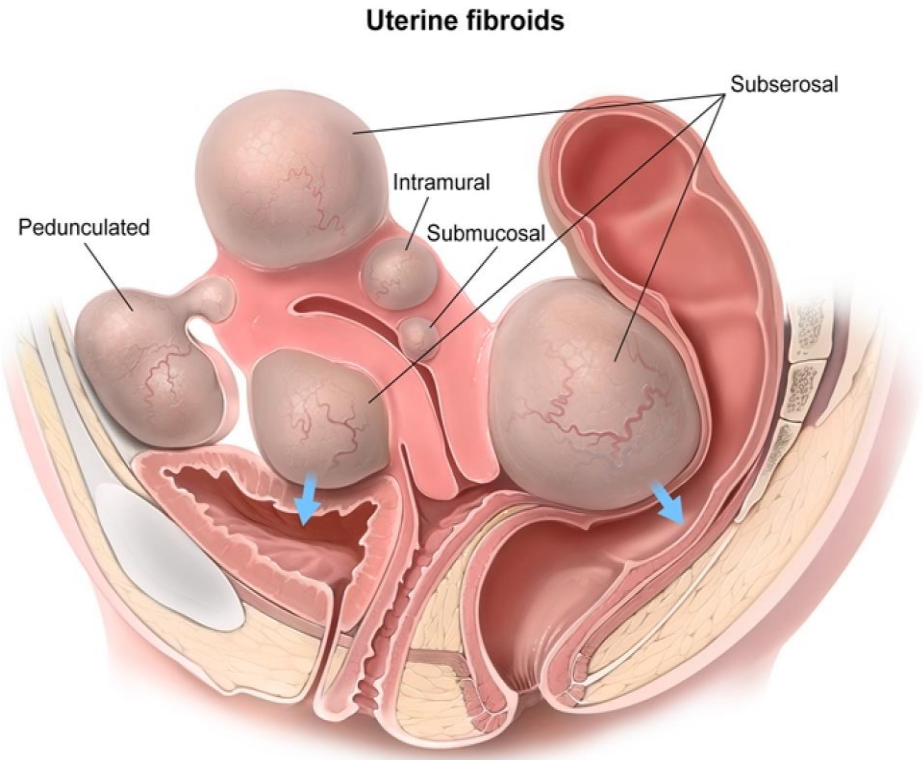
- When small it is usually asymptomatic and cannot be felt on examination unless it enlarges to where the normal uterine external contour is altered.

B. Submucosal:

- These myomas are located beneath the endometrium and can distort the uterine cavity.
- The distorted overlying endometrium may not respond appropriately to the normal hormonal fluctuations, resulting in unpredictable, often intermenstrual, bleeding.
- Abnormal vaginal bleeding is the most common symptom of a submucosal myoma and can result in anemia.
- Most fibroids do not affect pregnancy. However, having large or multiple fibroids can increase the risk of obstetrical complications (miscarriage, malrepresentation, abruptio placentae, preterm birth).

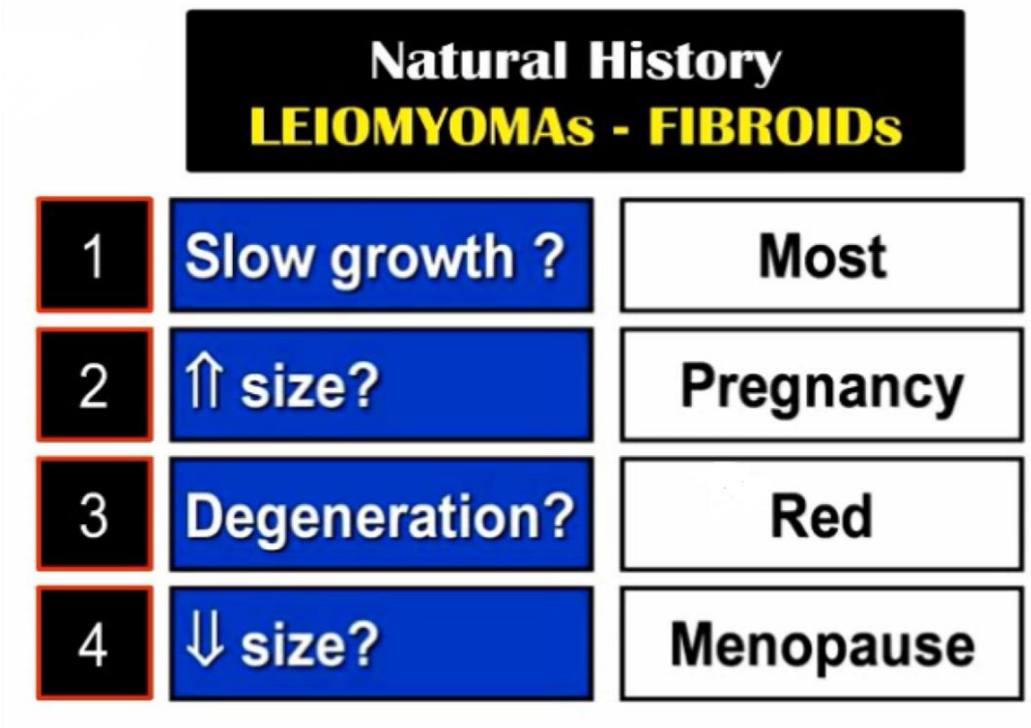
C. Subserosal:

- These are located beneath the uterine serosa.
- As they grow, they distort the external contour of the uterus causing the firm, nontender asymmetry. Leiomyomata can cause an irregularly enlarged uterus and size-date discrepancy during pregnancy.
- Depending on their location they can put pressure on the bladder, rectum, or ureters.
- Subserosal and pedunculated uterine leiomyomata can cause bulk-related symptoms (pelvic pressure, back/pelvic pain, sensation of incomplete voiding, and constipation).



- Natural History:

- Changes in size are dependent on the reproductive life stage of the woman.



- Slow growth:
  - Most leiomyomas are small, grow slowly, and cause no symptoms.
  - Only when massive in size do they cause pelvic pressure symptoms.

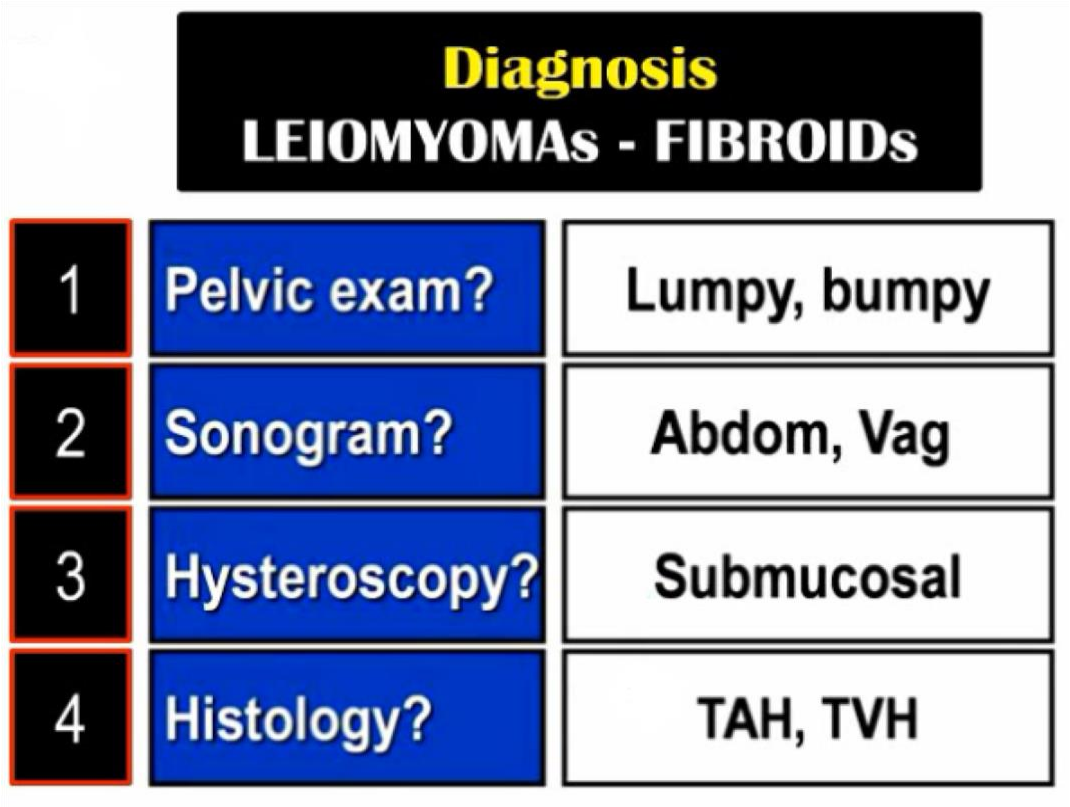
- Rapid growth:
  - Estrogen receptors are increased in leiomyomas resulting in rapid enlargement during times of high estrogen levels, such as pregnancy.

- Degeneration:
  - During times of rapid growth, myomas may outgrow their blood supply, resulting in ischemic degeneration of a fibroid.

- Leiomyomata uteri are more likely to degenerate during pregnancy because myometrial blood flow shifts toward the developing fetus and placenta. An infarcted, degenerating uterine fibroid can cause severe abdominal pain; uterine tenderness; a palpable, firm, and tender mass: and signs of inflammation (leukocytosis).

- Shrinkage:
  - When estrogen levels fall, with estrogen receptors no longer stimulated, leiomyomas will typically decrease in size.
  - This predictably occurs after menopause but can also occur when estrogen levels are medically reduced through gonadotropin releasing hormone (GnRH) agonist suppression of follicle-stimulating hormone (FSH).

- Diagnosis:



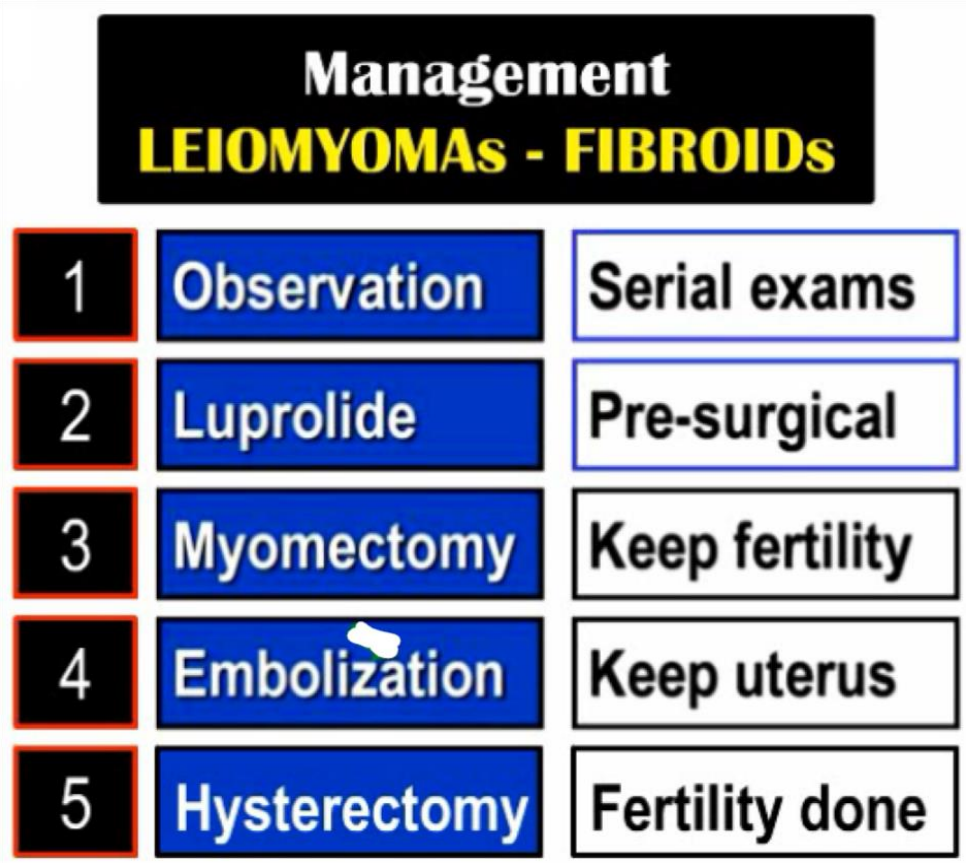
- Pelvic examination: In most cases the diagnosis is made clinically by identifying an enlarged, asymmetric, nontender uterus in the absence of pregnancy.

- Sonography: Ultrasound is the preferred initial diagnostic imaging modality for most patients. It is widely available, cost effective, and has a high sensitivity (>95%) for detecting uterine fibroids and ovarian pathology.

- Hysteroscopy: Submucosal myomas may be identified by visualizing them directly with hysteroscopy.

- Histology: The only definitive diagnosis is by surgical confirmation of excised tissue.

- Management:



- Observation:
  - Most leiomyomas can be managed conservatively and followed expectantly with regular pelvic examinations.

- Presurgical shrinkage:
  - After 3-6 months of GnRH analog therapy, with resultant hypoestrogenic state, a 60-70% reduction in size of the fibroids can be expected. However, once the leuprolide (Lupron) is terminated, there will be a regrowth of the fibroid within 6 months. Thus, GnRH analogs cannot be used for definitive cure, but they can be used in the adjuvant setting with surgical therapy.

  - If a myomectomy is done, a decrease in size will be associated with a decrease in blood loss, and if a hysterectomy is planned, then perhaps a vaginal instead of an abdominal hysterectomy can be performed.

- Hysteroscopic Myomectomy:
  - This is a surgical procedure performed if the patient desires to maintain fertility.

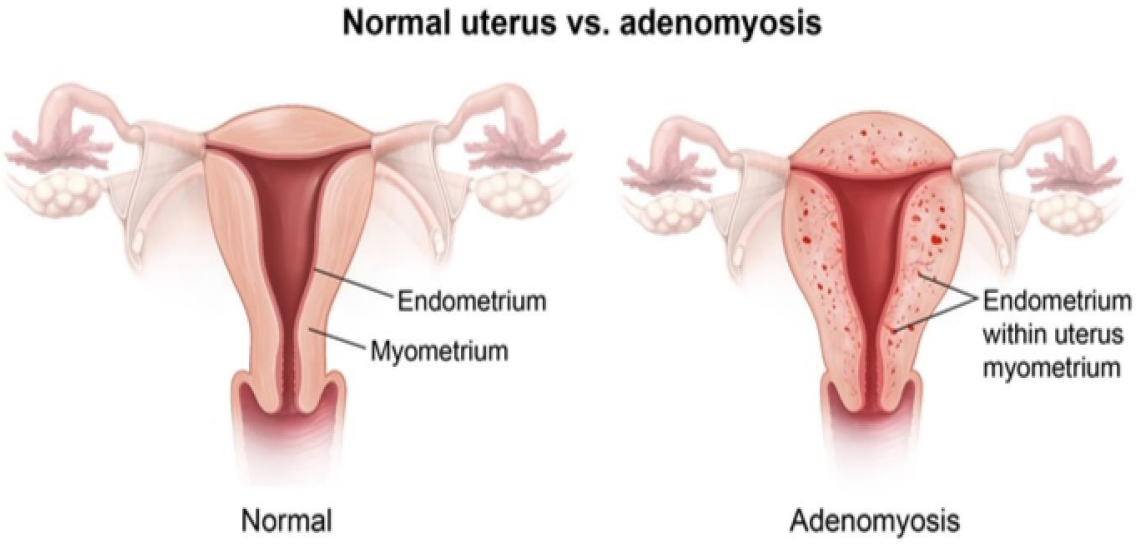
  - If the myomectomy incision entered the endometrial cavity, delivery of any subsequent pregnancy should be by cesarean section because of increased risk of scar rupture in labor.

- Embolization:
  - This is an invasive radiology procedure in which a catheter is placed into the vessels supplying the myoma.
  - Microspheres are injected, causing ischemia and necrosis of the myoma.
- Hysterectomy:
  - If the patient has completed her childbearing, definitive therapy is an abdominal or vaginal hysterectomy.

Adenomyosis

- Definition:

- Ectopic endometrial glands and stroma are located within the myometrium of the uterine wall.



- Diagnosis:

- In most cases the diagnosis is made clinically by identifying an enlarged, symmetric, tender uterus in the absence of pregnancy. Tenderness is most common immediately before and during menses.

- The disruption of the arrangement of the smooth muscle fibers interferes with normal uterine contraction and causes dysmenorrhea.

- The continued accumulation of endometrial tissue within the myometrium causes an increase in the endometrial cavity surface area resulting in heavy menstrual bleeding.

- The only definitive diagnosis is by histologic confirmation of the surgically excised tissue.

Leiomyoma	Adenomyosis
Asymmetric	Symmetric
Firm	Soft
Nontender	Tender

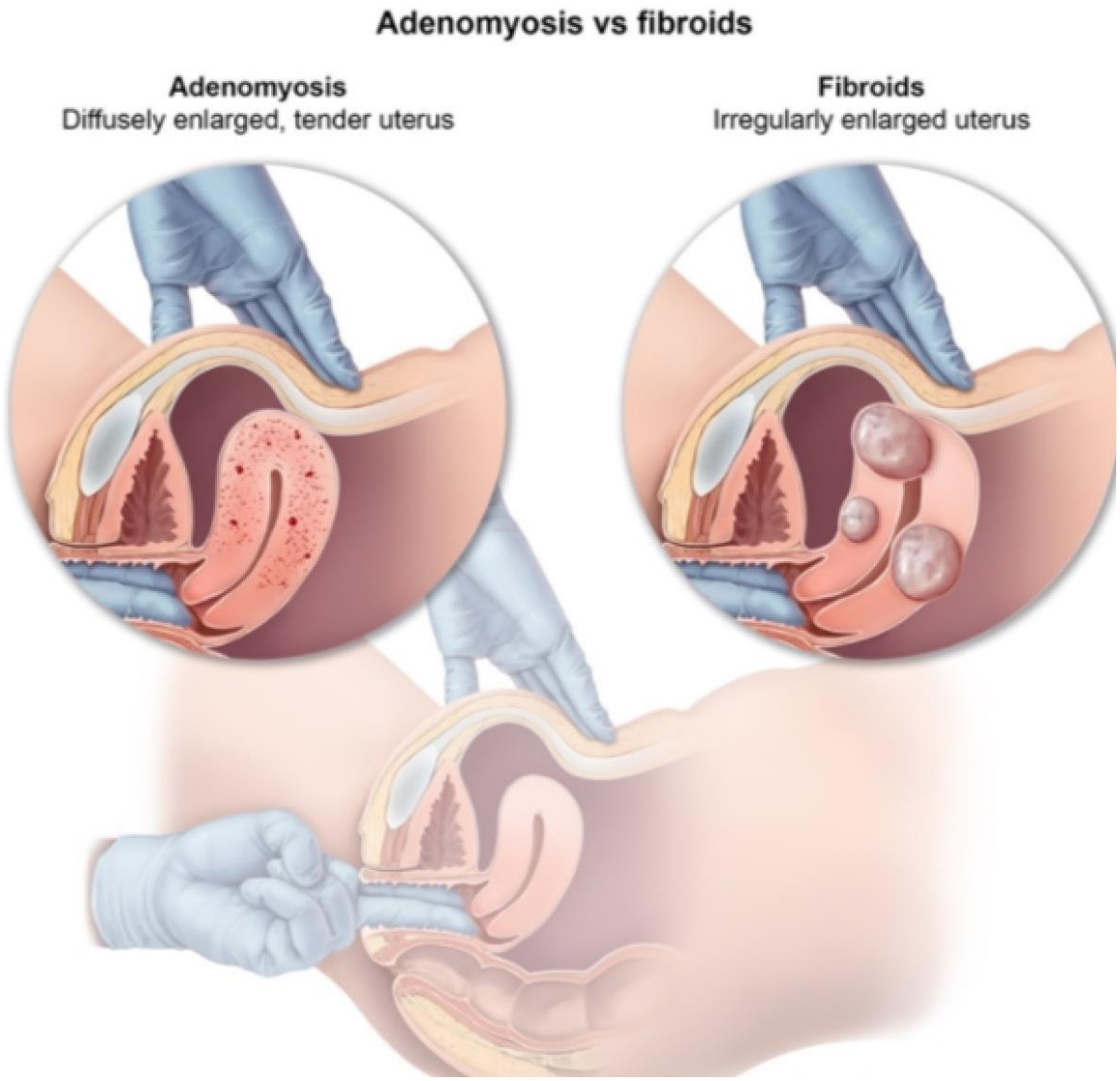
- Imaging:

- Ultrasound study or MRI imaging shows a diffusely enlarged uterus with cystic areas found within the myometrial wall.

- Management:

- Medical treatment includes the levonorgestrel (LNG) intrauterine system (IUS), which may decrease heavy menstrual bleeding.

- Surgery, in the form of hysterectomy, is the definitive treatment.



Endometrial Neoplasia

- Definition:
- A patient is considered to be in menopause after 3 continuous months of cessation of menses and elevated gonadotropins.
- Menopause usually occurs at approximately 52 years of age.
- Postmenopausal bleeding is any bleeding that occurs after menopause.

- Epidemiology:
- Endometrial carcinoma is the most common gynecologic malignancy.
- The mean age at diagnosis age 61.

- Screening: There is no screening test.

- Differential Diagnosis:
- The differential diagnosis of postmenopausal bleeding includes endometrial carcinoma, vaginal or endometrial atrophy, and postmenopausal hormonal replacement therapy.
- Although the most common cause of postmenopausal bleeding is vaginal or endometrial atrophy, the most important diagnosis to rule out is endometrial carcinoma.

- Pathophysiology:
- The mediating factor for most endometrial carcinomas appears to be unopposed estrogen.
- This results from excessive hyperstimulation of the endometrium without the stabilizing effect of progesterone.

- Risk Factors:
- These include obesity, hypertension, and diabetes mellitus.
- Other risk factors include tamoxifen, nulliparity, late menopause, and chronic anovulation conditions, such as PCO disease.

- Diagnostic Tests:
- Either endometrial biopsy or transvaginal U/S can be used as an initial test for evaluating the endometrium:
  - Endometrial sampling: This office procedure has historically been the initial diagnostic test for postmenopausal bleeding, due to its high sensitivity, low complication rate, and low cost.

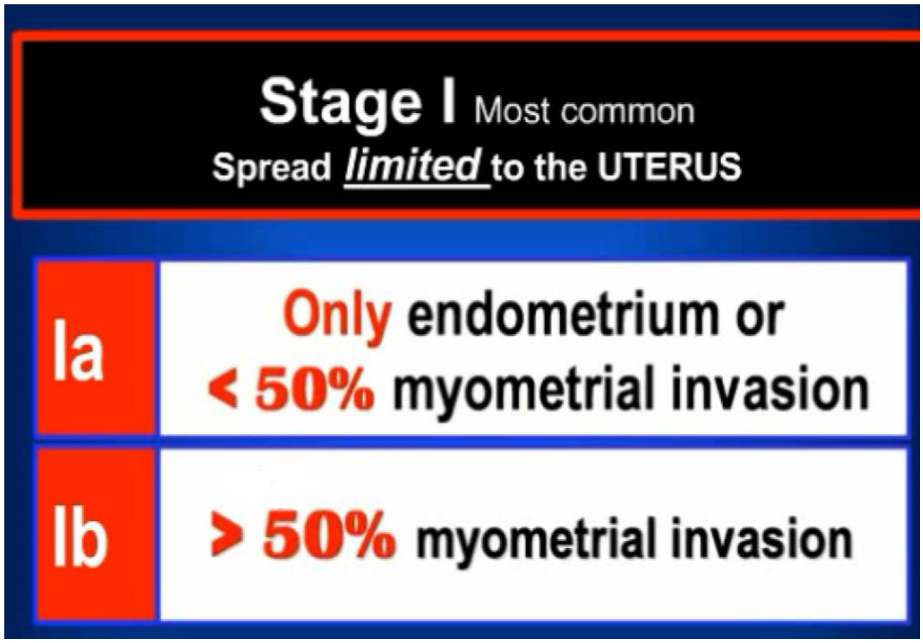
- Transvaginal sonogram: This is an acceptable alternative initial test for non-persistent minimal bleeding in women who are not on hormone replacement. A thin, homogenous endometrial stripe ≤4 mm can reasonably exclude endometrial carcinoma. A thicker endometrial stripe warrants further assessment with an endometrial sampling.

- Hysteroscopy:
- This procedure allows direct visualization of the endocervical canal and endometrial cavity.

- Endocervical or endometrial polyps, or submucus leiomyomas, can be removed at the time of the hysteroscopy.

- Staging:
- Staging is done after an evaluation of the pathology report. Staging is surgical.

Stage I:	Spread **limited** to the uterus (**most common** stage at diagnosis)
IA.	Limited to the endometrium or invasion less than half of myometrium
IB.	Invasion more than half of myometrium
Stage II:	Extension to the cervix but not outside the uterus
Stage III:	Spread **adjacent** to the uterus
IIIA.	Invades serosa or adnexa or positive cytology
IIIB.	Invasion of vagina
IIIC.	Invasion of pelvic or para-aortic nodes
Stage IV:	Spread **further** from the uterus
IVA.	Involves bladder or rectum
IVB.	Distant metastasis



- Management:

- If the endometrial histology sampling reveals atrophy and no evidence of cancer, it can be assumed the patient is bleeding from atrophy and can be treated with hormone replacement therapy. With hormone replacement therapy, estrogen and progesterone should be given to the patient. If estrogen is given alone, the risk of endometrial cancer increases.

- If the endometrial sampling reveals adenocarcinoma, the patient should be treated surgically.

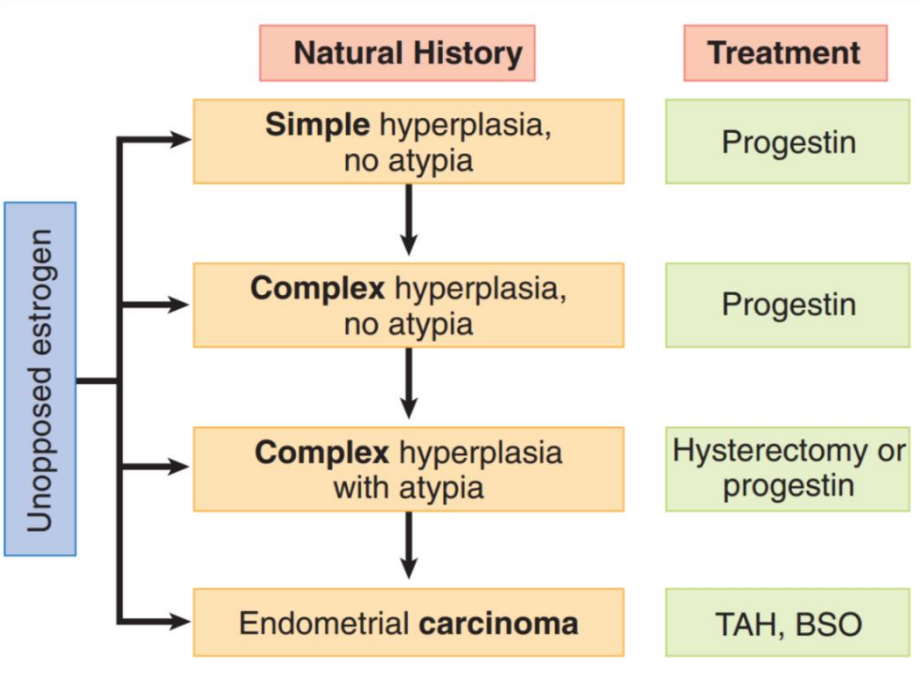
- Surgical therapy:
  - The mainstay of treatment of endometrial carcinoma is a total abdominal hysterectomy (TAH) and bilateral salpingo-oophorectomy (BSO), pelvic and para-aortic lymphadenectomy, and peritoneal washings.

- Radiation therapy:
  - An evaluation of the postoperative pathology report will classify patients into poor or good prognosis.

  - Patients with poor prognosis should be considered for radiation therapy.

  - Poor prognostic factors include metastasis to lymph nodes, >50% myometrial invasion, positive surgical margins, or poorly differentiated histology.

- Chemotherapy: Medical treatment is used for metastatic disease and involves progestins and cytotoxic agents.



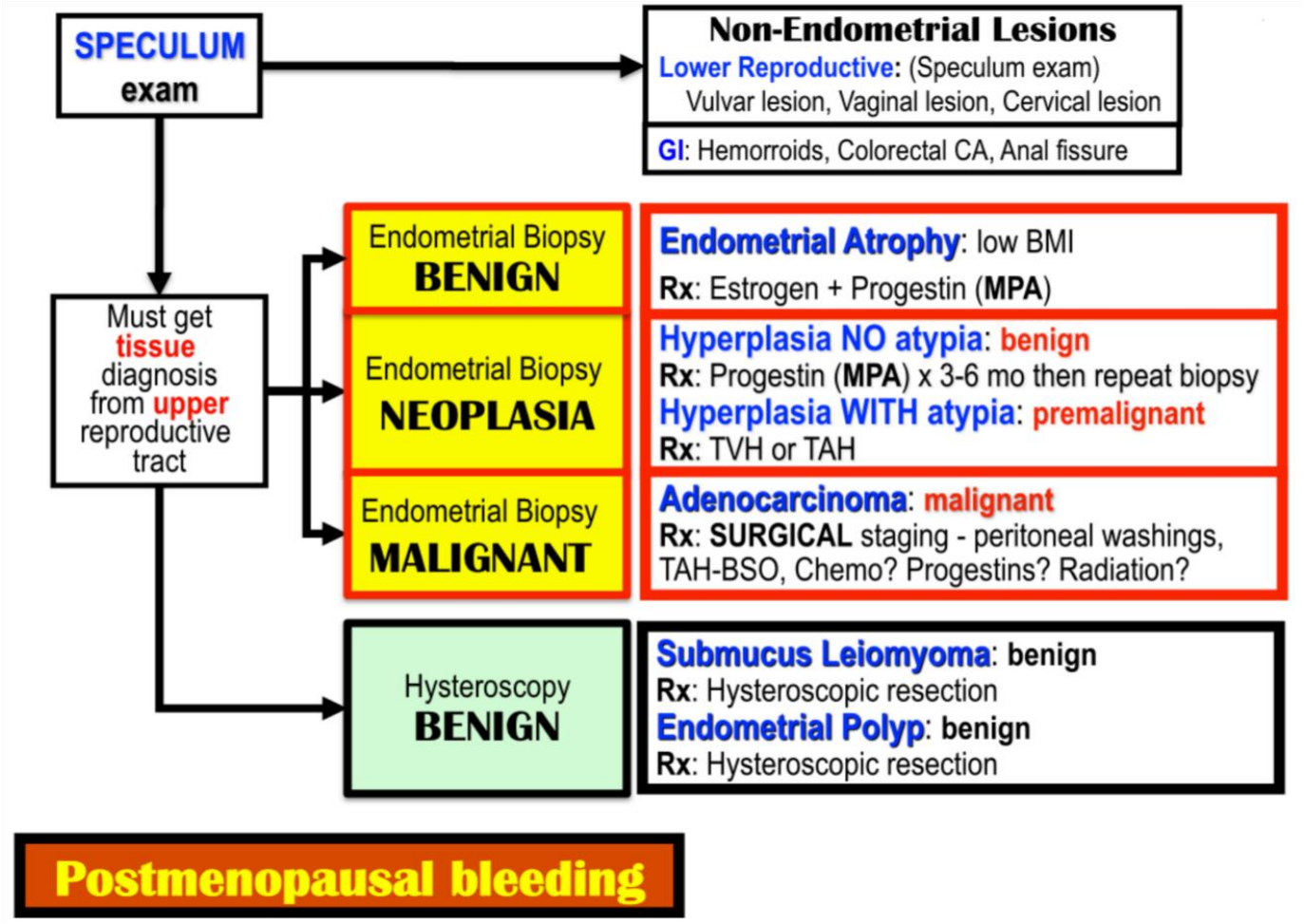
- Prevention:

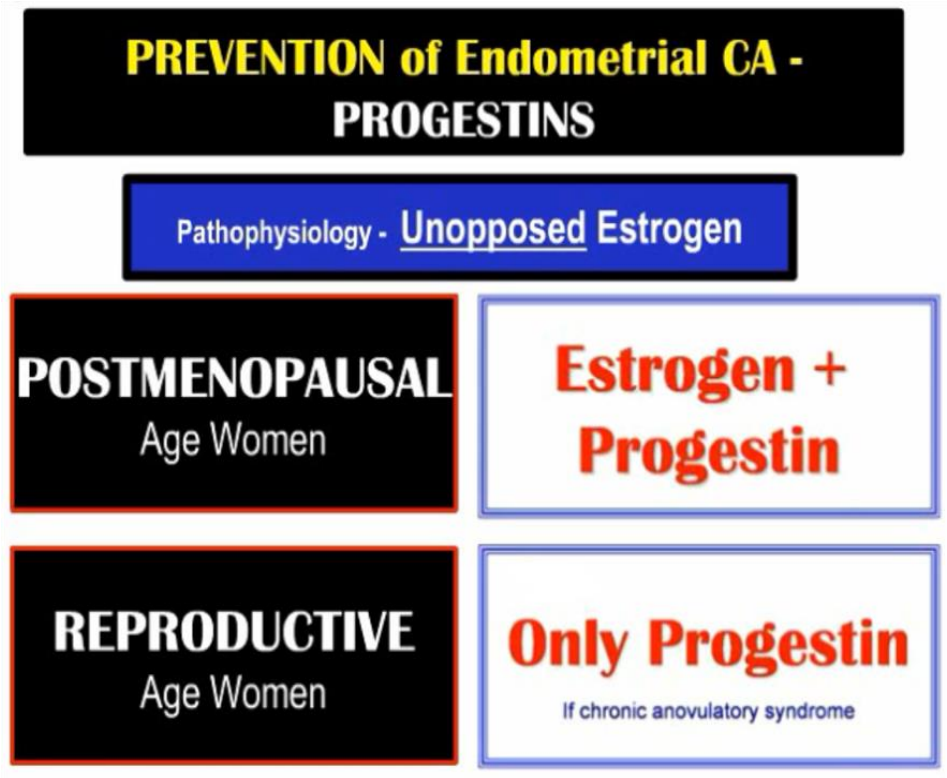
- Postmenopausal patients taking estrogen replacement therapy must be also treated with progestins to prevent unopposed estrogen stimulation, which may lead to endometrial cancer.

- Reproductive age women who have chronic anovulation, such as PCO syndrome, should also be treated with progestins to avoid endometrial hyperplasia from unopposed estrogen.

Endometrial hyperplasia/cancer	
Risk factors	Excess estrogen • Obesity • Chronic anovulation/PCOS • Nulliparity • Early menarche or late menopause • Tamoxifen use
Clinical features	• Heavy, prolonged, intermenstrual &/or postmenopausal bleeding
Evaluation	• Endometrial biopsy (gold standard) • Pelvic ultrasound (postmenopausal women)
Treatment	• Hyperplasia: progestin therapy or hysterectomy • Cancer: hysterectomy

PCOS = polycystic ovary syndrome.

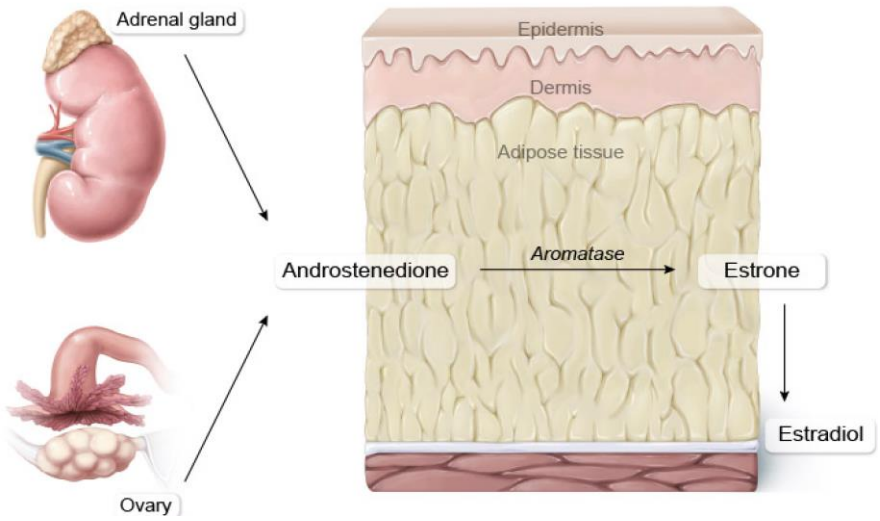

SPECULUM exam
Non-Endometrial Lesions
Lower Reproductive: (Speculum exam)
Vulvar lesion, Vaginal lesion, Cervical lesion
GI: Hemorroids, Colorectal CA, Anal fissure
Must get tissue diagnosis from upper reproductive tract
Endometrial Biopsy BENIGN
Endometrial Biopsy NEOPLASIA
Endometrial Biopsy MALIGNANT
Endometrial Atrophy: low BMI
Rx: Estrogen + Progestin (MPA)
Hyperplasia NO atypia: benign
Rx: Progestin (MPA) x 3-6 mo then repeat biopsy
Hyperplasia WITH atypia: premalignant
Rx: TVH or TAH
Adenocarcinoma: malignant
Rx: SURGICAL staging - peritoneal washings, TAH-BSO, Chemo? Progestins? Radiation?
Hysteroscopy BENIGN
Submucus Leiomyoma: benign
Rx: Hysteroscopic resection
Endometrial Polyp: benign
Rx: Hysteroscopic resection
Postmenopausal bleeding


PREVENTION of Endometrial CA - PROGESTINS
Pathophysiology - Unopposed Estrogen
POSTMENOPAUSAL Age Women
Estrogen + Progestin
REPRODUCTIVE Age Women
Only Progestin
If chronic anovulatory syndrome

❖ N.B:

1. Obesity increases endometrial cancer risk due to increased peripheral estrogen production leading to uncontrolled endometrial proliferation.

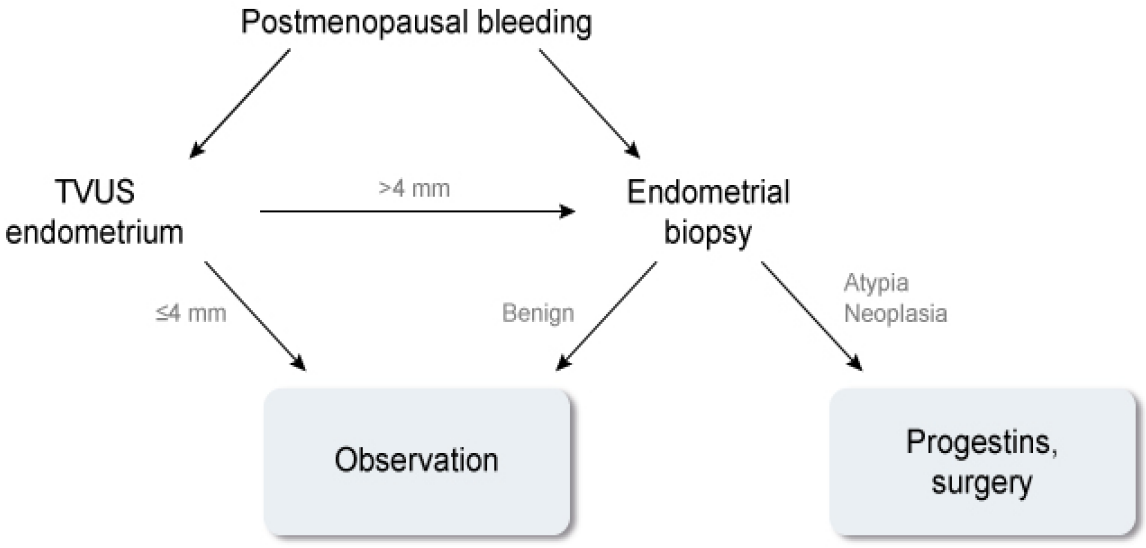
Peripheral estrogen conversion in adipose tissue



2. In a postmenopausal patient, evaluation of abnormal uterine bleeding can begin with either a transvaginal ultrasound (TVUS) or endometrial biopsy.

- In women who initially undergo a TVUS, those with an endometrium ≤4 mm require no additional evaluation.
- In contrast, women with an endometrium >4 mm require an endometrial biopsy.

Approach to postmenopausal bleeding



TVUS = transvaginal ultrasound.

CHAPTER 6

Disorders of the Ovaries and Oviducts

Disorders of the Ovaries and Oviducts

Functional Cysts

- Definition:

- The most common cause of a simple cystic mass in the reproductive age years is a physiologic cyst (luteal or follicular cyst).

- During the reproductive years the ovaries are functionally active, producing a dominant follicle in the first half of the cycle and a corpus luteum after ovulation in the second half of the menstrual cycle.

- Either of these structures, the follicle or the corpus luteum, can become fluid-filled and enlarged, producing a functional cyst.

- Differential Diagnosis:

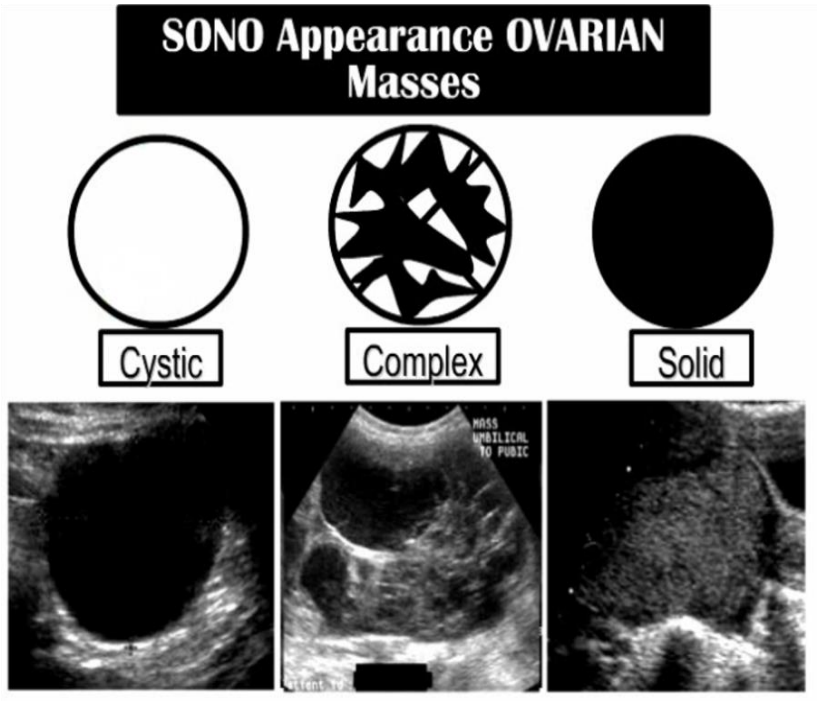
- Pregnancy: The most common cause of a pelvic mass in the reproductive years is pregnancy.

- Complex mass:
  - The most common complex adnexal mass in young women is a dermoid cyst or benign cystic teratoma.
  - Other diagnoses include endometrioma, tubo-ovarian abscess, and ovarian cancer.

- Diagnosis:

- Qualitative β-human chorionic gonadotropin (β-hCG) test: If negative, this will rule out pregnancy.

- Sonogram: A complex mass on ultrasound appearance is incompatible with a functional cyst.



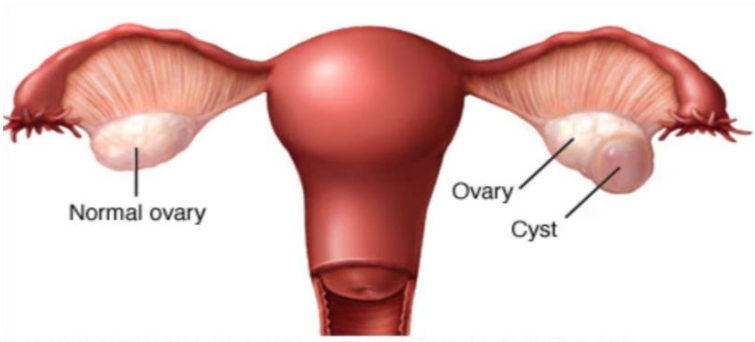
- Management:

- Observation:

  - If the sonogram shows a simple cyst it is probably benign but careful follow-up is needed.
  - Follow-up examination should be in 6-8 weeks, at which time the functional cyst should have spontaneously resolved.
  - During this period of observation, the patient should be alerted to the possibility of acute onset of pain, which may be indicative of torsion of the adnexal cyst.
  - Oral contraceptive medication can be used to help prevent further functional cysts from forming.

- Laparoscopy:

  - Even if the cyst is simple in appearance, surgical evaluation should be performed if the cyst is >7 cm or if patient had been on prior steroid contraception.
  - Physiologic cysts do not usually get larger than 7 cm in diameter.
  - Functional cysts should not form if the patient has been on oral contraception for at least 2 months because gonadotropins should have been suppressed.

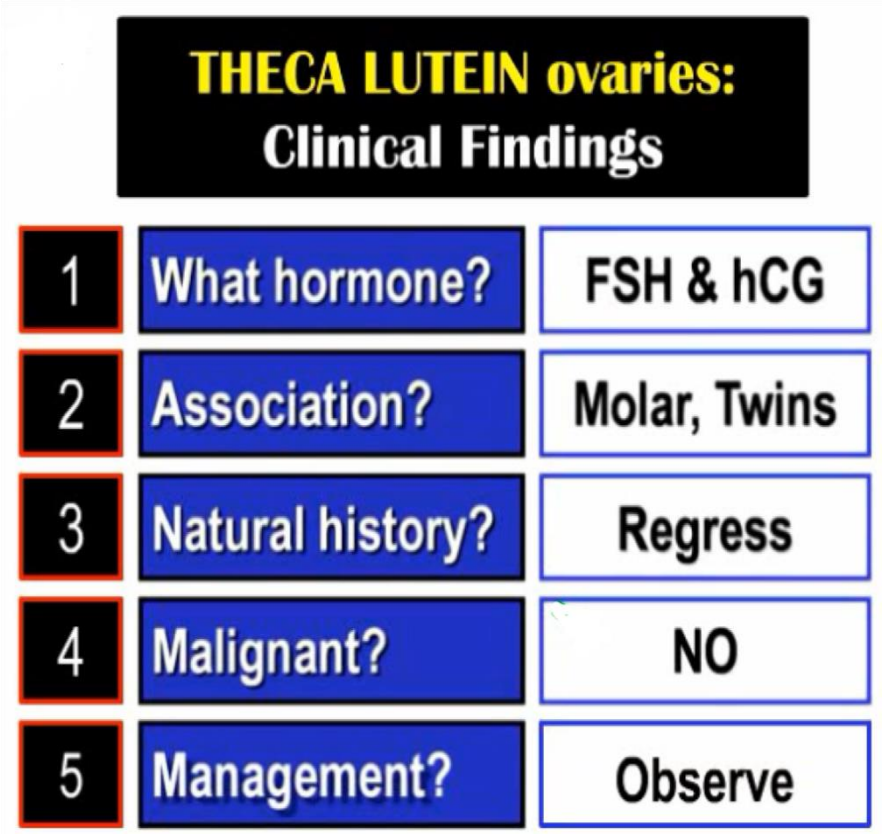


Luteoma of Pregnancy

- Luteoma of pregnancy is a rare, non-neoplastic tumor-like mass of the ovary that emerges during pregnancy and regresses spontaneously after delivery.
- It is usually asymptomatic and is found incidentally during a cesarean section or postpartum tubal ligation.
- It can be hormonally active and produce androgens resulting in maternal and fetal hirsutism and virilization.
- Management primarily involves clinical monitoring and ultrasound evaluation as the masses and symptoms regress spontaneously after delivery.

Theca Lutein Cysts

- These are benign neoplasms stimulated by high levels of FSH and β-hCG (ovarian hyperstimulation).
- They are associated with twins and molar pregnancies, but they are only rarely associated with a normal singleton pregnancy.
- The natural course of these tumors is postpartum spontaneous regression and require only conservative management.



Premenopausal pelvic mass

- Definition:

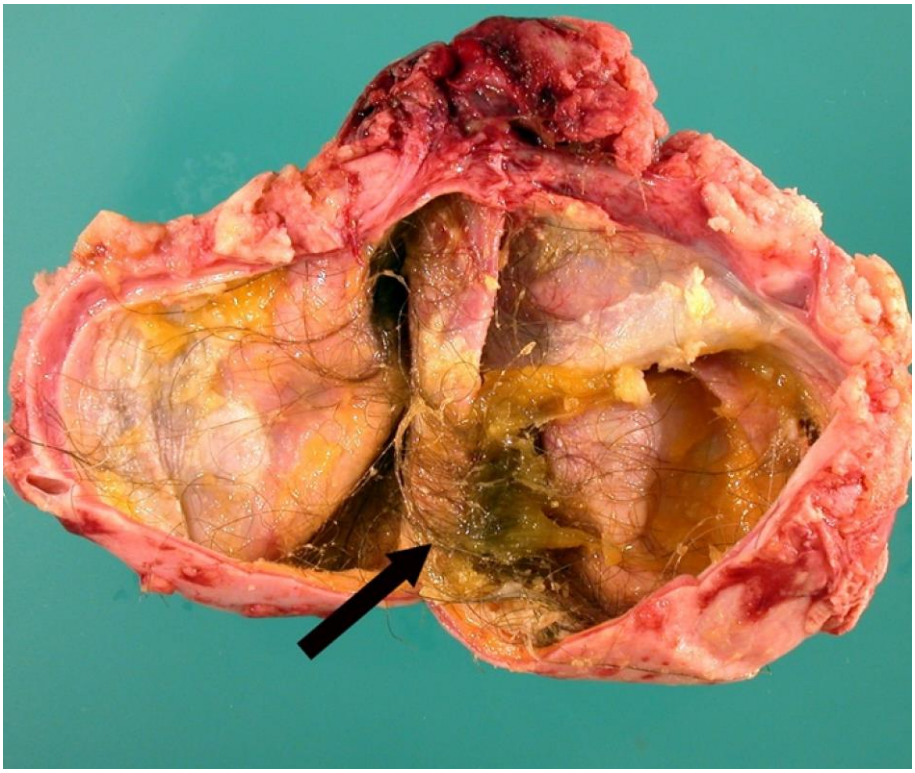
- The most common complex adnexal mass in young women is a dermoid cyst or benign cystic teratoma. Other diagnoses include endometrioma, tubo-ovarian abscess, and ovarian cancer.

- Dermoid cysts are benign tumors.

- Patients are usually asymptomatic but can experience pelvic pain.

- They can contain cellular tissue from all 3 germ layers. The most common histology seen is ectodermal skin appendages (hair, sebaceous glands), and therefore the name "dermoid." Thyroid tissue can also be identified, and if it comprises more than 50% of the dermoid, then the condition of struma ovarii is identified.

- Rarely, a malignancy can originate from a dermoid cyst, in which case the most common histology would be squamous cell carcinoma, which can metastasize.



- Differential Diagnosis:

- Pregnancy.
- Functional cysts.

- Diagnosis:

- Qualitative β-human chorionic gonadotropin (β-hCG) test to rule out pregnancy.

- The appearance of a complex mass on ultrasound will rule out a functional cyst.

- Typical ultrasound findings are calcifications and hyperechoic nodules.

- Management:

- Cystectomy:

  - At the time of surgery, ovarian cystectomy should be attempted to preserve ovarian function in the reproductive age and reduce the risk of ovarian torsion.

  - Careful evaluation of the opposite adnexa should be performed, as dermoid cysts can occur bilaterally in 10-15% of cases.

  - Intraperitoneal spillage of cyst contents should be avoided as it can cause chemical peritonitis.

- Oophorectomy:

  - If an ovarian cystectomy cannot be done because of the size of the dermoid cyst, then an oophorectomy is performed, but conservative management should always be attempted before an oophorectomy is done.

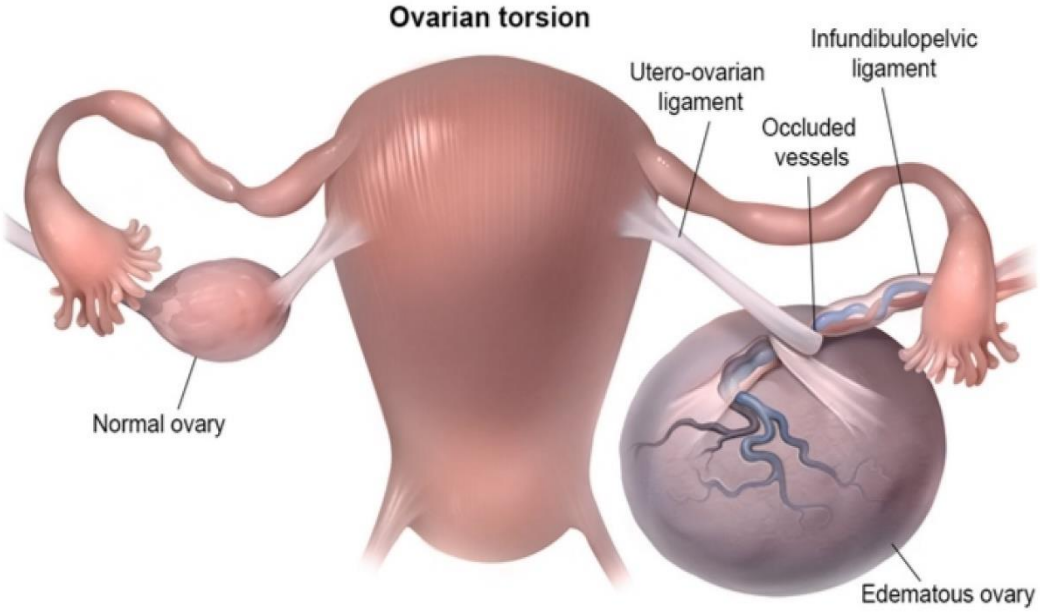
Painful adnexal mass

- Ovarian torsion Is a gynecologic emergency typically occurring in premenopausal patients, including adolescents.

- Sudden onset Pelvic pain, nausea, vomiting, and low-grade fever in a patient with a known ovarian mass should be suspected as ovarian torsion until proven otherwise. Symptoms arise due to ischemia and eventually necrosis of the ovary.

- Dermoid cysts in particular have a higher likelihood of torsion than other types of ovarian masses.

- A mass on the ovary puts weight on the adnexa and makes it vulnerable to twisting around its supporting structures [infundibulopelvic ligament (suspensory ligament of the ovary) or utero-ovarian ligament], which contain the ovarian blood supply.



- Diagnosis:

- Diagnosis is with ultrasound demonstrating absent blood flow to the ovary with doppler; the presence of an ovarian mass makes torsion more likely.

- Management:

- Detorsion: The management of the torsion should be to untwist the ovary and observe the ovary for a few minutes in the operating room to ensure revitalization. This can be performed with laparoscopy or laparotomy.

- Cystectomy: If revitalization occurs, an ovarian cystectomy can be performed with preservation of the ovary.

- Oophorectomy: If the ovary is necrotic, a unilateral salpingo-oophorectomy is performed.

Ovarian torsion	
Risk factors	• Ovarian mass • Women of reproductive age • Infertility treatment with ovulation induction
Clinical presentation	• Sudden-onset unilateral pelvic pain • Nausea & vomiting • ± Palpable adnexal mass
Ultrasound	• Adnexal mass with absent Doppler flow to ovary
Treatment	• Laparoscopy with detorsion • Ovarian cystectomy • Oophorectomy if necrosis or malignancy

❖ N.B:

- Ruptured ovarian cyst is a cause of acute pelvic pain affecting women of reproductive age Symptoms are caused by peritoneal irritation from leaking of cyst contents.
- Patients typically develop sudden onset of unilateral lower abdominal pain, often after strenuous activity or sexual intercourse.
- Physical examination shows tenderness of the lower abdomen, and an adnexal mass is sometimes palpable.
- Although hemoperitoneum (ovarian bleeding from cyst rupture) does not typically occur with ovarian cyst rupture, patients who are on anticoagulation can bleed intra-abdominally and become hemodynamically unstable.
- A complete blood count should be ordered to assess for anemia due to acute blood loss, and a pregnancy test should be obtained to exclude ectopic pregnancy. Pelvic ultrasound usually shows pelvic free fluid from leaking cyst contents but an adnexal mass may be absent in the case of complete rupture.
- An uncomplicated cyst rupture with no fever, hypotension, tachycardia, or signs of hemoperitoneum/infection can be managed conservatively with analgesics on an outpatient basis. Patients who are hemodynamically unstable or have significant hemoperitoneum require surgical intervention.

Prepubertal pelvic mass

- Etiology:

- An adnexal mass in the prepubertal age group is abnormal.

- During the prepubertal and the postmenopausal years, functional ovarian cysts are not possible because ovarian follicles are not functioning. Therefore, any ovarian enlargement is suspicious for neoplasm.

- Differential Diagnosis:

- If sonography shows a complex adnexal mass in a girl or teenager, the possibility of germ cell tumors of the ovary has to be considered.

- The following serum tumor markers should be obtained:
  - lactate dehydrogenase (LDH) for dysgerminoma.
  - β-hCG for choriocarcinoma.
  - α-fetoprotein for endodermal sinus tumor.

- Presentation:

- These tumors characteristically grow rapidly and give early symptomatology as opposed to the epithelial cancers of the ovary that are diagnosed in advanced stages.

- Sudden onset of acute abdominal pain is a typical presentation of germ cell tumors of the ovary.

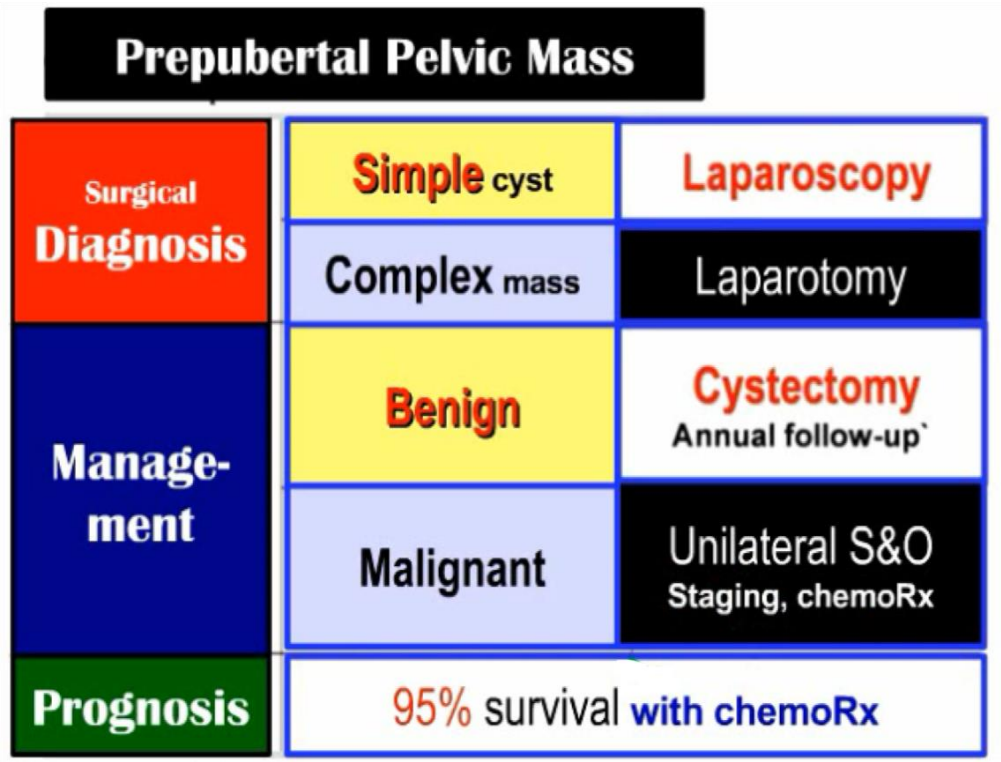
- Germ cell tumors of the ovary are most common in young women and present in early stage disease.

- Diagnosis:

- Simple mass: If the ultrasound shows the consistency of the mass to be simple (no septations or solid components), this mass can be evaluated through a laparoscopic approach.

- Complex mass: If the mass has septations or solid components, laparotomy should be performed.

- Management:



- Benign histology:
  - Because of the patient's age the surgical goal should be toward conservation of both ovaries.
  - Cystectomy should be performed instead of a salpingo-oophorectomy.
  - Follow-up is on an annual basis.
- Germ cell tumor:
  - A unilateral salpingo-oophorectomy and surgical staging (peritoneal and diaphragmatic biopsies, peritoneal cytology, pelvic and para-aortic lymphadenectomy, and omentectomy) should be done.
  - All patients with germ cell tumors require postoperative chemotherapy.
  - Follow-up after conservative surgery is every 3 months with pelvic examination and tumor marker measurements.

- Prognosis:
- The current survival is >95% in patients with germ cell tumors managed with conservative management and chemotherapy.

Postmenopausal pelvic mass

- Definition:

- A pelvic mass identified after menopause.

- Ovaries in the postmenopausal age group should be atrophic; anytime they are enlarged, the suspicion of ovarian cancer arises.

- Screening Test: There is no current screening test for ovarian cancer.

- Epidemiology:

- Ovarian carcinoma is the second most common gynecologic malignancy, with a mean age at diagnosis of 69 years.

- It is the most common gynecologic cancer leading to death.

- Risk Factors:

- These include BRCA1 gene, positive family history, high number of lifetime ovulations, and infertility.

- Protective Factors:

- These are conditions that decrease the total number of lifetime ovulations: oral contraceptive pills, chronic anovulation, breast-feeding, and short reproductive life.

- Diagnostic Tests:

- A palpable adnexal mass on physical examination is best evaluated by pelvic ultrasonography to rule out malignant features [thick septations, solid components, and peritoneal free fluid (ascites)].

- GI tract lesions: Abdominal pelvic CT scan or a pelvic ultrasound, and GI studies (barium enema) to rule out any intestinal pathology such as diverticular disease.

- Urinary tract lesions: IVP to identify any impingement of the urinary tract.

- Classification of Ovarian Cancer:

A. Epithelial tumors (80%):

- The most common type of histologic ovarian carcinoma is epithelial cancer, which predominantly occurs in postmenopausal women.

- These include serous, mucinous, Brenner, endometrioid, and clear cell tumors.

- The most common malignant epithelial cell type is serous.

B. Germ cell tumors (15%):

- Another histologic type of ovarian cancer is the germ cell tumor, which predominantly occurs in teenagers.

- Examples are dysgerminoma, endodermal sinus tumors, teratomas, and choriocarcinoma.

- The most common malignant germ cell type is dysgerminoma.

C. Stromal tumors (5%):

- The third type of ovarian tumor is the stromal tumor, which is functionally active.

- These include:

1. Granulosa-theca cell tumors, which secrete estrogen:
   - Unopposed estrogen stimulation can lead to endometrial hyperplasia or carcinoma, which presents as postmenopausal bleeding and appears on ultrasonography as a thickened endometrium. Postmenopausal bleeding with a thickened endometrium and a large ovarian mass is concerning for endometrial hyperplasia/cancer in the setting of a granulosa cell ovarian tumor. Endometrial biopsy is the gold standard test to rule out endometrial malignancy.

   - In children, symptoms can include precocious puberty, which is the onset of secondary sexual characteristics in girls age <8. Physical examination may show a pelvic mass, breast bud development, and pubic hair. White, odorless vaginal discharge is also indicative of estrogen stimulation.

2. Sertoli-Leydig cell tumors, which secrete testosterone: The testosterone excess results in the clinical features often associated with this tumor, including:
   - Rapid onset virilization: Testosterone and dihydrotestosterone affect peripheral tissues, resulting in clitoromegaly. Additional features may include male-pattern (bitemporal) balding, voice deepening, and increased muscle mass.

   - Signs of estrogen deficiency: Testosterone inhibits hypothalamic GnRH and pituitary FSH/LH release, resulting in low estrogen. Therefore, patients may develop breast atrophy, vulvovaginal atrophy, dyspareunia, and oligomenorrhea.

- Tumor Markers:

- CA-125 (cancer antigen 125) and CEA (carcinoembryonic antigen) should also be drawn for the possibility of ovarian epithelial cancer.

- LDH, hCG, and α-fetoprotein should be drawn for the possibility of germ cell tumors.

- Estrogen and testosterone should be drawn for the possibility of stromal tumors.

- Adnexal mass with ascites:

- The most common method of ovarian carcinoma spread is by peritoneal dissemination (exfoliation) and is commonly seen metastatic to the omentum and to the GI tract.

- In a female patient with ascites, ovarian carcinoma must always be considered.

- The presence of peritoneal fluid in a postmenopausal woman is pathologic and is the origin of the typical symptoms of bloating, early satiety/anorexia, and abdominal distension seen in ovarian cancer.

- The cause of death of patients with advanced ovarian carcinoma is bowel obstruction.

- Staging: Staging is surgical

Stage I:	Spread limited to the **ovaries**
IA.	Limited to one ovary, capsule intact, negative cytology
IB.	Limited to both ovaries, capsules intact, negative cytology
IC.	One or both ovaries but ruptured capsule, positive cytology
Stage II:	Extension to the **pelvis**
IIA.	Extension to uterus or tubes
IIB.	Extension to other pelvic structures
IIC.	Extension to pelvis with positive cytology
Stage III:	**Peritoneal** metastases or positive nodes. This is the **most common** stage at diagnosis.
IIIA.	Microscopic peritoneal metastases
IIIB.	Macroscopic peritoneal metastases ≤2 cm
IIIC.	Macroscopic peritoneal metastases >2 cm
Stage IV:	**Distant** metastases
IVA.	Involves bladder or rectum
IVB.	Distant metastasis

- Management:

- Management involves exploratory laparotomy with cancer resection and staging with inspection of the entire abdominal cavity.

- At the time of surgery, a unilateral salpingo-oophorectomy (USO) is done and sent for frozen section:

A. Benign Histology:

- Not a good surgical candidate: If the patient is not a good surgical candidate or the patient desires to maintain her uterus and contralateral ovary, a USO is sufficient treatment.

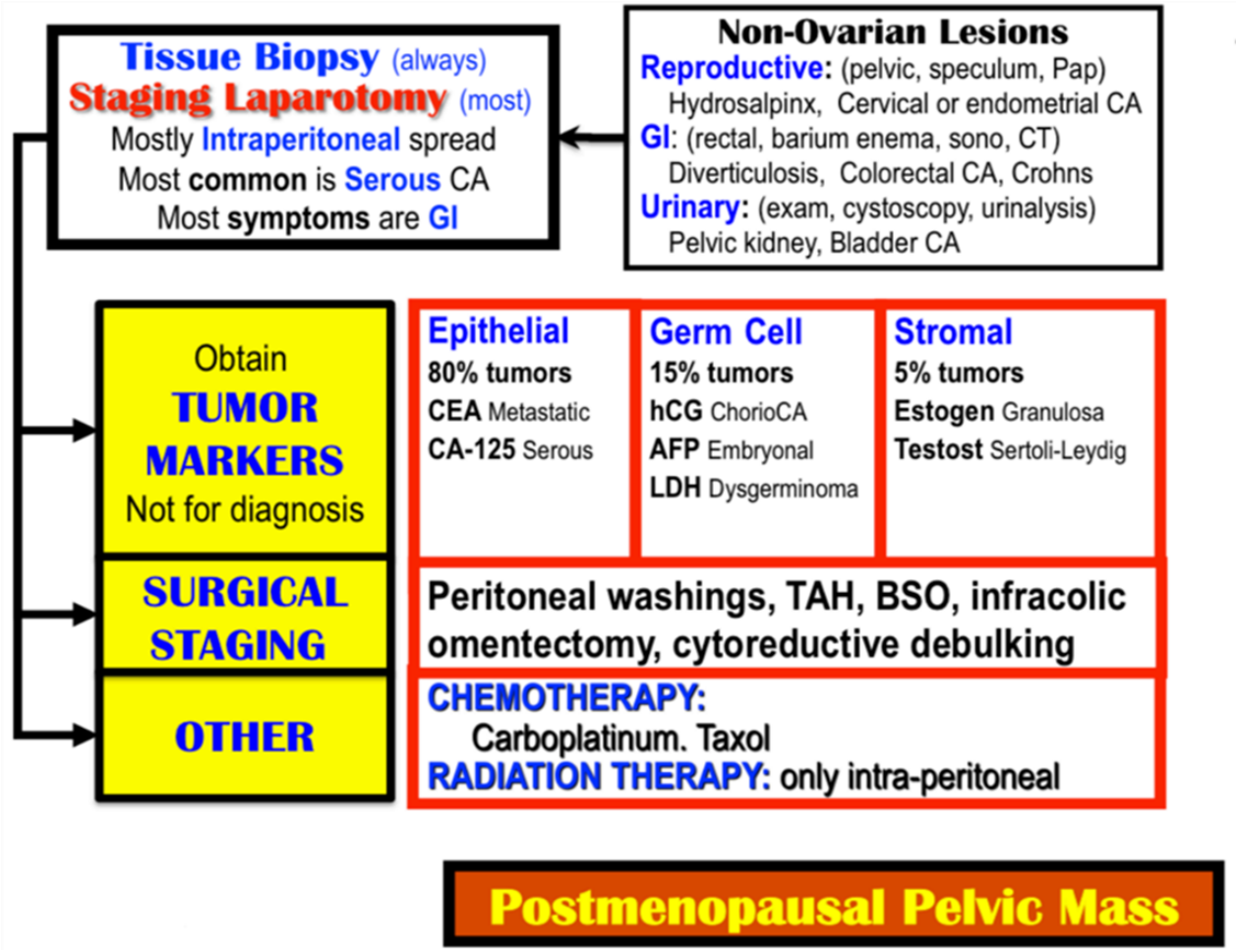
- Good surgical candidate: If the USO by frozen section is benign and the patient is a good surgical candidate, then a TAH and BSO may be performed even though it is benign disease because the uterus and ovaries are not unusual sites of pathology in a woman.

B. Malignant Histology:

- In this case, a debulking procedure (cytoreduction) should be performed.

- This procedure consists of a TAH and BSO, omentectomy, and bowel resection, if necessary.

- Postoperative chemotherapy should be administered.



❖ N.B:

1. BRCA mutations predispose patients to breast and ovarian cancers. Typically identified in an individual with breast cancer at age <50 or ovarian cancer at any age.

- Specifically, BRCA1 and BRCA2 mutations carry a 60% and 20% lifetime risk of ovarian cancer, respectively.
- Premenopausal prophylactic bilateral salpingo-oophorectomy (BSO) has been shown to significantly decrease the incidence of ovarian cancer (as well as breast cancer and overall mortality) in BRCA-positive individuals and is recommended as soon as childbearing is complete.
- Oral contraceptive use also has a protective effect on ovarian cancer incidence, but it is not as pronounced as a prophylactic removal of ovaries and tubes.
- Premenopausal patients considering BSO should be counseled on side effects from surgical menopause, including possible issues with libido, decreased bone density, and increased risk of heart disease. Due to morbidity and mortality risks associated with premature menopause, a BSO is not routinely recommended to prevent ovarian cancer in patients without a hereditary increased risk.

2. Ovarian cancer risk increases after menopause, and an ovarian mass in a postmenopausal patient is highly concerning for malignancy.

- Investigation by pelvic ultrasonography and CA-125 measurement is necessary. Even if the mass has no malignant features on ultrasound an elevated CA-125 level is concerning and requires further imaging and possible surgical exploration.
- CA-125 levels can also be used to monitor for recurrence of a proven malignancy after treatment.

Epithelial ovarian carcinoma	
Clinical presentation	• Acute: Shortness of breath, obstipation/constipation with vomiting, abdominal distension • Subacute: Pelvic/abdominal pain, bloating, early satiety • Asymptomatic adnexal mass
Laboratory findings	• ↑ CA-125
Ultrasound findings	• Solid mass • Thick septations • Ascites
Management	• Exploratory laparotomy

3. The ureter is vulnerable to injury during gynecologic procedures due to its proximity to the ovarian vessels (in the infundibulopelvic/suspensory ligament) and uterine vessels (near the cervix).

- Most ureteral injuries are identified during surgery but missed cases can present up to 2 weeks postoperatively as the damaged ureter drains urine directly into the abdomen, resulting in a large volume of intraabdominal fluid and subsequent abdominal distension (diffuse pain, bloating).
- The caustic effects of the urine may cause signs of peritoneal inflammation (fever, nausea, abdominal pain).
- Patients with a unilateral ureteral injury often have regular voiding and normal serum creatinine and urinalysis because the contralateral kidney and ureter continue to function normally.
- Diagnosis is typically with CT urography and treatment is surgical repair.

Gestational Trophoblastic Neoplasia

- Definition:

- GTN, or molar pregnancy, is an abnormal proliferation of placental tissue involving both the cytotrophoblast and/or syncytiotrophoblast.

- It can be benign or malignant.

- Malignant GTN can be characterized as either localized or metastatic as well as classified into either Good Prognosis or Poor Prognosis.

- Classification:

- Benign GTN is the classic hydatidiform mole:

A. Complete mole:
   - Complete mole is the most common benign GTN.
   - It results from fertilization of an empty egg with a single X sperm resulting in paternally derived (androgenetic) normal 46, XX karyotype.
   - No fetus, umbilical cord or amniotic fluid is seen.
   - The uterus is filled with grape-like vesicles composed of edematous avascular villi.
   - Progression to malignancy is 20%.

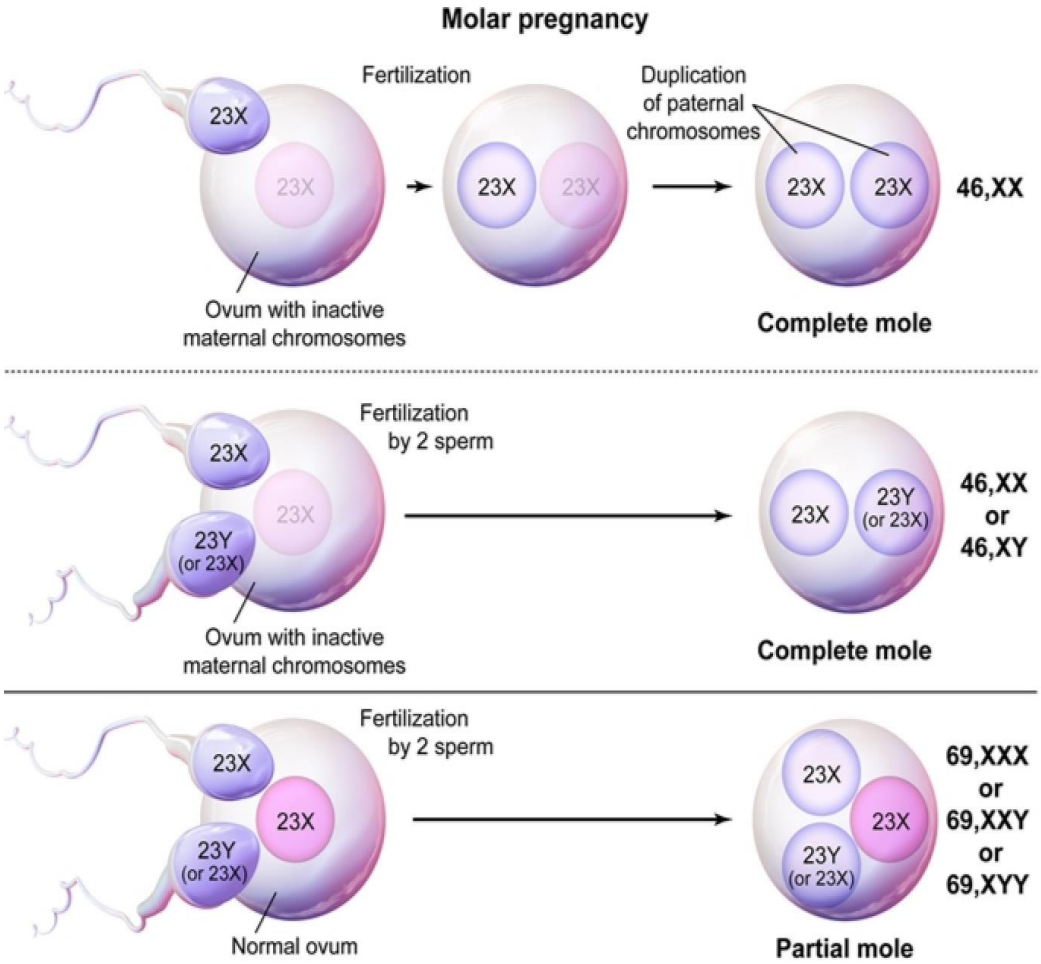
B. Incomplete mole:
   - Incomplete mole is the less common benign GTN.
   - It results from fertilization of a normal egg with two sperm resulting in triploid 69, XXY karyotype.
   - A fetus, umbilical cord and amniotic fluid is seen which results ultimately in fetal demise.
   - Progression to malignancy is 10%.

- Malignant GTN is the gestational trophoblastic tumor (GTT) which can develop in 3 categories:

A. Non-metastatic disease: localized only to the uterus.

B. Good Prognosis metastatic disease: has distant metastasis with the most common location being the pelvis or lung. Cure rate is >95%.

C. Poor Prognosis metastatic disease: has distant metastasis with the most common location being the brain or the liver. Other poor prognosis factors are serum β-hCG levels >40,000, >4 months from the antecedent pregnancy, and following a term pregnancy. Cure rate is 65%.



- Clinical Findings:

- The most common symptom is bleeding prior to 16 weeks' gestation and passage of vesicles from the vagina.

- Other symptoms of a molar pregnancy include hypertension, hyperthyroidism, and hyperemesis gravidarum, and no fetal heart tones appreciated.

- The most common sign is fundus larger than dates, absence of fetal heart tones, bilateral cystic enlargements of the ovary known as theca-lutein cysts.

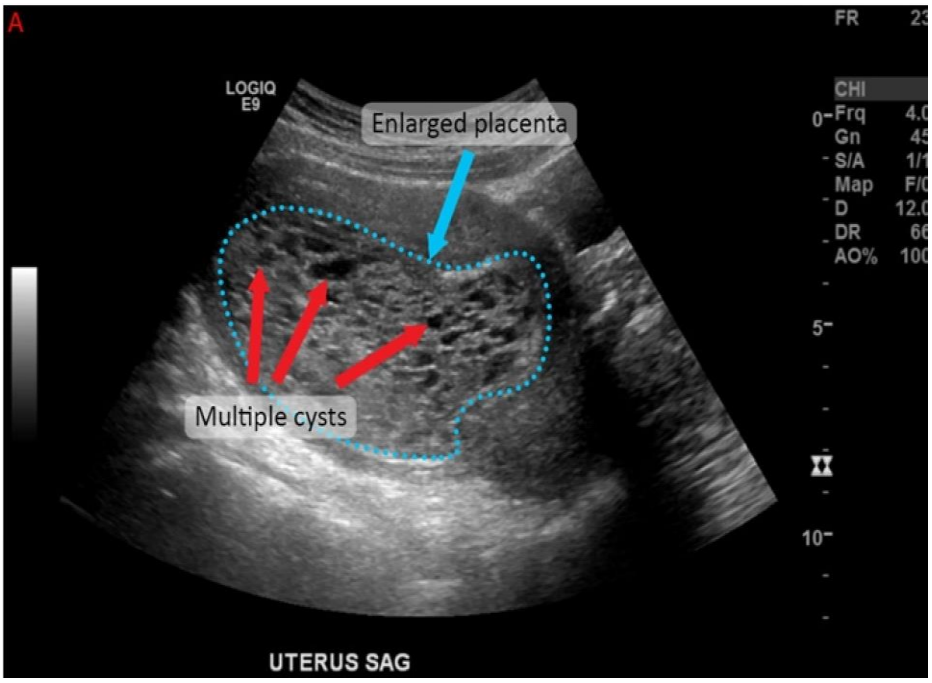
- Hydatidiform mole can present with theca lutein cysts, bilateral multiloculated ovarian cysts that are associated with ovarian hyperstimulation from markedly elevated β-hCG levels. The theca lutein cysts resolve after treatment of the hydatidiform mole when the β-hCG level decreases.

- The most common site of distant metastasis is the lungs.

- Diagnosis:

- The characteristic ultrasound finding of a complete hydatidiform mole is an endometrium with a "snowstorm appearance".

- This appearance is due to cystic hydropic villi that create a heterogenous mass but no fetus or amniotic fluid. Additional ultrasound findings may include theca lutein cysts: large, bilateral, multilocular cysts that occur due to ovarian hyperstimulation.



- Management:

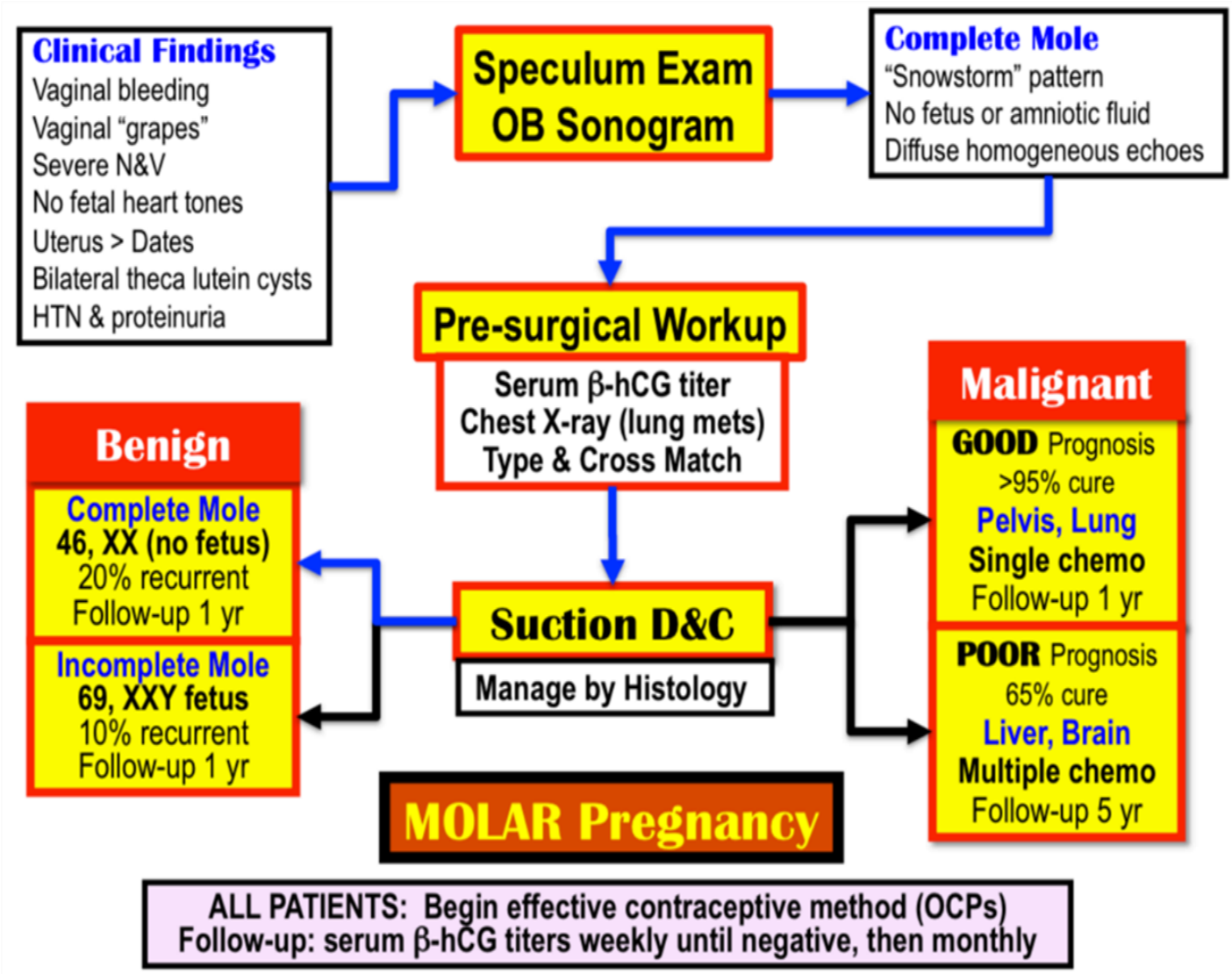
- Baseline quantitative β-hCG titer.

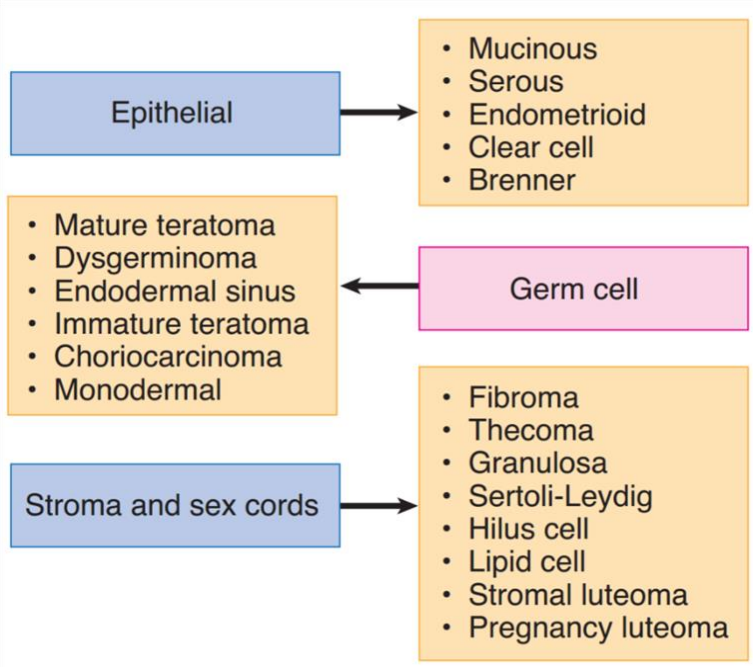
- Chest x-ray to rule out lung metastasis.

- Suction D&C to evacuate the uterine contents.

- Place the patient on effective contraception (oral contraceptive pills) for the duration of the follow-up period to ensure no confusion between rising β-hCG titers from recurrent disease and normal pregnancy.

- Treatment is then based on histology and location of metastasis.


Clinical Findings
Vaginal bleeding
Vaginal "grapes"
Severe N&V
No fetal heart tones
Uterus > Dates
Bilateral theca lutein cysts
HTN & proteinuria
Speculum Exam
OB Sonogram
Complete Mole
"Snowstorm" pattern
No fetus or amniotic fluid
Diffuse homogeneous echoes
Pre-surgical Workup
Serum β-hCG titer
Chest X-ray (lung mets)
Type & Cross Match
Benign
Complete Mole
46, XX (no fetus)
20% recurrent
Follow-up 1 yr
Incomplete Mole
69, XXY fetus
10% recurrent
Follow-up 1 yr
Suction D&C
Manage by Histology
Malignant
GOOD Prognosis
>95% cure
Pelvis, Lung
Single chemo
Follow-up 1 yr
POOR Prognosis
65% cure
Liver, Brain
Multiple chemo
Follow-up 5 yr
MOLAR Pregnancy
ALL PATIENTS: Begin effective contraceptive method (OCPs)
Follow-up: serum β-hCG titers weekly until negative, then monthly


Epithelial
Mucinous
Serous
Endometrioid
Clear cell
Brenner
Germ cell
Mature teratoma
Dysgerminoma
Endodermal sinus
Immature teratoma
Choriocarcinoma
Monodermal
Stroma and sex cords
Fibroma
Thecoma
Granulosa
Sertoli-Leydig
Hilus cell
Lipid cell
Stromal luteoma
Pregnancy luteoma

❖ N.B:

- Choriocarcinoma is a form of gestational trophoblastic neoplasia, a malignancy that arises from placental trophoblastic tissue and secretes β-hCG.
- Although it most commonly follows a hydatidiform mole, choriocarcinoma can occur after a normal gestation or spontaneous abortion. Choriocarcinoma typically presents <6 months after a pregnancy.
- Presenting symptom include irregular vaginal bleeding, an enlarged uterus, and pelvic pain.
- Choriocarcinoma is an aggressive type of gestational trophoblastic neoplasia; the most common site of metastatic spread is to the lungs. Symptoms of pulmonary metastasis include chest pain, hemoptysis, and dyspnea.
- When choriocarcinoma is suspected, obtaining a quantitative β-hCG level helps to confirm the diagnosis.

CHAPTER 7

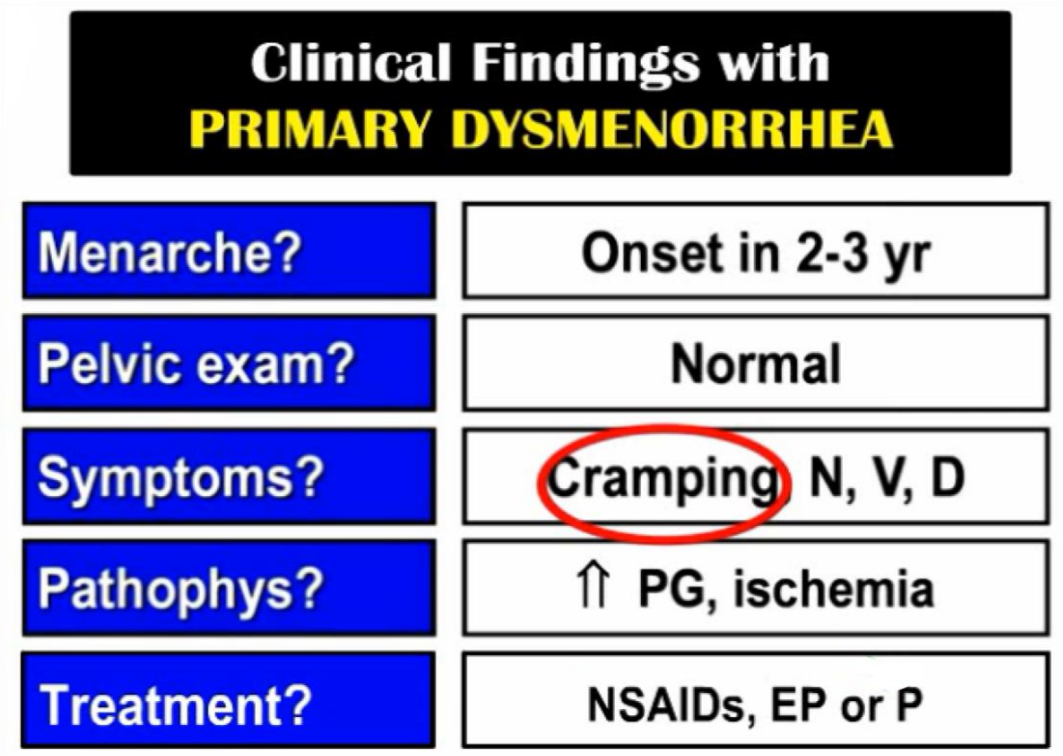
Primary dysmenorrhea

Primary dysmenorrhea

- Definition:

- Primary dysmenorrhea refers to recurrent, crampy lower abdominal pain, along with nausea, vomiting, and diarrhea, that occurs during menstruation in the absence of pelvic pathology.

- It is the most common gynecologic complaint among adolescent girls.



- Findings:

- Onset of pain generally does not occur until ovulatory menstrual cycles are established.

- The symptoms typically begin several hours prior to the onset of menstruation and continue for 1 to 3 days.

- Pathogenesis:

- Symptoms appear to be caused by excess production of endometrial prostaglandin resulting from the spiral arteriolar constriction and necrosis that follow progesterone withdrawal as the corpus luteum involutes.

- The prostaglandins cause dysrhythmic uterine contractions, hypercontractility, and increased uterine muscle tone, leading to uterine ischemia.

- The effect of the prostaglandins on the gastrointestinal smooth muscle also can account for nausea, vomiting, and diarrhea via stimulation of the gastrointestinal tract.

- Management:

- Suppression of prostaglandins is the objective of treatment.

- Nonsteroidal anti-inflammatory drugs (prostaglandin synthetase inhibitors) are the first choice in treatment.

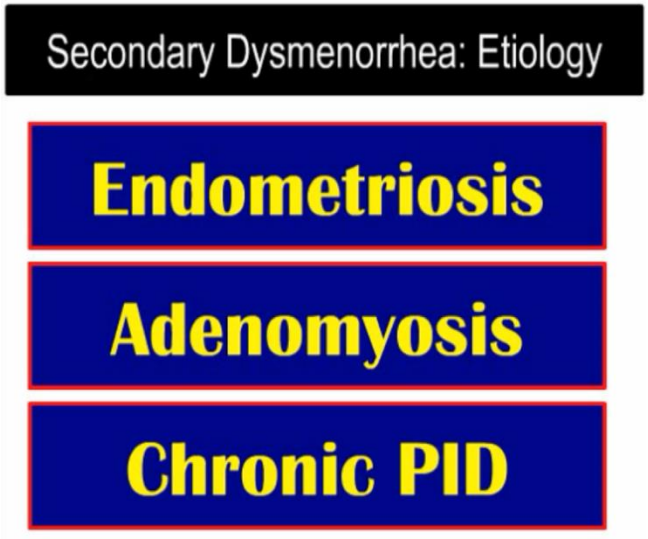
- Continuous combination estrogen-progesterone steroid agents (oral contraceptives) are the second choice for suppressing prostaglandin release.

CHAPTER 8

Secondary dysmenorrhea

Secondary dysmenorrhea

- Secondary dysmenorrhea refers to painful menstruation in the presence of pelvic pathology. It is more common among women in the fourth and fifth decades of life.



Endometriosis

- Definition:

- Endometriosis is a benign condition in which endometrial glands and stroma are seen outside the uterus.

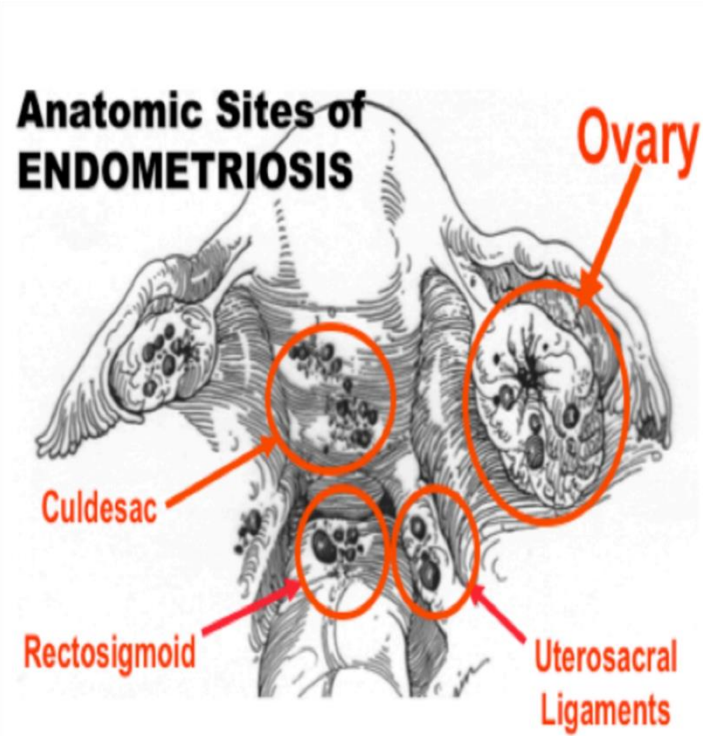
- Pathophysiology:

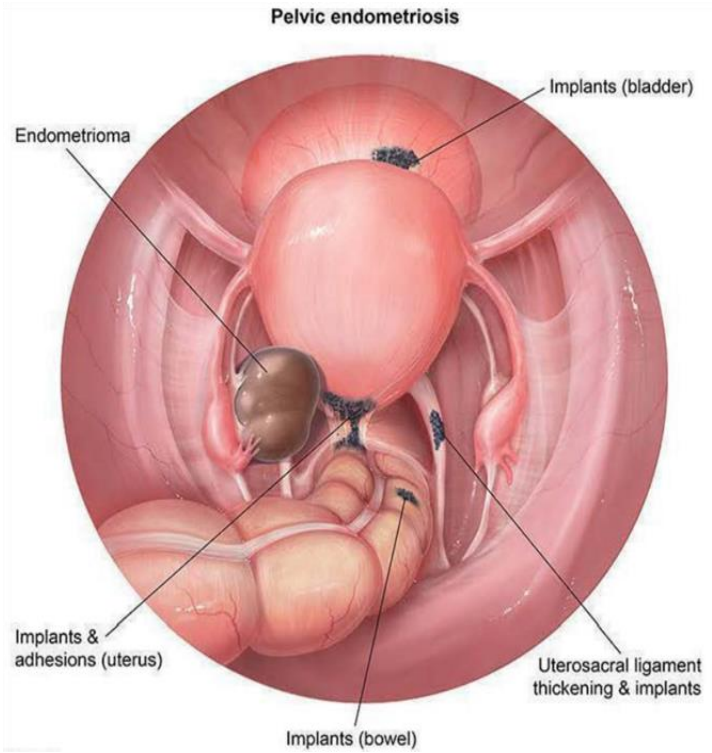
- Although the etiology of endometriosis is not known, the most accepted theory of explanation is retrograde menstruation.

- The most common site of endometriosis is the ovary, and because this is functioning endometrium, it bleeds on a monthly basis and can create adnexal enlargements known as endometriomas, also known as a chocolate cyst.

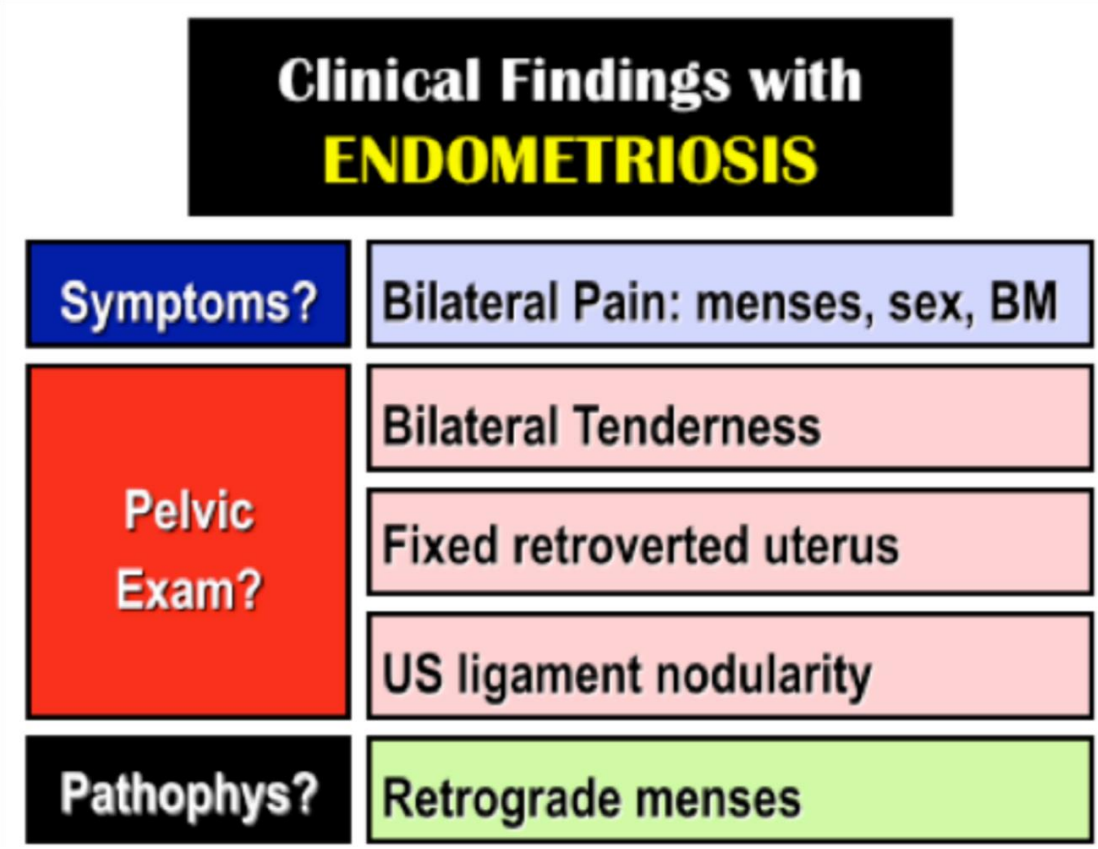
- The second most common site of endometriosis is the cul-de-sac, and in this area the endometriotic nodules grow on the uterosacral ligaments, giving the characteristic uterosacral ligament nodularity and tenderness appreciated by rectovaginal examination.

- Menstruation into the cul-de-sac creates fibrosis and adhesions of bowel to the pelvic organs and a rigid cul-de-sac, which accounts for dyspareunia.





- Clinical Findings:



A. Symptoms:

- Patients with endometriosis can have chronic pelvic pain and/or infertility, or be completely asymptomatic and diagnosed during an unrelated surgical procedure.

- Endometriosis is a common cause of chronic pelvic pain (>6 months) in reproductive-age women.

- The hallmarks of endometriosis (the "3 Ds") are dysmenorrhea, deep dyspareunia, and dyschezia (pain with defecation). Dyspareunia and dyschezia are caused by implants in the posterior cul-de-sac.

- Infertility is commonly the sole presenting symptom of endometriosis, which is present in one quarter of all patients with infertility. Cyclic accumulation of ectopic foci of hemorrhage and adhesions can distort pelvic anatomy and impair fertility by obstructing oocyte release or sperm entry. The presence of an endometrioma (ovarian endometriosis cyst) is also associated with impaired ovarian function.

B. Examination:

- Physical examination findings vary but commonly include a fixed, retroverted and immobile uterus and rectovaginal nodularity often caused by cul-de-sac adhesions.

- Adnexal mass or fullness should be confirmed by ultrasonography, and the finding of a homogeneous cystic ovarian mass is highly suggestive of an ovarian endometrioma. An endometrioma can be the only clinical manifestation of endometriosis.

▪ Mangement:

- Asymptomatic patients do not require treatment.

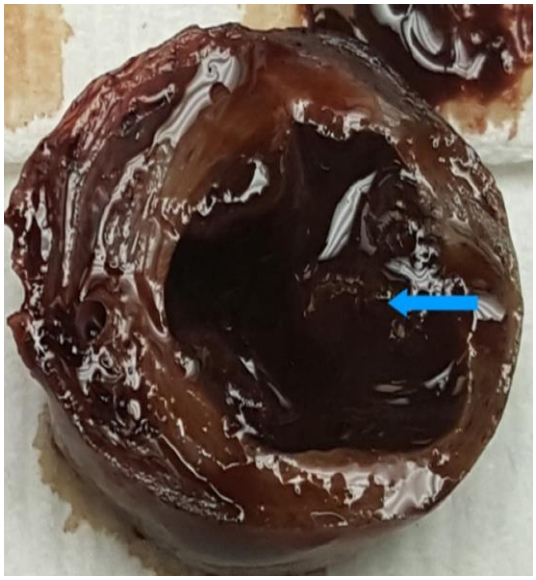
- Nonsteroidal anti-inflammatory drugs (ibuprofen, naproxen) and/or combined (estrogen and progestin) oral contraceptives (COCs) are first-line empiric treatment options that are appropriate without definitive surgical diagnosis. COC therapy is thought to reduce pain by ovulation suppression, which may result in atrophy of endometrial tissue.

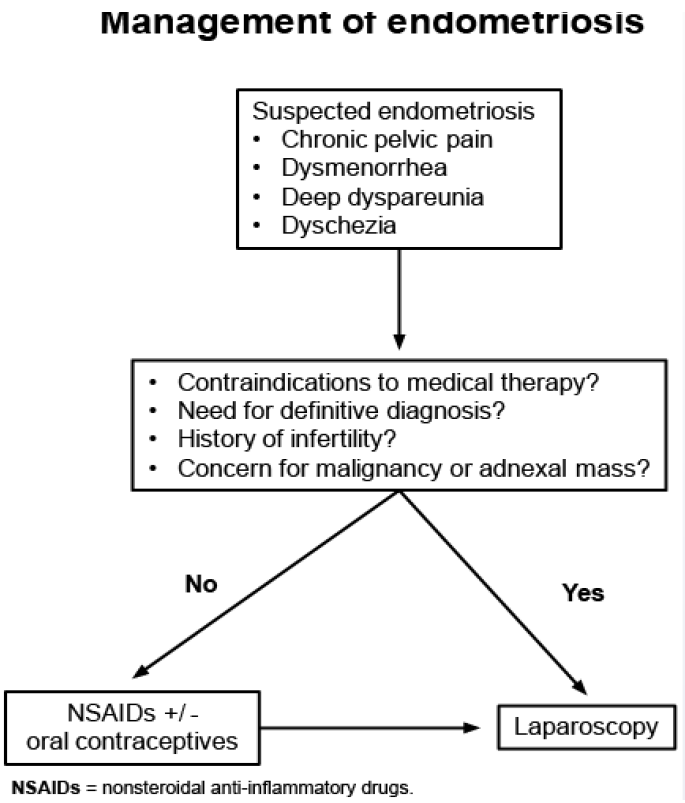
- Failure of conservative treatment, presence of an adnexal mass, and infertility necessitate laparoscopic evaluation.

- Surgical resection of endometriomas usually improves fertility.

- Laparoscopy is indicated after failure of empiric therapy. Laparoscopy allows for direct visualization, biopsy, and removal of endometriotic lesions.

- Definitive treatment in women who have completed childbearing is with hysterectomy and oophorectomy.





- Medical therapy of endometriosis:

- Medical therapy of endometriosis seeks to prevent shedding of the ectopic endometrial tissue, thus decreasing adhesion formation and pain:

A. Pregnancy:

- Pregnancy can be helpful to endometriosis because during pregnancy there is no menstruation and also the dominant hormone throughout pregnancy is progesterone, which causes atrophic changes in the endometrium.

- However, infertility may make this impossible.

B. Pseudopregnancy:

- Pseudopregnancy achieves this goal through preventing progesterone withdrawal bleeding.

- Continuous oral medroxyprogesterone acetate (MPA [Provera]), subcutaneous medroxyprogesterone acetate (SQ-DMPA [Depo Provera]), or combination oral contraceptive pills (OCPs) can mimic the atrophic changes of pregnancy.

C. Pseudomenopause:

- Pseudomenopause achieves this goal by making the ectopic endometrium atrophic.

- The treatment is based on inhibition of the hypothalamic-pituitary-ovarian axis to decrease the estrogen stimulation of the ectopic endometrium.

- The best inhibition of the hypothalamic-pituitary-ovarian axis is achieved by GnRH analogs (leuprolide or Lupron). GnRH stimulates the pituitary in a pulsatile fashion, and GnRH analogs stimulate by continuous stimulation, which produces a condition known as down-regulation of the pituitary.

- Although regression of the endometriotic nodules can be achieved, the patient can become symptomatic with menopausal symptoms, such as hot flashes, sweats, vaginal dryness, and personality changes.

▪ Surgical management may be conservative or aggressive:

A. Conservative:

- If preservation of fertility is desired, the procedures can be performed in many cases through laparoscopic approach.

- Lysis of paratubal adhesions may allow adherent fimbria to function and achieve pregnancy.

- Ovarian cystectomies as well as oophorectomies can be treatment for endometriomas.

- Laser vaporization of visible lesions is also performed laparoscopically.

B. Aggressive:

- If fertility is not desired, particularly if severe pain is present because of diffuse adhesions, definitive surgical therapy may be carried out through a total abdominal hysterectomy (TAH) and bilateral salpingo-oophorectomy (BSO).

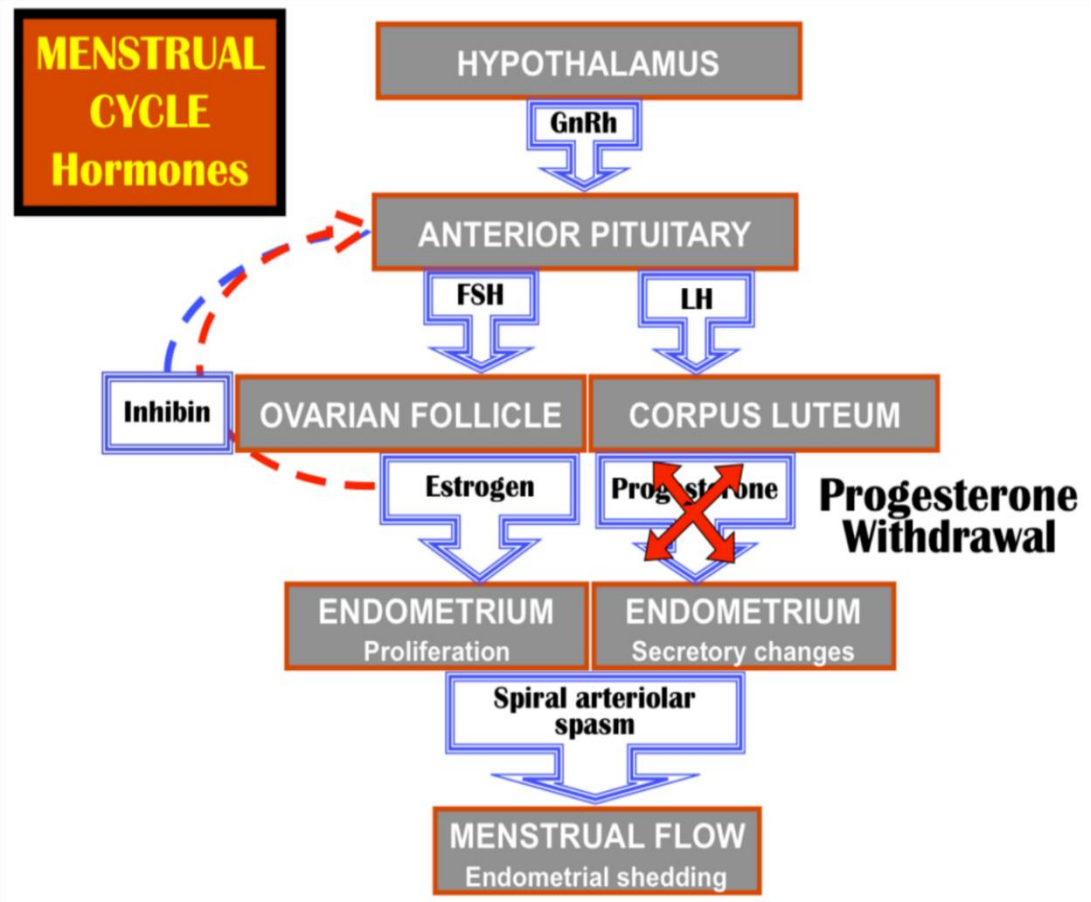
- Estrogen replacement therapy is then necessary.

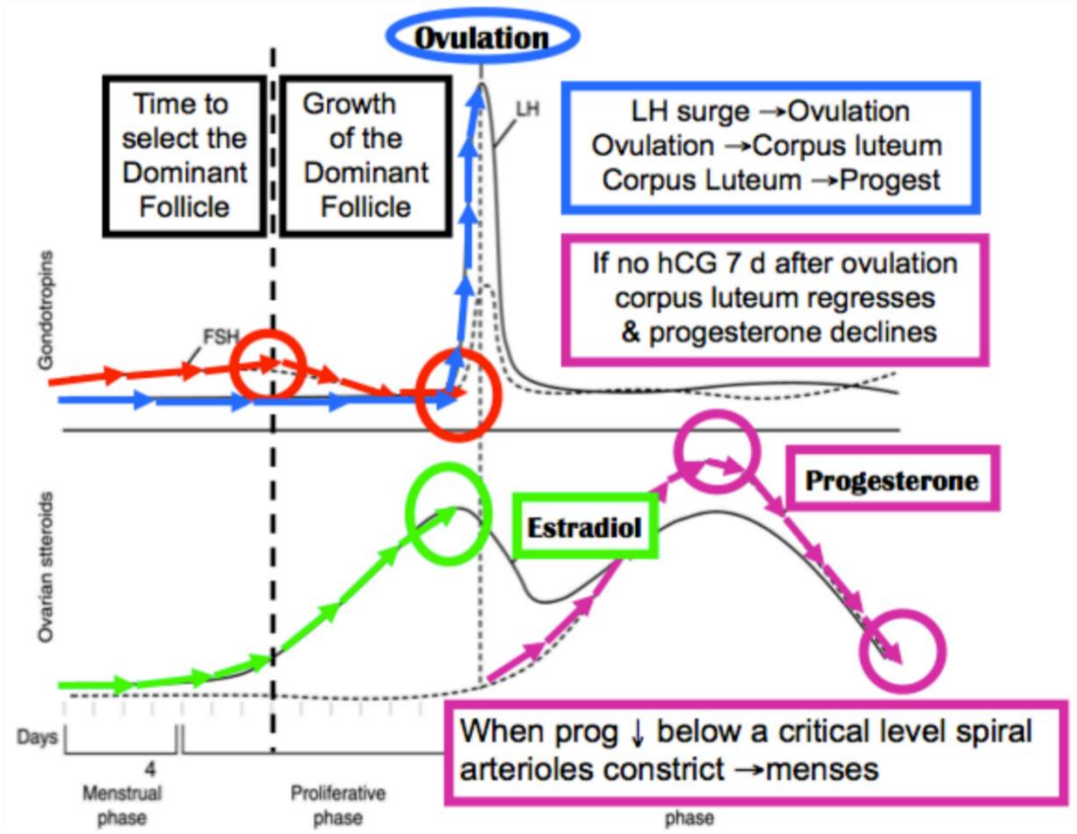
Endometriosis	
Pathogenesis	• Ectopic implantation of endometrial glands
Clinical features	• Dyspareunia • Dysmenorrhea • Chronic pelvic pain • Infertility • Dyschezia
Physical examination	• Immobile uterus • Cervical motion tenderness • Adnexal mass • Recto-vaginal septum, posterior cul-de-sac, uterosacral ligament nodules
Diagnosis	• Direct visualization & surgical biopsy
Treatment	• Medical (oral contraceptives, NSAIDs) • Surgical resection

NSAIDs = nonsteroidal anti-inflammatory drugs.

CHAPTER 9

Menstrual Abnormalities





Premenarchal vaginal bleeding

- Definition:

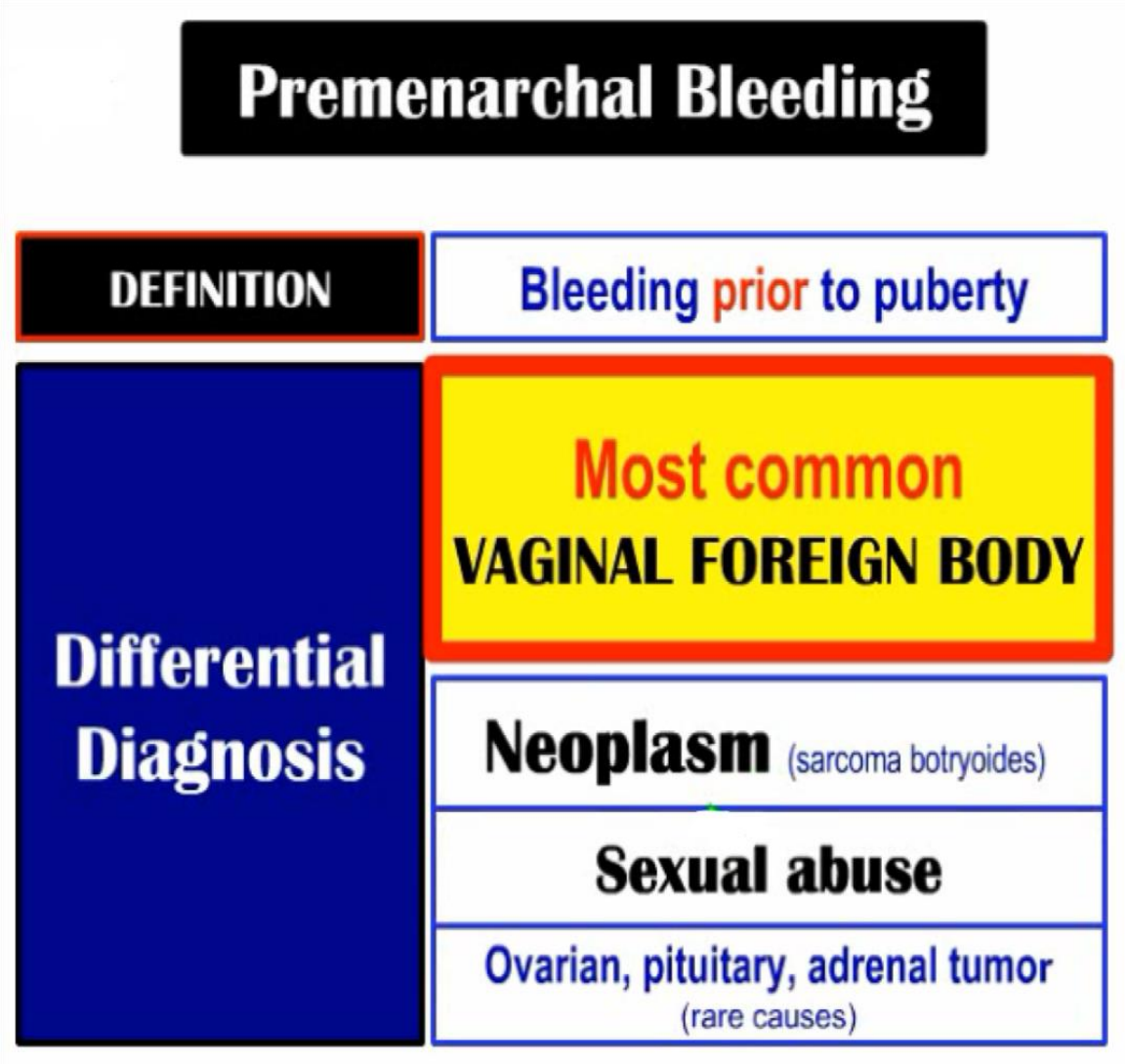
- Premenarchal bleeding is bleeding that occurs before menarche.

- The average age at menarche is 12 years old.

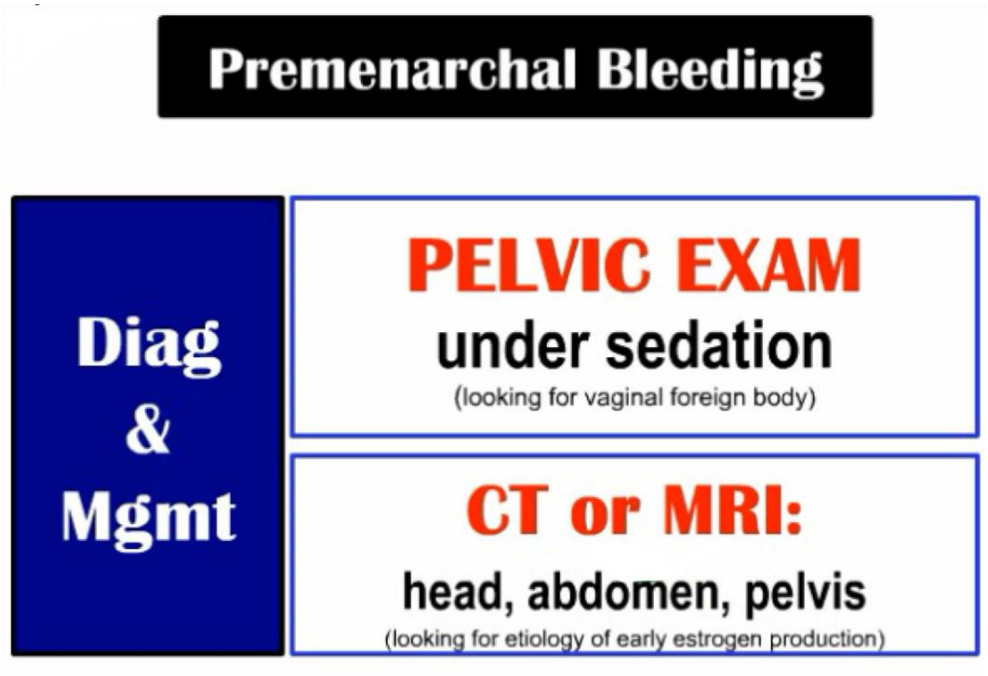
- Differential Diagnosis and Etiology:

- Possible causes include ingestion of estrogen medication, a foreign body that irritates the vaginal lining, a cancer of the vagina or of the cervix (sarcoma botryoides), a tumor of the pituitary or adrenal gland, an ovarian tumor, sexual abuse, or idiopathic precocious puberty.

- The most common cause of premenarchal bleeding is a foreign body.

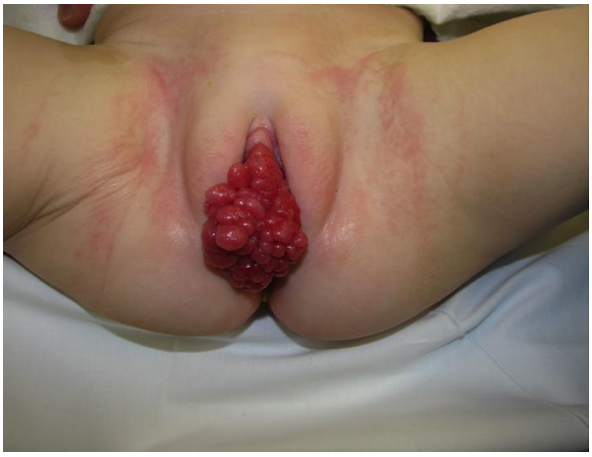


- Diagnosis and Management:



A. Pelvic examination:

- The patient who complains of premenarchal bleeding should have a pelvic examination under sedation.
- In this examination, evidence of a foreign body, sexual abuse, or tumor is looked for.
- Sarcoma botryoides typically looks like grapes arising from the vaginal lining or from the cervix.



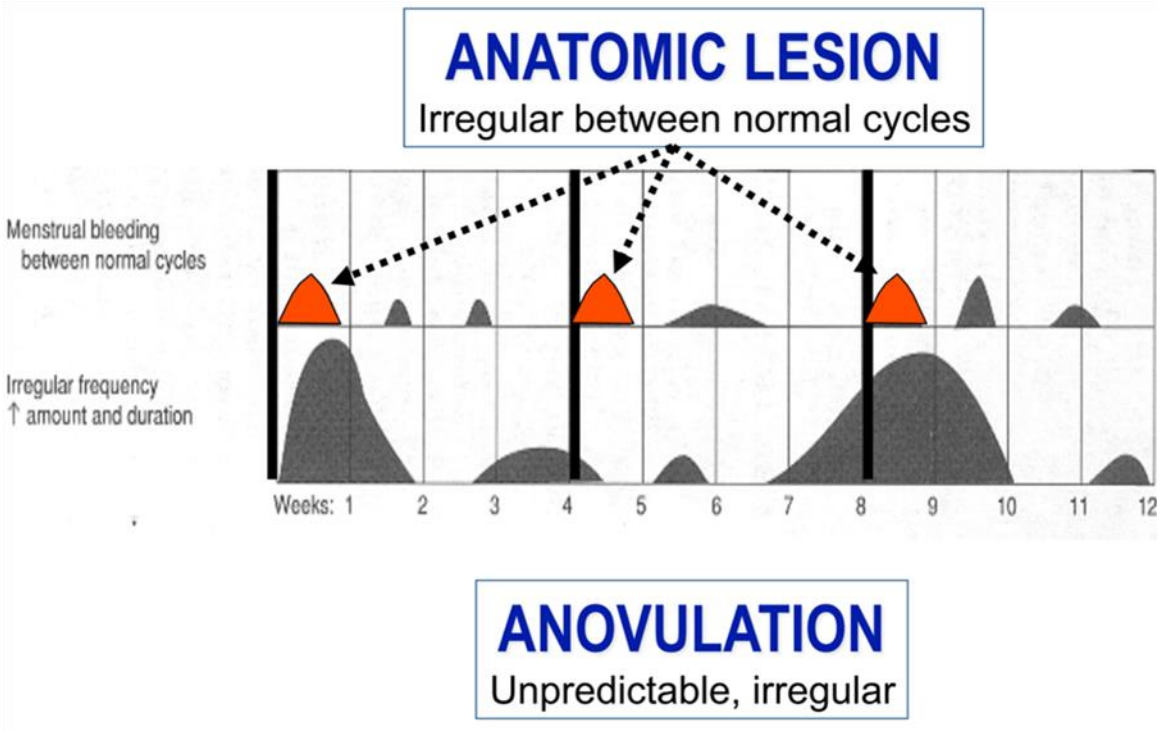
B. Imaging study:

- CT scan or MRI scan of the pituitary, abdomen, and pelvis should be done.
- The scans are looking for evidence of a pituitary, ovarian, or adrenal tumor, which may cause early estrogen production.

❖ N.B:

- The most common cause of vaginal bleeding and discharge in the neonatal period is maternal withdrawal of estrogen.
- Similar to the follicular phase of menstruation, maternal estrogen crosses the placenta during pregnancy and causes growth of the fetal endometrial lining. Following delivery, the neonatal endometrium may slough off causing self-limited, mucoid, vaginal bleeding.
- This bleeding typically occurs within the first 2 weeks of life and may last for several days. The effect of maternal hormones may also lead to temporary breast bud and external genitalia engorgement during the first month of life.
- There is no required treatment, and parents should be reassured that this brief bleeding is physiologic and normal.

Abnormal vaginal bleeding



A. Pregnancy:

- In a patient who has abnormal bleeding during the reproductive age group, pregnancy or a complication must first be considered.

- Mechanism:

- Complications of early pregnancy that are associated with bleeding include incomplete abortion, threatened abortion, ectopic pregnancy, and hydatidiform mole.

- Diagnosis:

- Urine or serum β-hCG test is required to confirm pregnancy.

- If pregnancy is identified vaginal ultrasound will help sort out which pregnancy complication is operative.

- Management: Treatment will vary with the individual diagnosis identified.

B. Anatomic lesion:

- If the pregnancy test is negative, then an anatomic cause of vaginal bleeding should be considered.

- The classic history is that of unpredictable bleeding (without cramping) occurring between normal, predictable menstrual periods (with cramping).

- Mechanism:

- A variety of lower and upper reproductive tract factors can cause bleeding:
  - Vaginal lesions: lacerations, varicosities or tumors.
  - Cervical lesions: polyps, cervicitis or tumors.
  - Endometrial lesions: submucous leiomyomas, polyps, hyperplasia or cancer.
  - Myometrial lesions: adenomyosis.

- Diagnosis:

- A number of tests can be used to for anatomic diagnosis.
  - Lower genital tract: pelvic and speculum exam.
  - Upper genital tract: endometrial biopsy, hysteroscopy.

- Treatment: Treatment will vary according to the individual diagnosis identified.

C. Inherited coagulopathy:

- Up to 15% of patients with abnormal vaginal bleeding, especially in the adolescent age group, have coagulopathies.

- Review of systems may be positive for other bleeding symptoms including epistaxis, gingival bleeding and ecchymoses.

- Von Willebrand disease is the most common hereditary coagulation abnormality.

- Initial laboratory tests include CBC with platelet count, PT and PTT.

- The best screening test for Von Willebrand disease is a vWF antigen.

D. Dysfunctional uterine bleeding (DUB):

- If the pregnancy test is negative, there are no anatomic causes for bleeding and coagulopathy is ruled out, then the diagnosis of hormonal imbalance should be considered.

- The classic history is that of bleeding that is unpredictable in amount, duration and frequency without cramping occurring.

- Mechanism:

- The most common cause of DUB is anovulation.

- Anovulation results in unopposed estrogen.

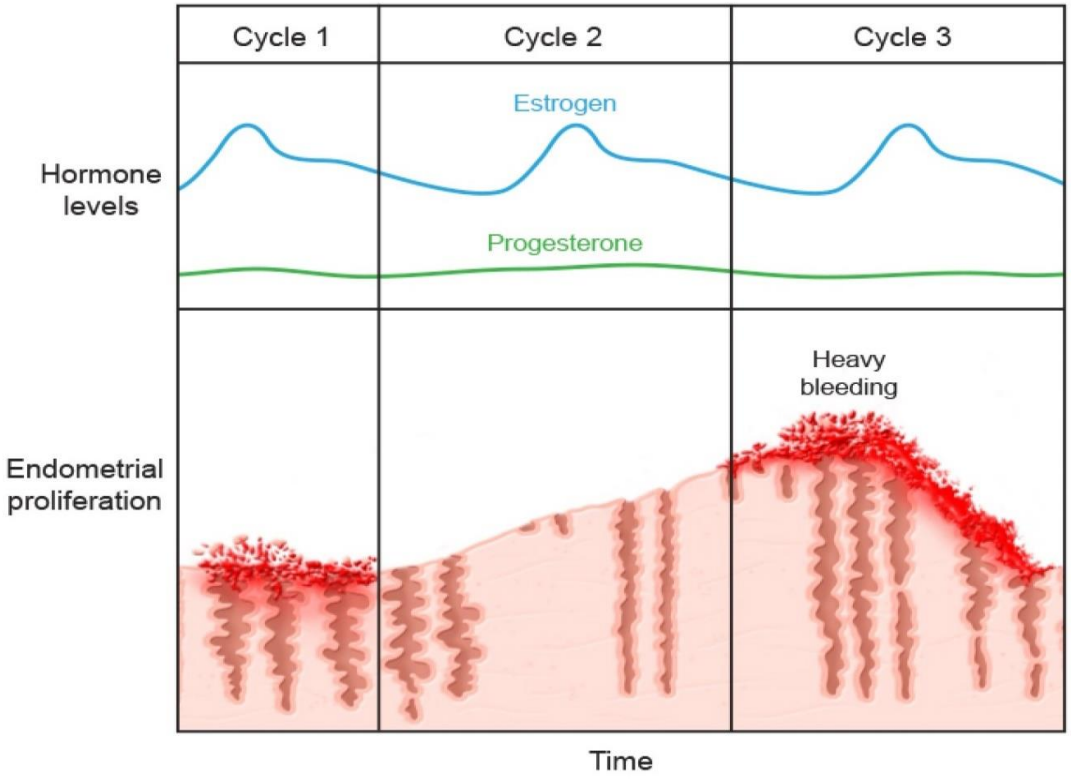
- With unopposed estrogen, there is continuous stimulation of the endometrium with no secretory phase.

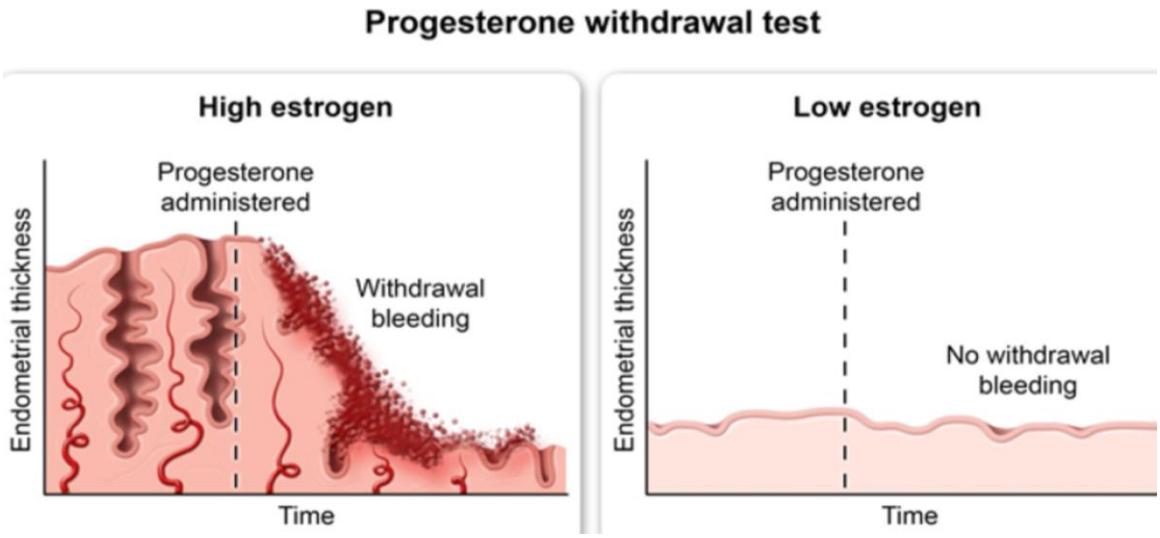
- An estrogen dominant endometrium is structurally unstable as it increasingly thickens. With inadequate structural support, it eventually undergoes random, disorderly, and unpredictable breakdown resulting in estrogen breakthrough bleeding.

▪ Diagnosis:

- Anovulatory cycles can usually be diagnosed from a history of irregular, unpredictable bleeding.
- Bleeding is usually without cramping since there is no PG release to cause myometrial contractions.
- Cervical mucus will be clear, thin and watery reflecting the estrogen dominant environment.
- Basal-body temperature (BBT) chart will not show a midcycle temperature rise due to the absence of the thermogenic effect of progesterone.
- Endometrial biopsy will show a proliferative endometrium.
- Progesterone trial involves administering progestin to stabilize the endometrium, stop the bleeding and prevent random breakdown. When the progestin is stopped, spiral arteriolar spasm results in PG release, necrosis, and an orderly shedding of the endometrium.
- A positive progesterone trial confirms a clinical diagnosis of anovulation. A negative progesterone trial rules out anovulation.

Effect of anovulatory cycles on the endometrium





- Correctable causes of anovulation:

- Anovulation can be secondary to other medical conditions. It is important to identify and correct a reversible cause of anovulation if present:
  - Hypothyroidism is a common cause of anovulation, diagnosed by a high TSH and treated with thyroid replacement.
  - Hyperprolactinemia, diagnosed by a serum prolactin test. An elevated prolactin inhibits GnRH. Treatment depends on the cause of the elevated prolactin.

- Progestin management:

- Treatment involves replacing the hormone which is lacking. These methods help regulate the menstrual flow and prevent endometrial hyperplasia, but do not reestablish normal ovulation:
  - Cyclic MPA (Medroxyprogesterone acetate): can be administered for the last 7 to 10 days of each cycle.
  - Oral contraceptive pills (OCs): Estrogen-progestin oral contraceptives are often used for convenience. The important ingredient however, is the progestin not the estrogen.
  - Progestin intrauterine system (LNG-IUS): The levonorgestrel IUS (Mirena) delivers the progestin directly to the endometrium.

- Other managements:

- If progestin management is not successful in controlling blood loss, the following generic methods have been successful:
  - Tranexamic acid: works by inhibiting fibrinolysis by plasmin. It is contraindicated with history of DVT, PE or CVA, and not recommended with E+P steroids.
  - Endometrial ablation: procedure destroys the endometrium by heat, cold or microwaves. It leads to iatrogenic Asherman syndrome and minimal or no menstrual blood loss. Fertility will be affected.
  - Hysterectomy: is a last resort and performed only after all other therapies have been unsuccessful.

❖ N.B:

1. Most menstrual cycles in the first one to two years following menarche are anovulatory. These cycles are typically irregular and may be complicated by menorrhagia.

- This is due to immaturity of the developing hypothalamic-pituitary-gonadal axis that does not produce adequate quantities and proportions of the hormones (LH and FSH) required to induce ovulation.

2. Evaluation of abnormal uterine bleeding with endometrial biopsy is necessary in patients age ≥45.

- Patients age <45 with obesity and abnormal uterine bleeding due to chronic anovulation also require endometrial biopsy due to increased risk of endometrial hyperplasia.

Endometrial biopsy indications	
Age ≥45	• Abnormal uterine bleeding • Postmenopausal bleeding
Age <45	Abnormal uterine bleeding PLUS: • Unopposed estrogen (obesity, anovulation) • Failed medical management • Lynch syndrome (hereditary nonpolyposis colorectal cancer)
Age ≥35	• Atypical glandular cells on Pap test

Primary amenorrhea

- Definition:

- Amenorrhea means absence of menstrual bleeding.

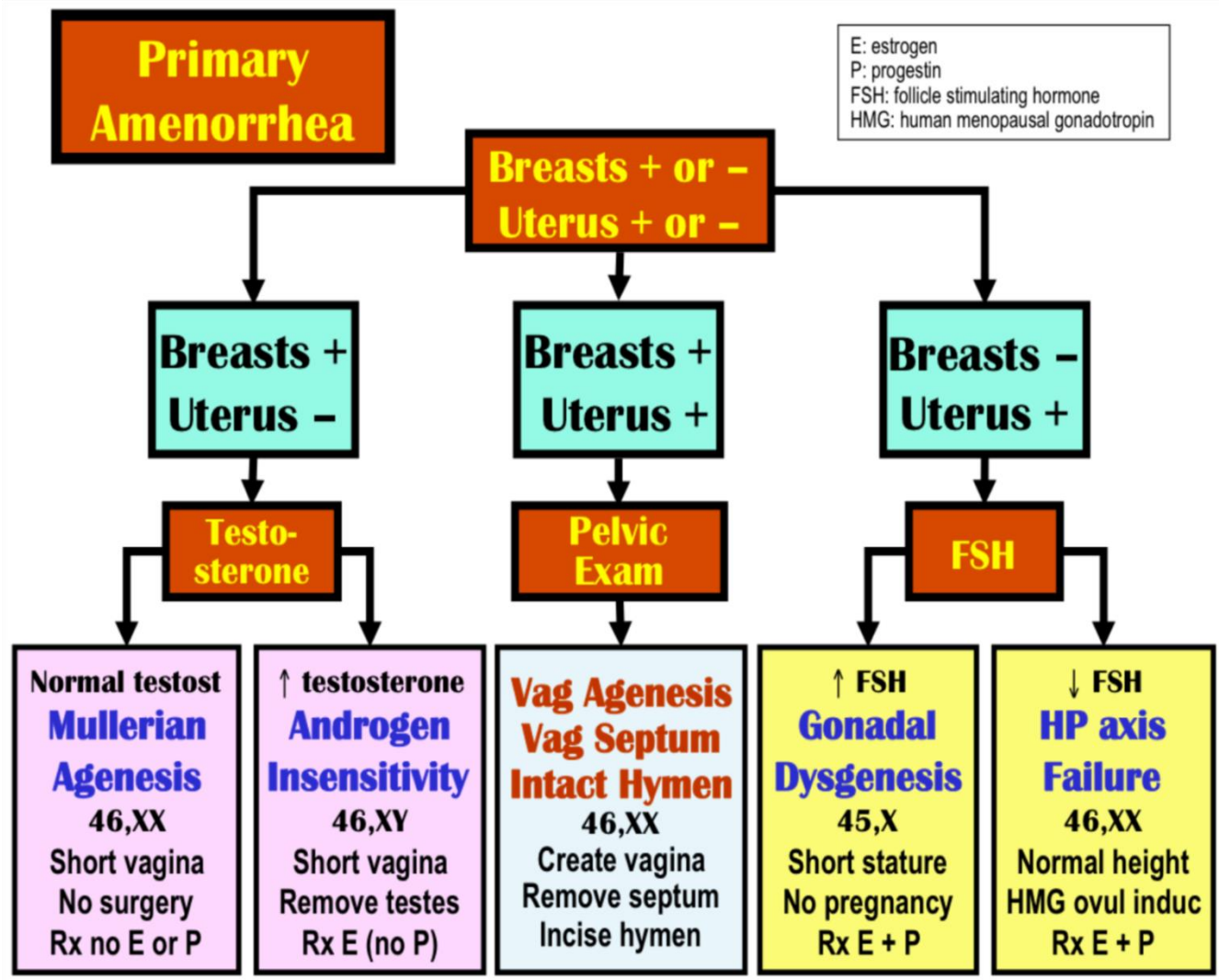
- Primary means that menstrual bleeding has never occurred.

- Diagnosis:

- Primary amenorrhea is diagnosed with absence of menses at age 14 without secondary sexual development or age 16 with secondary sexual development.

- Etiology:

- The two main categories of etiology are anatomic (vaginal agenesis/septum, imperforate hymen, or Mullerian agenesis) or hormonal (complete androgen insensitivity, gonadal dysgenesis [Turner syndrome], or hypothalamic-pituitary insufficiency).



- Clinical Approach:

- Are breasts present or absent? A physical examination will evaluate secondary sexual characteristics (breast development, axillary and pubic hair, growth).

- Breasts are an endogenous assay of estrogen:
  - Presence of breasts indicates adequate estrogen production.
  - Absence of breasts indicates inadequate estrogen exposure.

- Clinical Approach Based on Findings Regarding Breasts and Uterus:

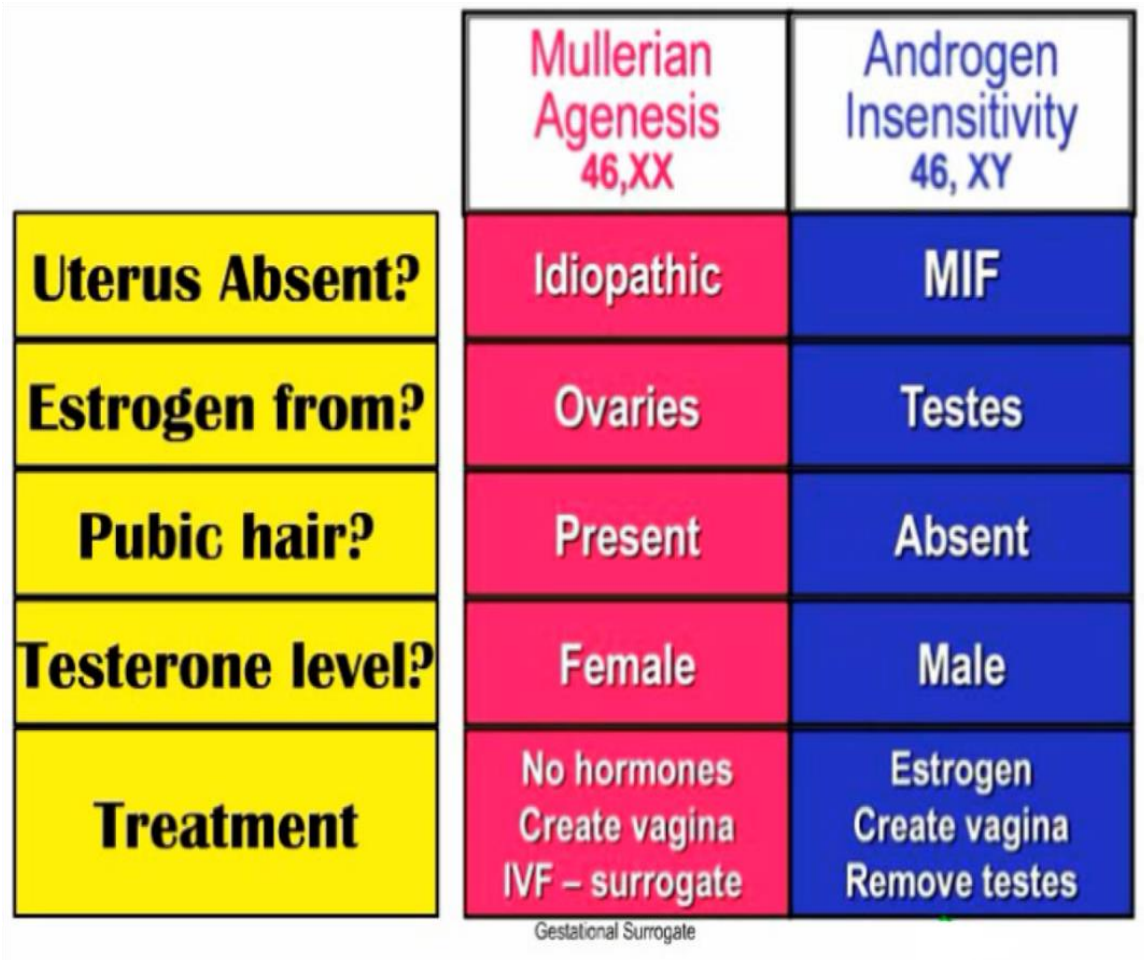
A. Breasts present, uterus present:

- Differential diagnosis includes an imperforate hymen, vaginal septum, and vaginal agenesis.

B. Breasts present, uterus absent:

- Differential diagnosis is:
  - Mullerian agenesis (Rokitansky- Kuster-Hauser syndrome).
  - Complete androgen insensitivity (testicular feminization).

- Testosterone levels and karyotype help make the diagnosis.



1. Mullerian agenesis:

- These are genetically normal females (46, XX) with idiopathic absence of the Mullerian duct derivatives: fallopian tubes, uterus, cervix, and upper 1/3 of the vagina; the lower vagina originates from the urogenital sinus.

- Patients develop secondary sexual characteristics because ovarian function is intact; Mullerian ducts do not give rise to the ovaries.

- Normal pubic and axillary hair is present.

- Testosterone levels are normal female.

- Management: surgical elongation of the vagina for satisfactory sexual intercourse.

2. Androgen insensitivity:

- In these genetically male (46, XY) individuals with complete lack of androgen receptor function, their bodies do not respond to the high levels of androgens present.

- Without androgen stimulation, internal Wolffian duct structures atrophy. With testicular Mullerian inhibitory factor present, the Mullerian duct derivatives involute.

- Without body recognition of dihydrotestosterone, external genitalia differentiate in a female direction. Patients function psychologically and physically as females and are brought up as girls.

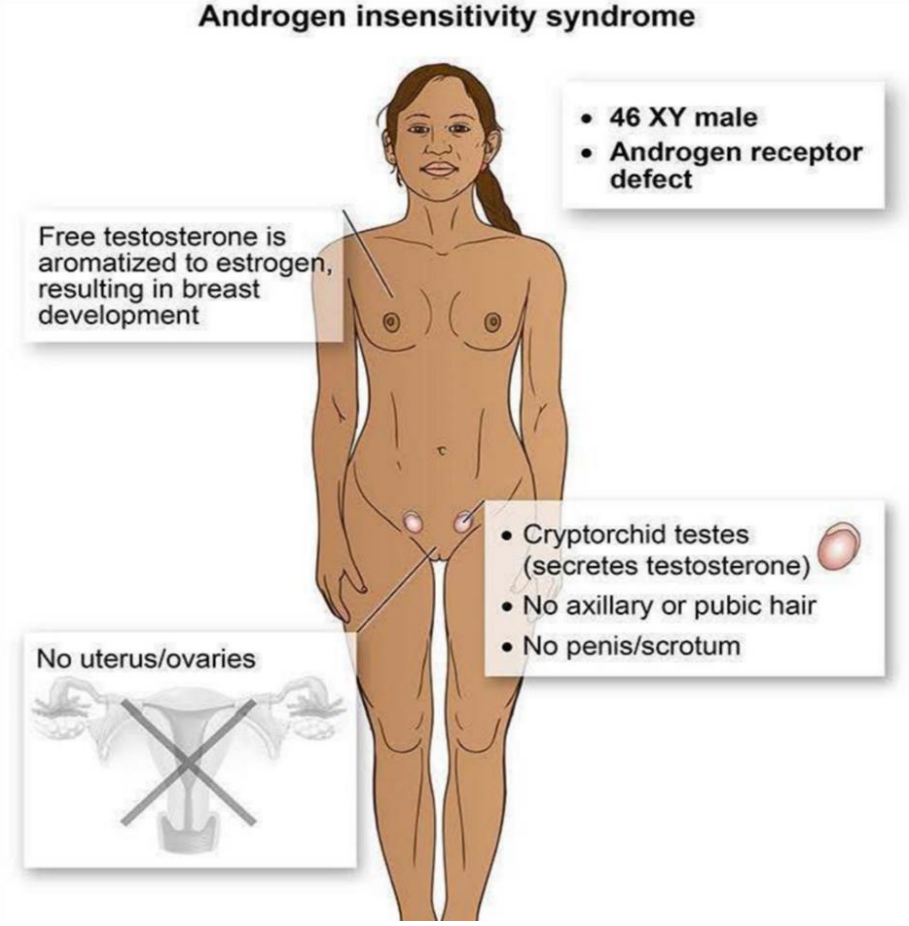
- At puberty, when primary amenorrhea is noted, the diagnosis is made.

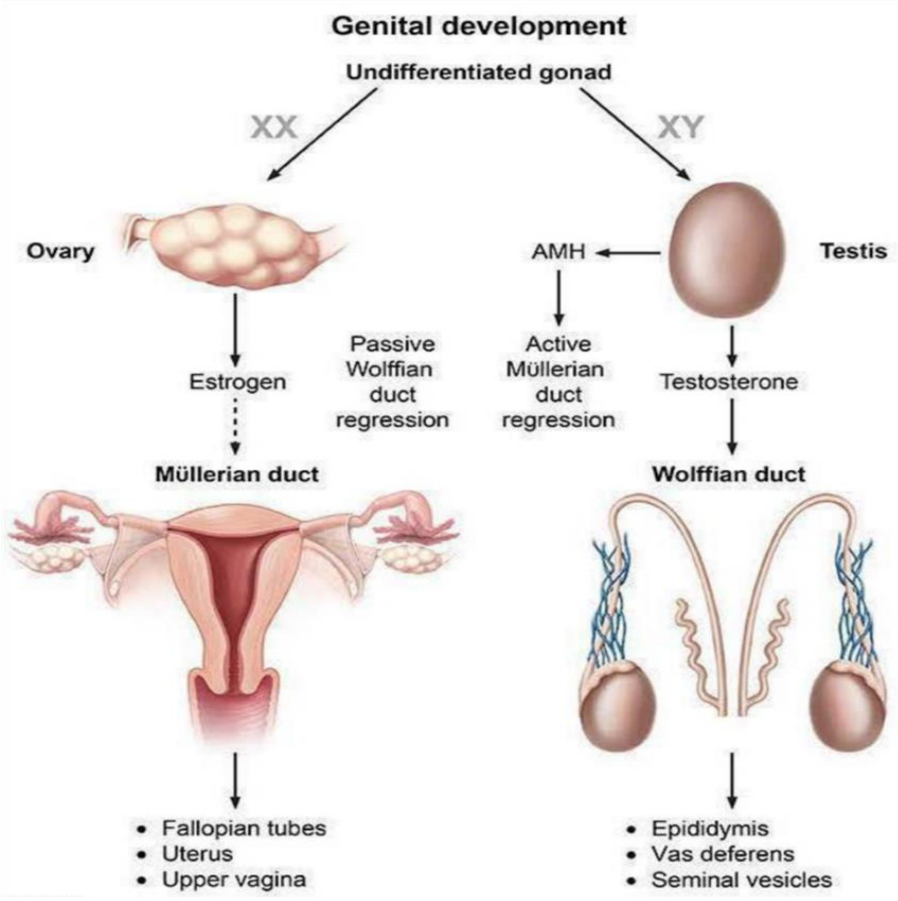
- Female secondary sexual characteristics are present because the testes do secrete estrogens without competition from androgens.

- Testosterone levels are normal male. However, the functionally normal gonads are cryptorchid as testicular descent is an androgen-dependent process. The testes may be found in the abdomen, inguinal canal, or labia majora.

- Management: testes removal at age 20 because the higher temperatures associated with the intraabdominal position of the testes may lead to testicular cancer. Estrogen replacement is then needed.

- Why 20? - In general, the benefits from undergoing gonad-stimulated puberty (attainment of adult height) outweigh the low risk of malignancy. Therefore, a gonadectomy can be deferred until completion of puberty.


Androgen insensitivity syndrome
• 46 XY male
• Androgen receptor defect
Free testosterone is aromatized to estrogen, resulting in breast development
• Cryptorchid testes (secretes testosterone)
• No axillary or pubic hair
• No penis/scrotum
No uterus/ovaries


Genital development
Undifferentiated gonad
XX
XY
Ovary
AMH
Testis
Estrogen
Passive Wolffian duct regression
Active Müllerian duct regression
Testosterone
Müllerian duct
Wolffian duct
• Fallopian tubes
• Uterus
• Upper vagina
• Epididymis
• Vas deferens
• Seminal vesicles

C. Breasts absent, uterus present:

- Differential diagnosis is:
  - Gonadal dysgenesis (Turner syndrome).
  - Hypothalamic-pituitary failure.

- FSH level and karyotype help make the diagnosis.

1. Gonadal dysgenesis:

- Turner syndrome (45, X) is caused by the lack of one X chromosome, essential for the presence of normal ovarian follicles. Instead of developing ovaries, patients develop streak gonads.

- FSH is elevated because of lack of estrogen feedback to the hypothalamus and pituitary.

- No secondary sexual characteristics are noted.

- Management: Estrogen and progesterone replacement for development of the secondary sexual characteristics.

2. Hypothalamic-pituitary failure:

- In the patient without secondary sexual characteristic but uterus present by ultrasound, another possibility is the hypothalamic causes of amenorrhea (stress, anxiety, anorexia nervosa, excessive exercise).

- Kallmann syndrome is the inability of the hypothalamus to produce GnRH and also anosmia.

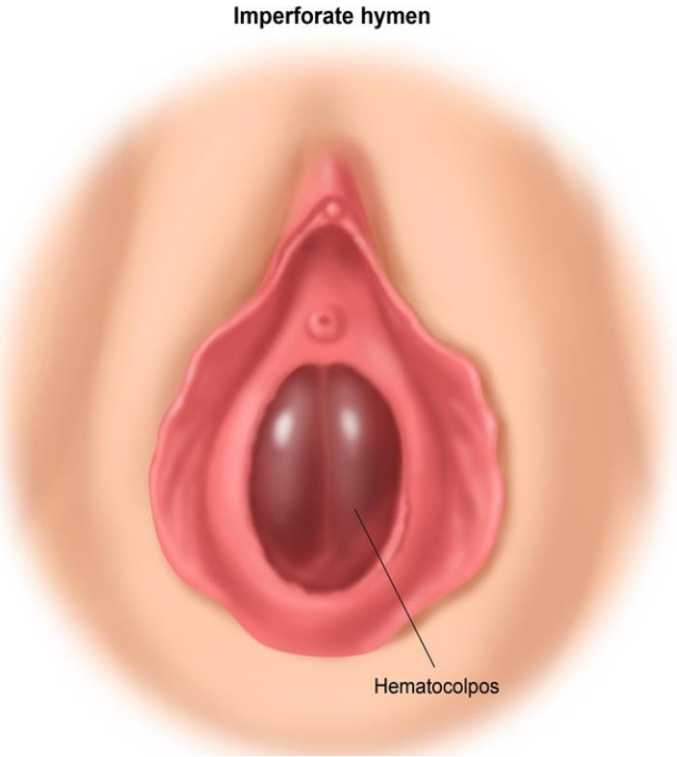
- FSH will be low.

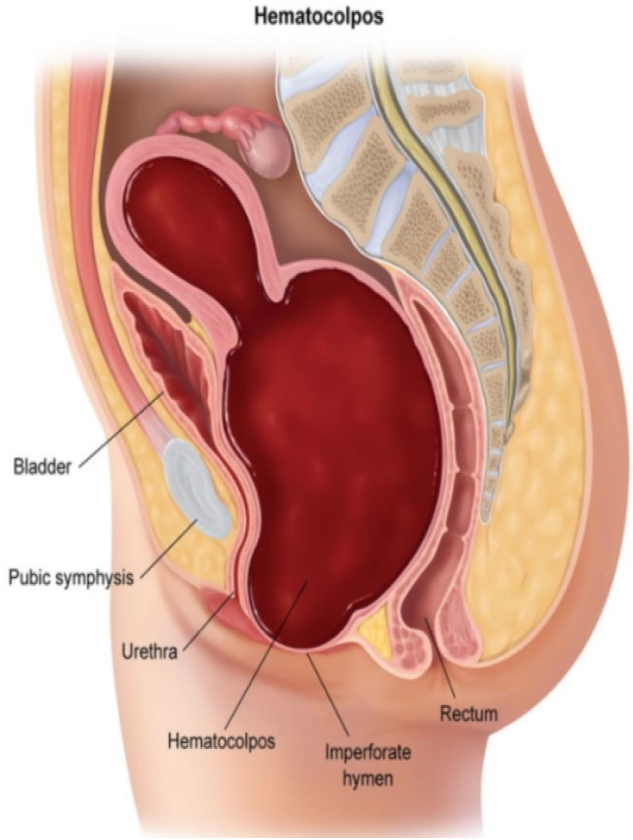
- Management: These patients should be treated with estrogen and progesterone replacement for development of the secondary sexual characteristics.

	Gonadal Dysgenesis 45,X	HP axis failure 46, XX
FSH?	↑	↓
NO ESTROGEN?	No ovarian follicles	Follicles not stimulated
OVARIES?	"Streak"	Normal
TREATMENT PREGNANCY	E + P Egg donor	E + P Ovul induc (HMG)
DIAGOSTIC TEST?	-----	CNS imaging

❖ N.B:

- Imperforate hymen is a common anatomic cause of primary amenorrhea.
- This occurs when the hymen fails to fenestrate during embryonic development.
- Infants may present with a bulging membrane due to mucus collection, but this typically resolves, and patients remain asymptomatic until menarche.
- When menstruation occurs, blood collects in the vagina behind the hymenal membrane (hematocolpos).
- The enlarging blood collection with each menstrual period causes increasing pressure on the surrounding pelvic organs, resulting in lower back pain, pelvic pressure, or defecatory rectal pain.
- Pelvic examination typically reveals a blue, bulging vaginal mass or membrane that swells with increased intraabdominal pressure (Valsalva).
- Treatment is with incision of the hymen and drainage of the hematocolpos.
- Patients with abnormal genital tract development should be evaluated for associated renal abnormalities with renal ultrasound.





Secondary amenorrhea

- Definition:

- Amenorrhea means absence of menstrual bleeding.

- Secondary means that previously menstrual bleeding had occurred.

- Diagnosis:

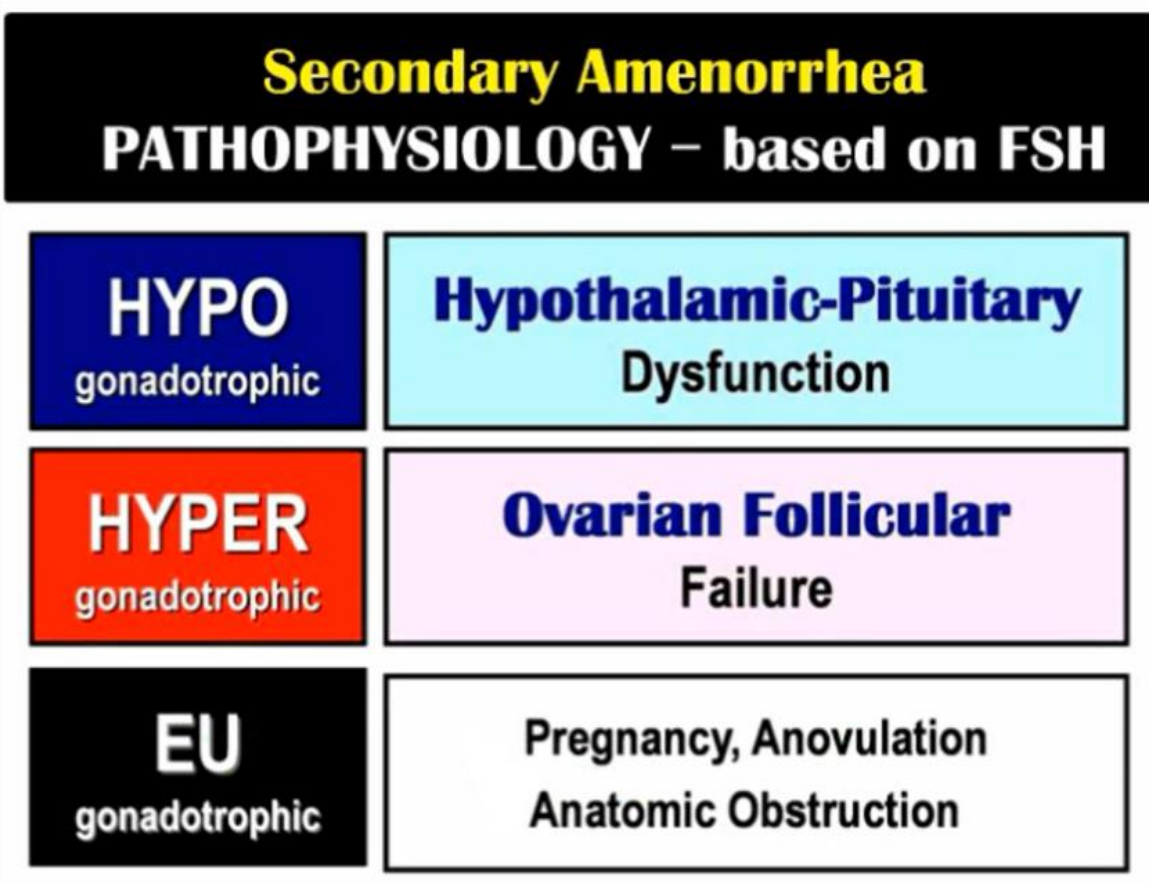
- Secondary amenorrhea is diagnosed with absence of menses for 3 months if previously regular menses or 6 months if previously irregular menses.

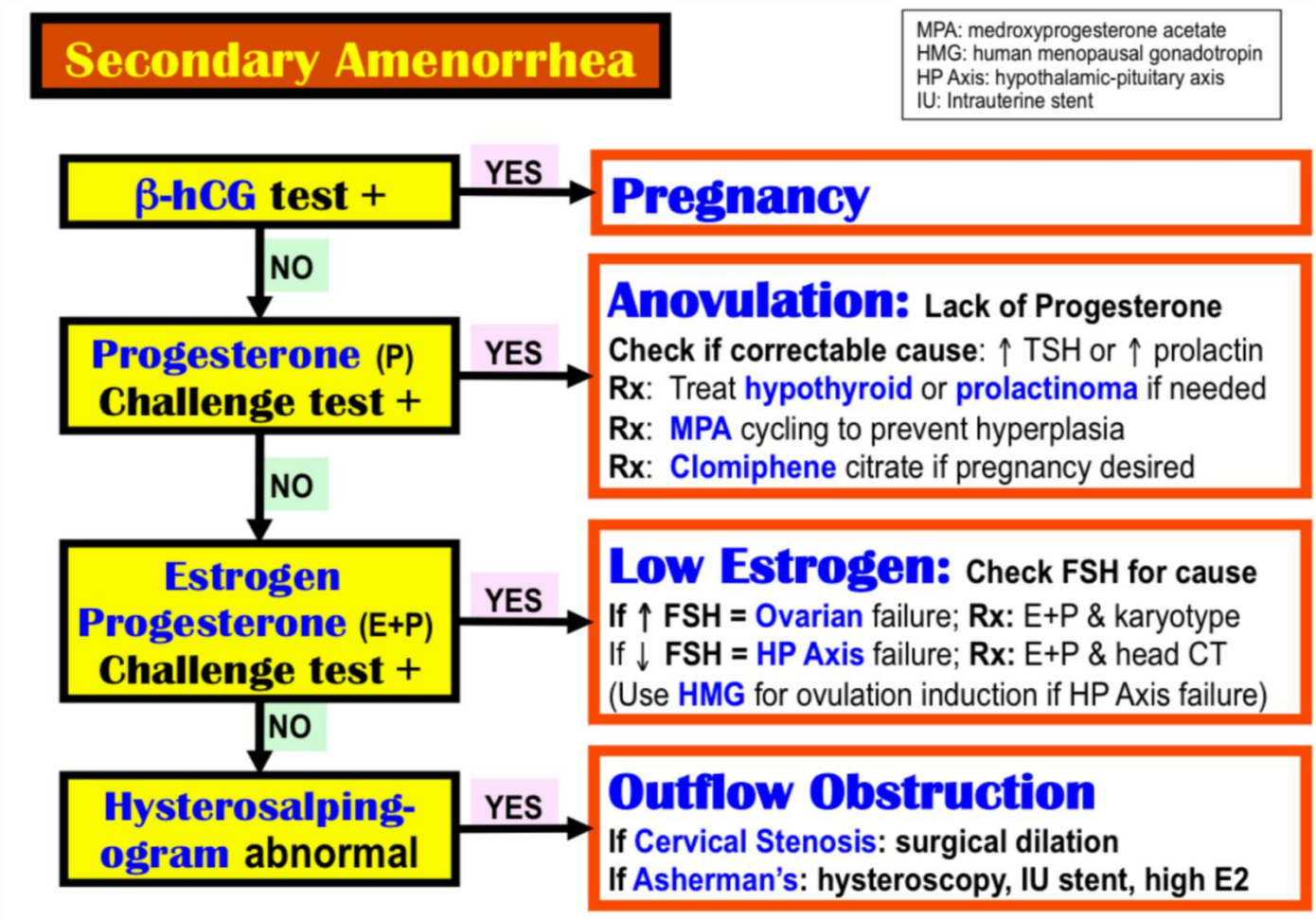
- Pathophysiology:

- There are multiple etiologies for secondary amenorrhea, which can be classified by alterations in FSH and LH levels.

- They include:

A. Hypogonadotropic: suggesting hypothalamic or pituitary dysfunction.
B. Hypergonadotropic: suggesting ovarian follicular failure.
C. Eugonadotropic: suggesting pregnancy, anovulation, or uterine or outflow tract pathology.





A. Pregnancy:

- The first step is a β-hCG to diagnose pregnancy.

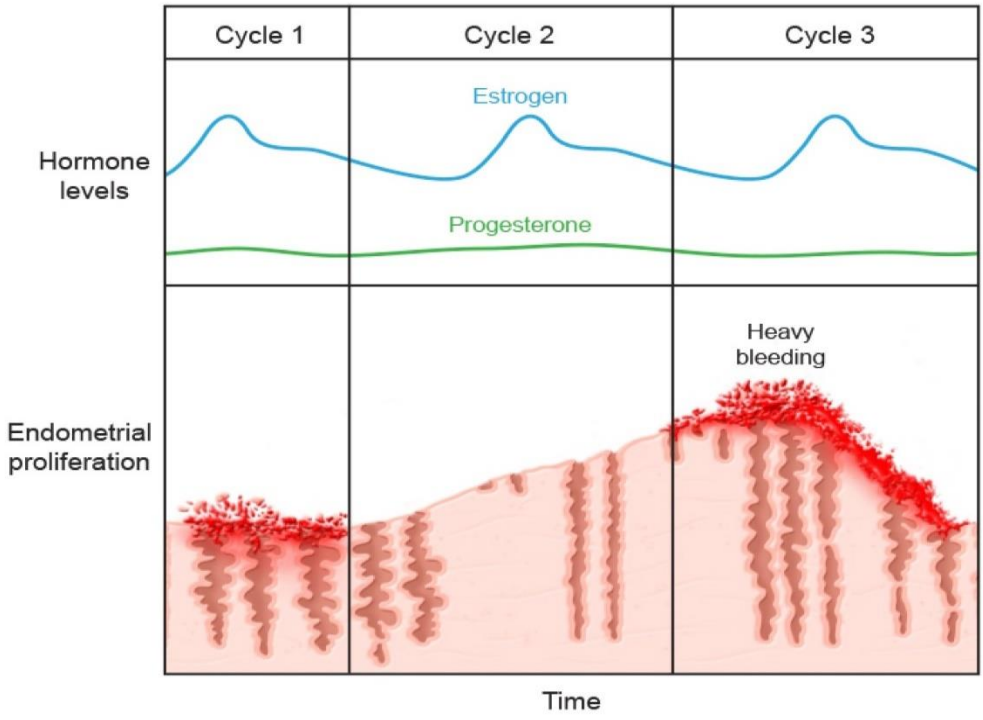
- This is the most common cause of secondary amenorrhea.

B. Anovulation:

- If no corpus luteum is present to produce progesterone, there can be no progesterone-withdrawal bleeding. Therefore, anovulation is associated with unopposed estrogen stimulation of the endometrium. Initially the anovulatory patient will demonstrate amenorrhea, but as endometrial hyperplasia develops, irregular, unpredictable bleeding will occur.

- The causes of anovulation are multiple, including PCOS, hypothyroidism, pituitary adenoma, elevated prolactin, and medications (antidepressants). The elevated thyrotropin-releasing hormone (TRH) in primary hypothyroidism can lead to an elevated prolactin.

Effect of anovulatory cycles on the endometrium



- Progesterone Challenge Test (PCT):

- If the β-hCG is negative, and TSH and prolactin levels are normal, administer either a single IM dose of progesterone or 7 days of oral medroxyprogesterone acetate (MPA):

A. Positive PCT:

- Any degree of withdrawal bleeding is diagnostic of anovulation.
- Cyclic MPA is required to prevent endometrial hyperplasia.
- Clomiphene ovulation induction will be required if pregnancy is desired.

B. Negative PCT:

- Absence of withdrawal bleeding is caused by either inadequate estrogen priming of the endometrium or outflow tract obstruction.

C. Estrogen Deficiency:

- Without adequate estrogen priming the endometrium will be atrophic with no proliferative changes taking place.

- The causes of hypoestrogenic states are multiple, including absence of functional ovarian follicles or hypothalamic- pituitary insufficiency.

- Estrogen-Progesterone Challenge Test (EPCT):

- If the PCT is negative, administer 21 days of oral estrogen followed by 7 days of MPA:

A. Positive EPCT:

- Any degree of withdrawal bleeding is diagnostic of inadequate estrogen.

- An FSH level will help identify the etiology:

A. Elevated FSH suggests ovarian failure.

B. Low FSH suggests hypothalamic-pituitary insufficiency: Order a CNS imaging study to rule out a brain tumor. Functional hypothalamic amenorrhea should be suspected in a patient with significant weight loss, strenuous exercise, anorexia nervosa, marijuana use, starvation, stress depression, or chronic illness.

B. Negative EPCT:

- Absence of withdrawal bleeding is diagnostic of either an outflow tract obstruction or endometrial scarring (Asherman syndrome; also called intrauterine synechiae).

- Asherman is the result of extensive uterine curettage and infection-produced adhesions. It is treated by hysteroscopic adhesion lysis followed by estrogen stimulation of the endometrium. An inflatable stent is then placed into the uterine cavity to prevent re-adhesion of the uterine walls.

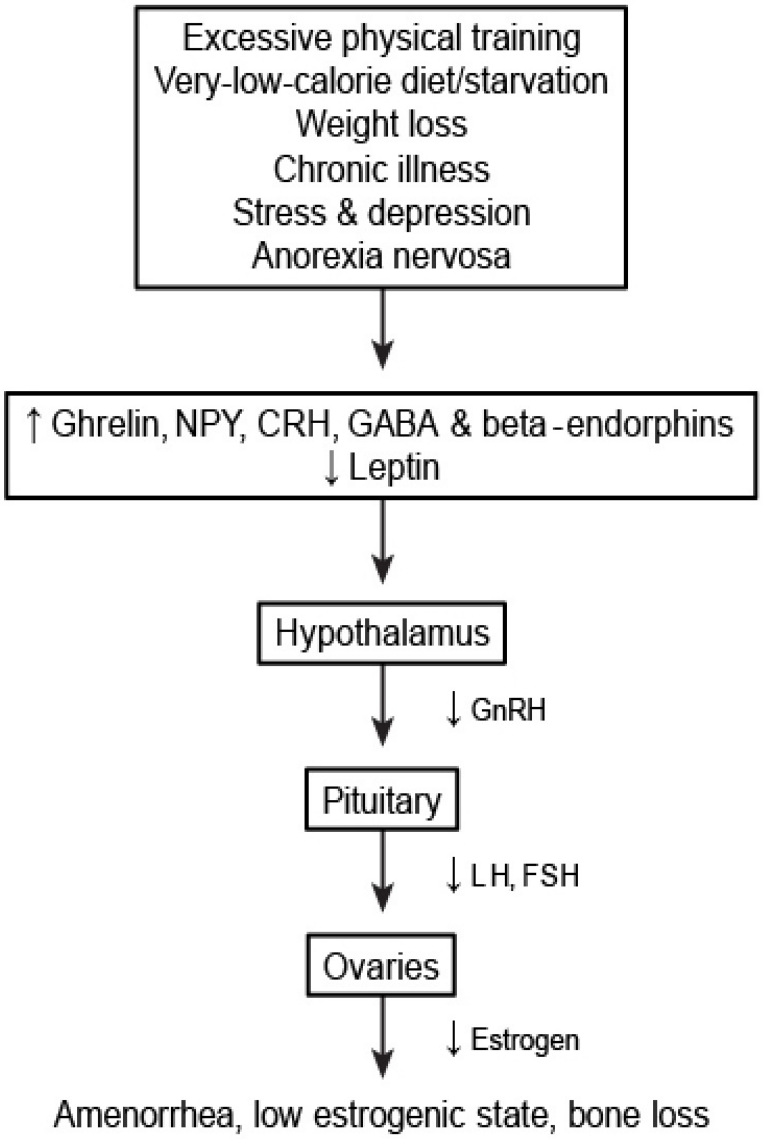
D. Outflow Tract Obstruction:

- Even with adequate estrogen stimulation and progesterone withdrawal, menstrual flow will not occur if the endometrial cavity is obliterated or stenosis of the lower reproductive tract is present.

❖ N.B:

- Amenorrhea is thought to occur in female athletes when there is a relative caloric deficiency secondary to inadequate nutritional intake as compared to the amount energy expended.
- Functional hypothalamic amenorrhea is due to suppression of the hypothalamic-pituitary-ovarian axis by strenuous exercise, anorexia nervosa, marijuana use, starvation, stress depression, or chronic illness.
- Women athletes with this condition have been shown to have decreased levels of gonadotropin-releasing hormone (GnRH), resulting in an estrogen deficiency.
- These amenorrheic women are therefore at increased risk for all conditions associated with estrogen deficiency, including infertility, vaginal atrophy, breast atrophy, and osteopenia.
- First-line treatment is with lifestyle changes, specifically increased caloric intake and exercise reduction.

Pathophysiology of functional hypothalamic amenorrhea

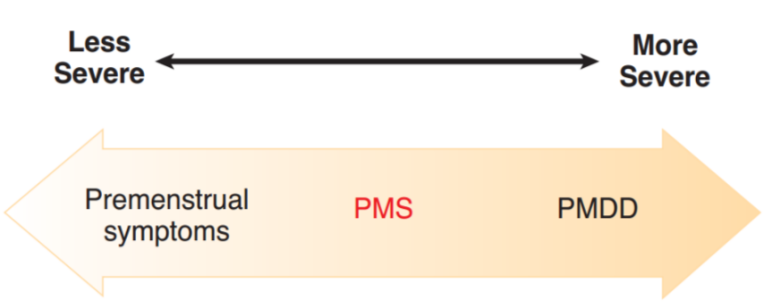


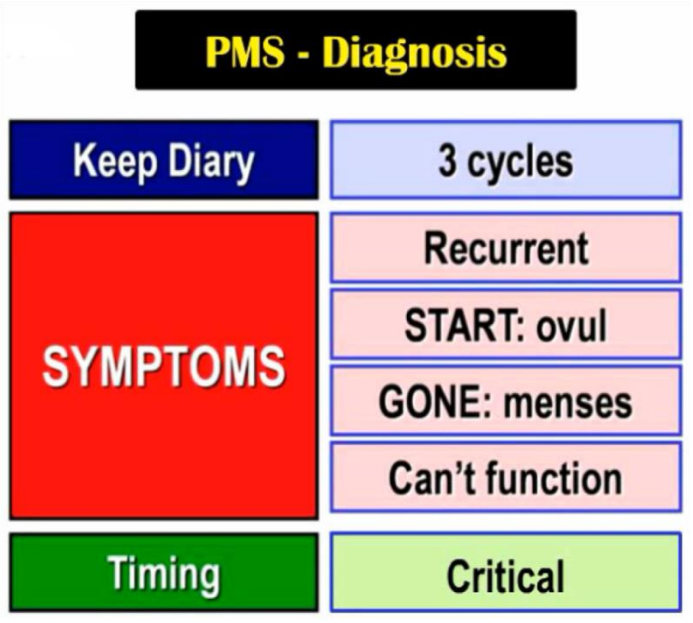
CRH = corticotropin-releasing hormone;
GnRH = gonadotropin-releasing hormone; **NPY** = neuropeptide Y.

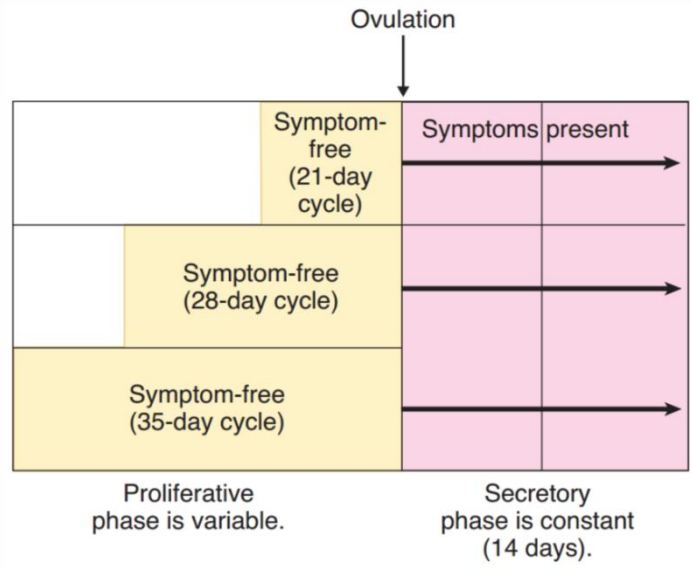
Premenstrual syndrome (PMS)

- Definition:

- PMS includes a wide range of physical and emotional difficulties, as well as the more severe affective changes included in premenstrual dysphoric disorder (PMDD).







- Diagnosis:

- All the following must be present about the symptoms:
  - Must be recurrent in at least 3 consecutive cycles.
  - Must be present in the 2 postovulatory weeks.
  - Must be absent in the preovulatory phase of the menstrual cycle.
  - Must interfere with normal functioning.
  - Must resolve with onset of menses.

- Clinical Findings:

- The symptoms may be of varied descriptions, including:
  - Fluid retention (bloating, edema, breast tenderness).
  - Autonomic changes (insomnia, fatigue, heart pounding).
  - Emotional symptoms (crying, anxiety, depression, mood swings).
  - Musculoskeletal complaints (headache, muscle aches, joint aches).

- The most common affective symptom is mood swings, and the most common physical symptom is abdominal bloating.

- Physical examination is typically normal.

- Proven treatments include the following:

- Selective serotonin reuptake inhibitors (fluoxetine) are the first-line treatment and can be given daily or limited to only the luteal phase.

- Yaz (drospirenone/ethinyl estradiol), with the unique progestin, drospirenone (DRSP), has been approved by the FDA for the treatment of PMS and work by causing anovulation.

- DRSP is an analogue of spironolactone which differs from other OCP progestins by exhibiting both anti-mineralocorticoid and antiandrogenic effects.

❖ N.B:

- Normal ovulation can cause pain in the middle of the menstrual cycle (mittelschmerz).
- Ovulation typically occurs on days 10-14 counting from the first day of the previous menses.
- This physiologic event causes discomfort when rupture of the follicle releases the egg. The concomitant release of a small amount of blood during this process irritates the peritoneum.
- Patients may have a recurrent monthly instance of pain halfway through their menstrual cycle or experience a single more uncomfortable episode. The pain is unilateral and usually lasts less than a day, resolving without intervention.
- Physical examination can be entirely normal or show localized, mild discomfort in the lower pelvis at the site of ovulation.
- Peritoneal signs are absent.
- Management consists of ruling out a more acute etiology as indicated by history and physical examination, followed by reassurance.

CHAPTER 10

Hirsutism and virilization

Hirsutism and virilization

- Definition:

- Hirsutism is excessive male-pattern hair growth in a woman on the upper lip, chin, chest, abdomen, back, and proximal extremities.

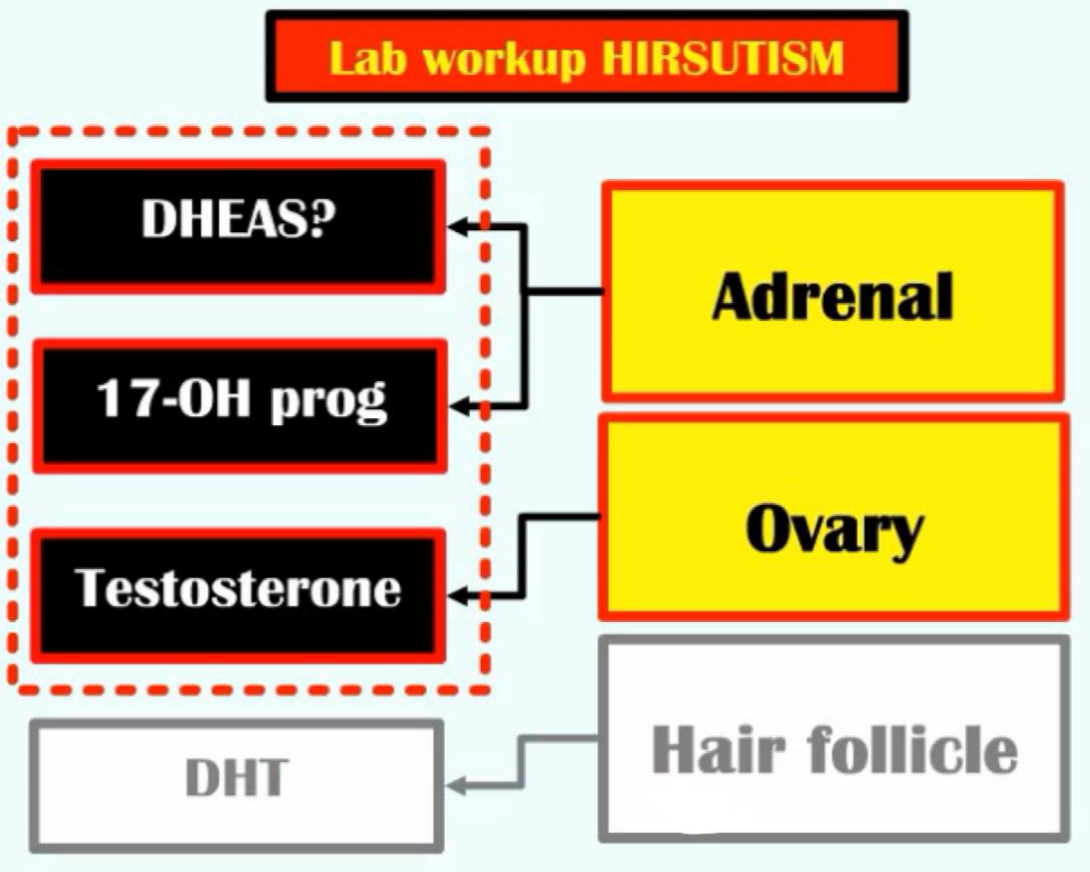
- Virilization is excessive male-pattern hair growth in a woman plus other masculinizing signs such as clitoromegaly, baldness, lowering of voice, increasing muscle mass, and loss of female body contours.

- Pathophysiology:

- Hirsutism involves the conversion of vellus hair (fine, nonpigmented hair) to terminal hair (coarse, dark hair) within the hair follicle.

- This conversion is under the influence of androgens. In women, androgens are generally produced in only 3 body locations: the ovaries, the adrenal glands, and within the hair follicle.

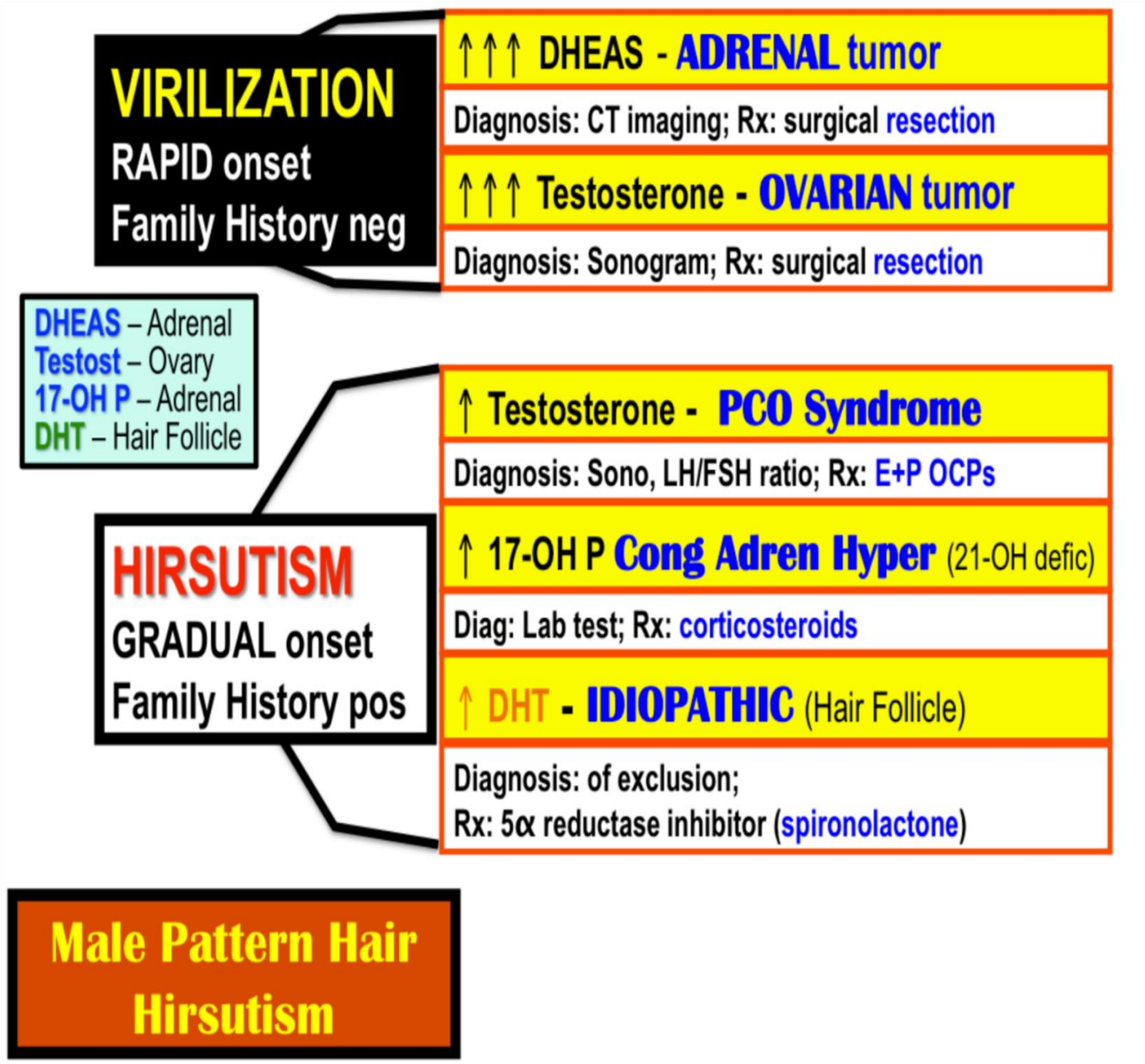
- The workup of hirsutism will seek to identify which of these body locations is producing the androgens that are responsible for the excess terminal hair.



A. Dehydroepiandrosterone sulfate (DHEAS) is produced only in the adrenal glands. A markedly elevated DHEAS is consistent with an adrenal tumor.

B. 17-OH progesterone is a precursor in the biosynthesis pathway of cortisol. It is elevated in late-onset congenital adrenal hyperplasia (CAH), with 21-hydroxylase deficiency. It is converted peripherally into androgens.

C. Testosterone is produced by both the ovary and the adrenal glands:
- A mildly elevated level is suggestive of PCO syndrome.
- A markedly elevated level is consistent with an ovarian tumor.



- Clinical entities:

A. Adrenal Tumor:

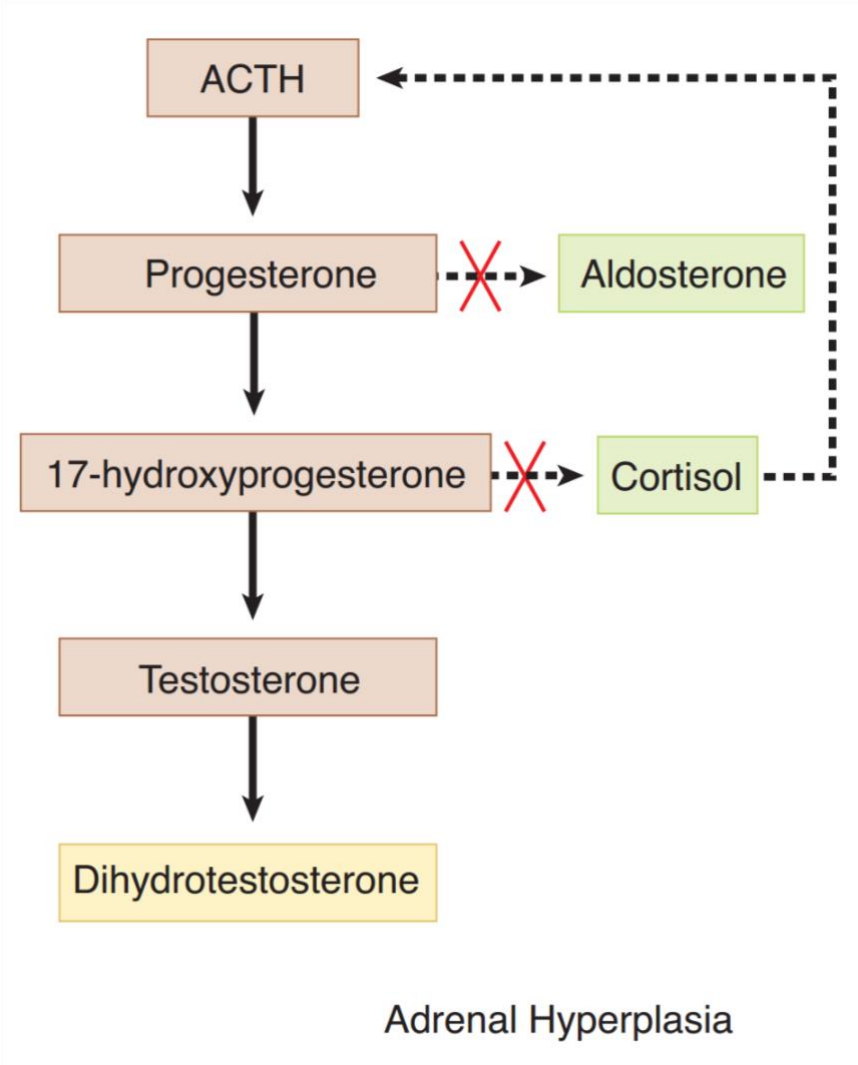
- History: Typically, the onset has been rapid without positive family history.
- Examination: Physical examination will show evidence of virilization.
- Laboratory tests: DHEAS level is markedly elevated.
- Imaging: CT or MRI scan will show an abdominal-flank mass.
- Management: Treatment involves surgical removal of tumor.

B. Ovarian Tumor:

- History: Typically, the onset has been rapid without positive family history.
- Examination:
  - Physical examination will show evidence of virilization.
  - An adnexal mass will be palpated on pelvic examination.
- Laboratory tests: Testosterone level is markedly elevated.
- Imaging: Pelvic ultrasound will show an adnexal mass.
- Management: Surgical removal of the mass, usually a Sertoli-Leydig cell tumor.

C. Congenital Adrenal Hyperplasia (21-Hydroxylase Deficiency):

- History: Family history may be positive. Late-onset CAH is one of the most common autosomal recessive genetic disorders.
- Examination: Physical examination will show evidence of hirsutism without virilization.
- Laboratory tests: Serum 17-OH progesterone level is markedly elevated.
- Management: Treatment is medical with continuous corticosteroid replacement, which will arrest the signs of androgenicity and restore ovulatory cycles.



❖ N.B:

- Aromatase deficiency is a rare genetic disorder marked by either total absence or poor functioning of the enzyme that converts androgens into estrogens.
- Its consequences are numerous:

- In utero the placenta will not be able to make estrogens, leading to masculinization of the mother that resolves after delivery.
- The high levels of gestational androgens result in a virilized XX child with normal internal genitalia but ambiguous external genitalia.
- Clitoromegaly is often seen when excessive androgens are present in utero.
- Later in life patients will have delayed puberty, osteoporosis, undetectable circulating estrogens, high concentrations of gonadotropins and polycystic ovaries.

CHAPTER 11

Polycystic Ovarian Syndrome (PCOS)

Polycystic Ovarian Syndrome (PCOS)

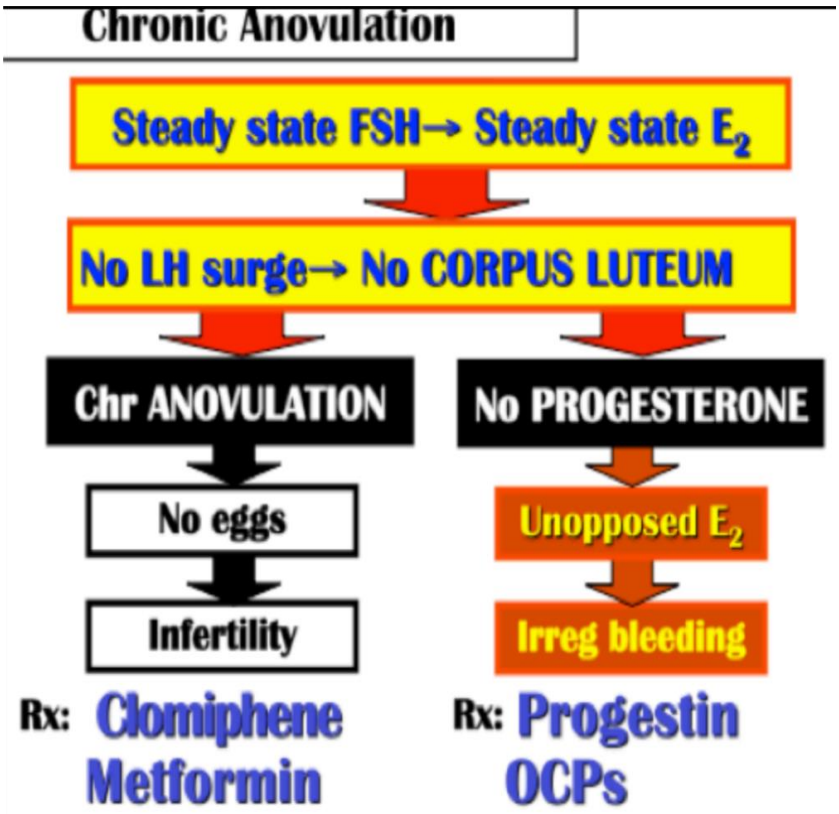
- Definition:

- Polycystic ovarian syndrome (PCOS), historically called Stein-Leventhal syndrome, is a condition of chronic anovulation with resultant infertility.

- The patient presents typically with irregular vaginal bleeding.

- Other symptoms include obesity and hirsutism.

- Pathophysiology:



A. Chronic anovulation:

- Instead of showing the characteristic hormone fluctuation of the normal menstrual cycle, PCOS gonadotropins and sex steroids are in a steady state, resulting in anovulation and infertility.

- Without ovulation, there is no corpus luteum to produce progesterone. Without progesterone there is unopposed estrogen. Endometrium, which is chronically stimulated by estrogen, without progesterone ripening and cyclic shedding, becomes hyperplastic with irregular bleeding.

- With time endometrial hyperplasia can result, which could progress to endometrial cancer.

B. Increased testosterone:

- Increased LH levels cause increased ovarian follicular theca cell production of androgens.

- The increased levels of androstenedione and testosterone suppress hepatic production of SHBG by 50%.

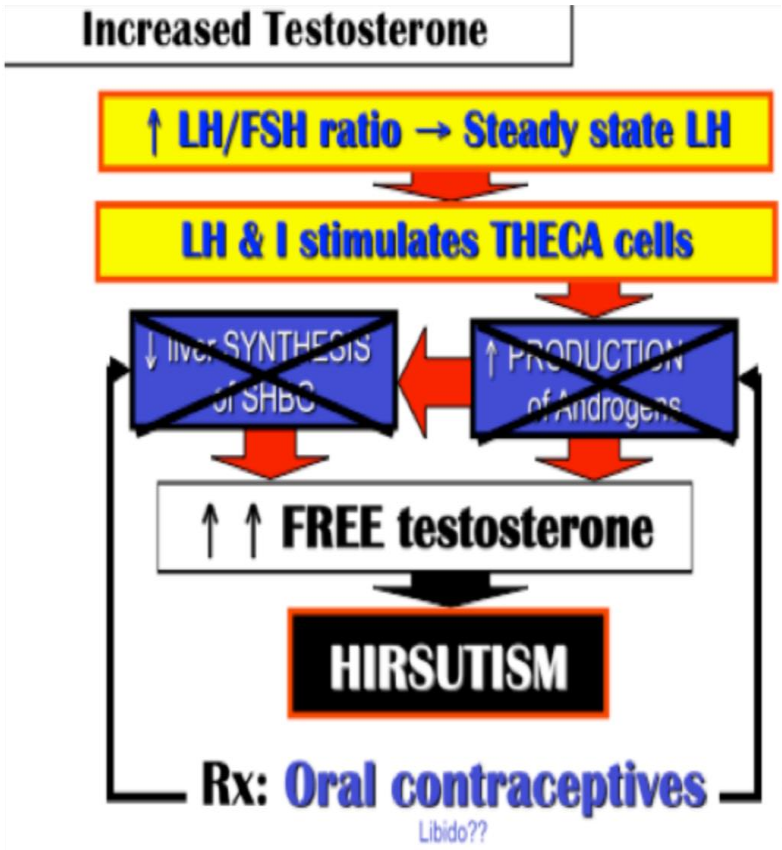
- The combined effect of increased total testosterone and decreased SHBG leads to mildly elevated levels of free testosterone. This results in hirsutism.

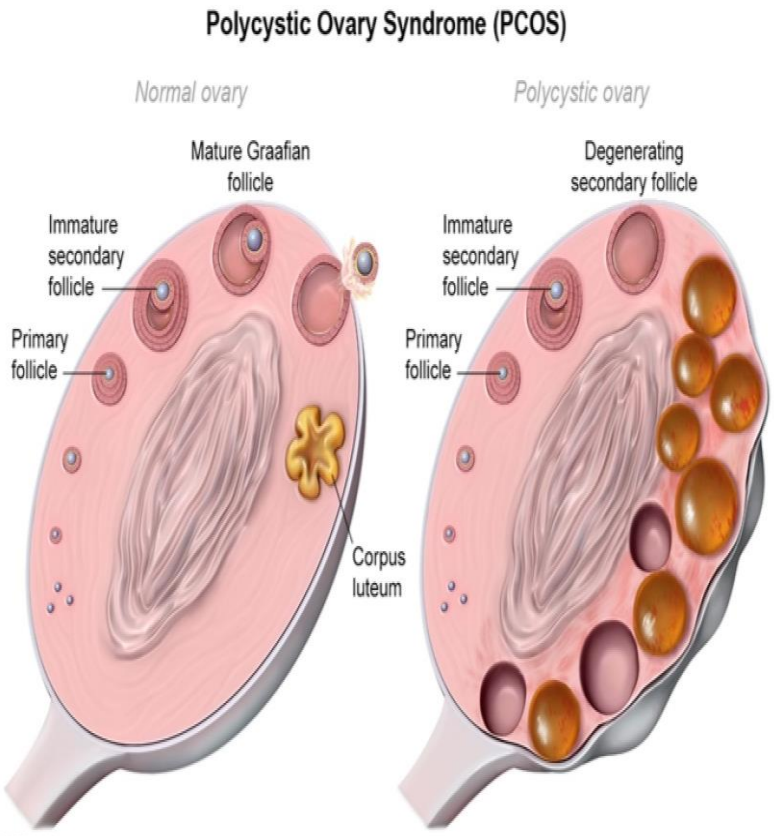
C. Ovarian enlargement:

- On ultrasound the ovaries demonstrate the presence of the necklace-like pattern of multiple peripheral cysts (20-100 cystic follicles in each ovary).

- This is due to high circulating androgens and high circulating insulin levels causing arrest of folliclular development in various stages.

- This along with stromal hyperplasia and a thickened ovarian capsule results in enlarged ovaries bilaterally.

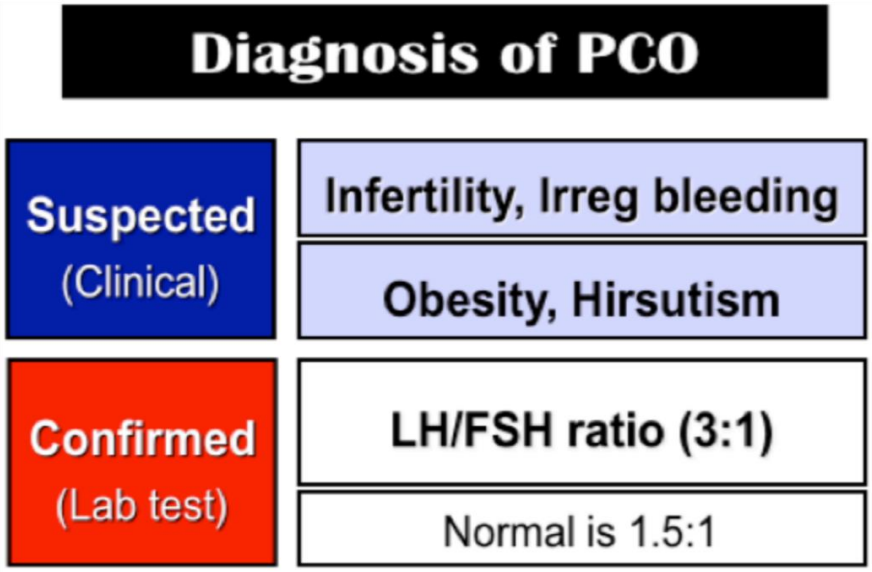




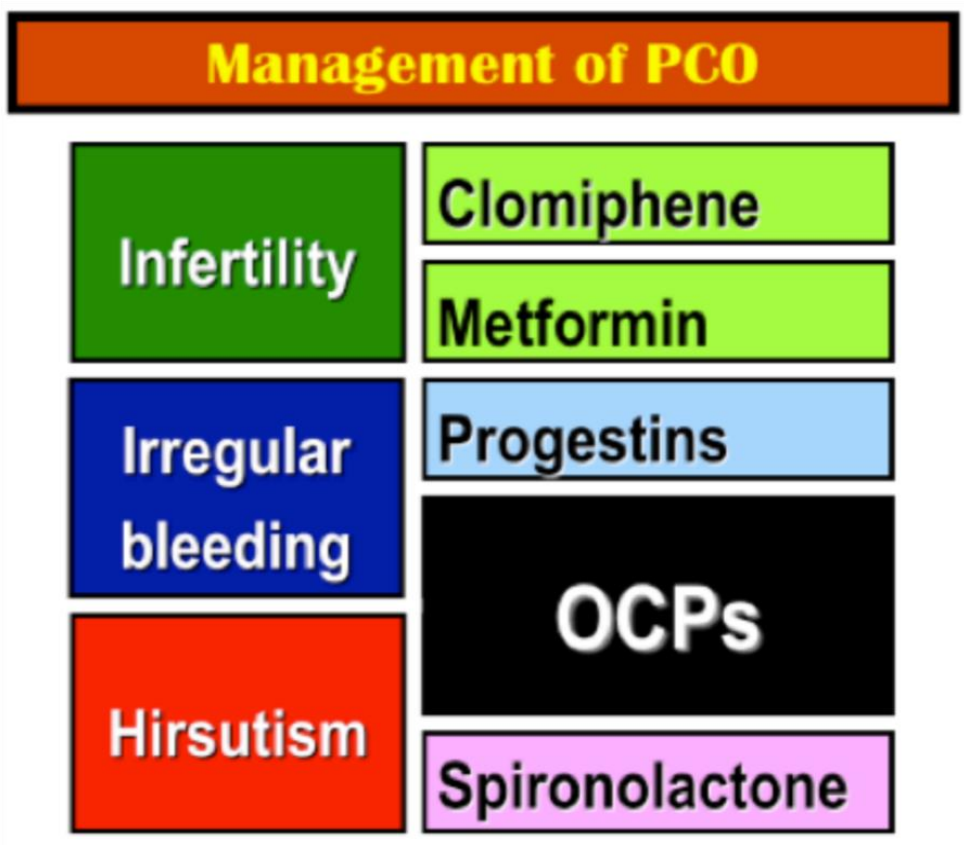
- Diagnosis:

- Diagnosis is based on the Rotterdam criteria, which requires 2 of the following 3 findings:

1. Oligomenorrhea or menstrual dysfunction.
2. Hyperandrogenism, clinically or biochemically.
3. Polycystic ovaries on sonogram (≥12 peripheral cysts).



- Management:



A. Irregular bleeding:

- The first-line therapy for menstrual regulation is a combination of weight loss and combined estrogen/progestin oral contraceptives.

- Combined oral contraceptives contain progesterone to stabilize the uterine lining, which restores normal cycles.

B. Hirsutism:

- Excess male-pattern hair growth can be suppressed 2 ways:
  - OCPs will lower testosterone production by suppressing LH stimulation of the ovarian follicle theca cells. OCPs will also increase SHBG, thus decreasing free testosterone levels.
  - Spironolactone suppresses hair follicle 5-α reductase enzyme conversion of andro- stenedione and testosterone to the more potent dihydrotestosterone.

C. Infertility:

- If she desires pregnancy, ovulation induction can be achieved through clomiphene citrate (Clomid) or human menopausal gonadotropin (HMG).

- Metformin, a hypoglycemic agent that increases insulin sensitivity, can enhance the likelihood of ovulation both with and without clomiphene.

❖ N.B:

- Patients with PCOS are at increased risk for multiple comorbidities, including dyslipidemia, hypertension, and type 2 diabetes mellitus (metabolic syndrome) and should undergo screening for these conditions.

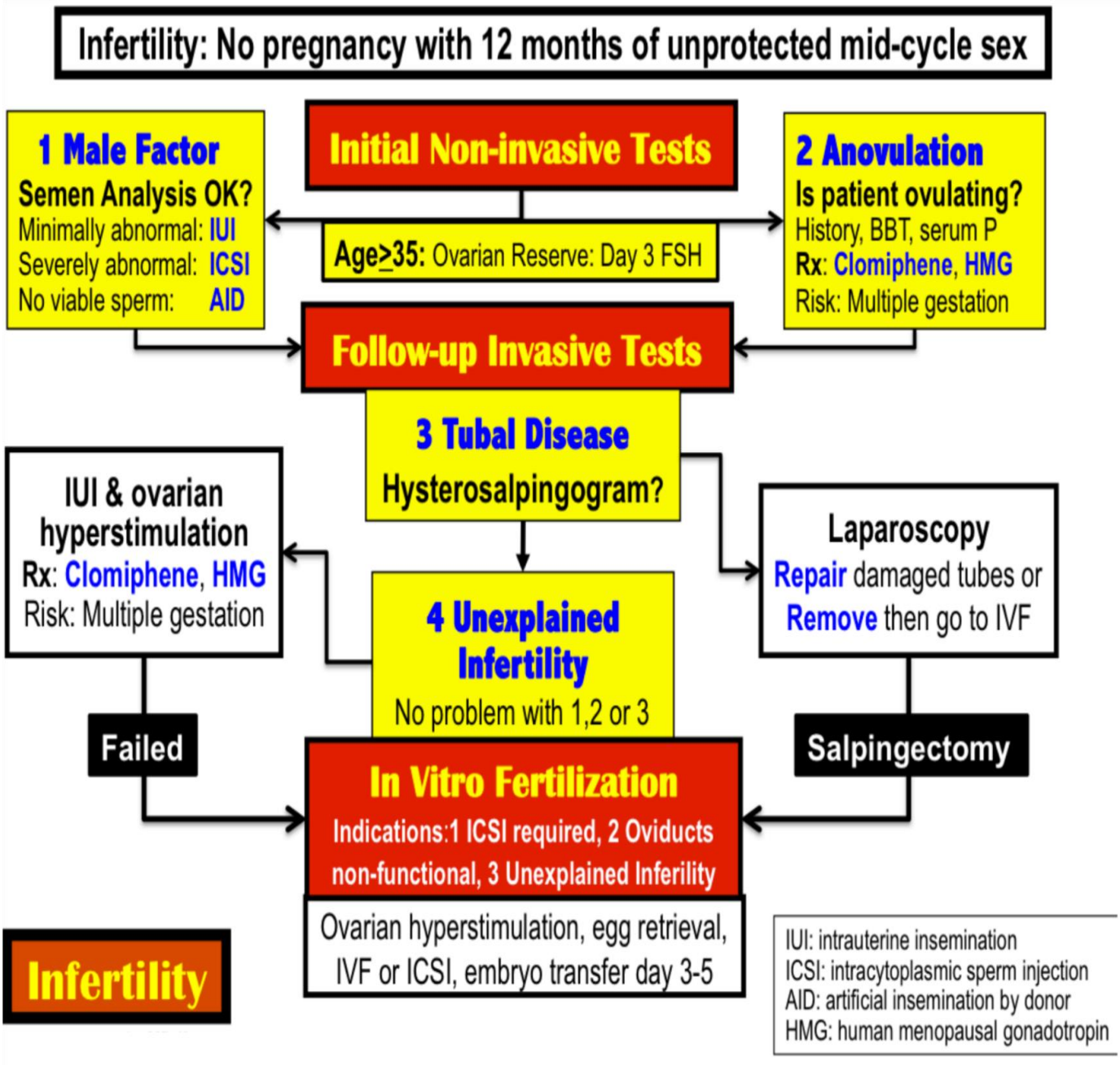
Polycystic ovary syndrome	
Clinical features	• **Androgen excess** (eg, acne, male pattern baldness, hirsutism) • Oligoovulation or anovulation (eg, **menstrual irregularities**) • Obesity • **Polycystic ovaries** on ultrasound
Pathophysiology	• ↑ Testosterone levels • ↑ Estrogen levels • LH/FSH imbalance
Comorbidities	• Metabolic syndrome (eg, diabetes, hypertension) • Obstructive sleep apnea • Nonalcoholic steatohepatitis • Endometrial hyperplasia/cancer
Treatment options	• Weight loss (first-line) • Oral contraceptives for menstrual regulation • Clomiphene citrate for ovulation induction

Infertility

- Definition:

- Infertility is defined as the inability to achieve pregnancy with frequent and unprotected sexual intercourse for 12 months if woman age <35 or for 6 months if woman age ≥35.

- Both male and female factors have to be evaluated in the patient with infertility.



1. Initial Noninvasive Tests (Semen analysis):

- Timing: The first step in the infertility evaluation is a semen analysis, which should be obtained after 2-3 days of abstinence and examined within 2 h.

- Normal values:
  - Expected findings are volume >2 ml; pH 7.2-7.8; sperm density >20 million/ml; sperm motility >50%; and sperm morphology >50% normal.
  - If values are abnormal, repeat the semen analysis in 4-6 weeks because semen quality varies with time.

- Treatment of male factor infertility:

A. Minimally abnormal:
  - If sperm density is mild to moderately lower than normal, intrauterine insemination may be used.
  - The goal of IUI is to increase the number of sperm that reach the fallopian tubes and subsequently increase the chance of fertilization.

B. Severely abnormal: If semen analysis shows severe abnormalities, intracytoplasmic sperm injection (ICSI) may be used in conjunction with in vitro fertilization and embryo transfer.

C. No viable sperm: With azoospermia or failed ICSI, artificial insemination by donor (AID) may be used.

2. Anovulation:

- Of all causes of infertility, treatment of anovulation results in the greatest success.

- Correctible causes: Hypothyroidism or hyperprolactinemia.

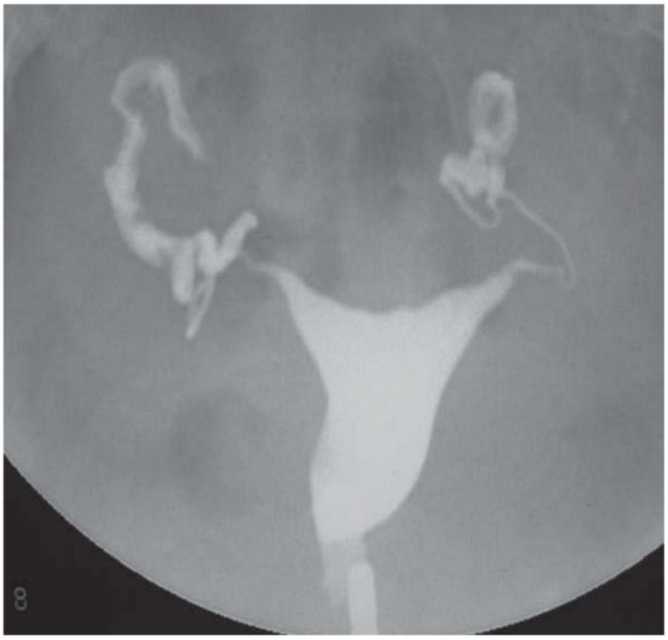
- Ovulation induction:
  - The agent of choice is clomiphene citrate administered orally for 5 days beginning on day 5 of the menstrual cycle.
  - HMG is administered parenterally and is used to induce ovulation if clomiphene fails.
  - When a patient is given clomiphene, her own pituitary is being stimulated to secrete her own gonadotropins, whereas when a patient is administered HMG, the patient is being stimulated by exogenous gonadotropins.

3. Follow-Up Invasive Tests:

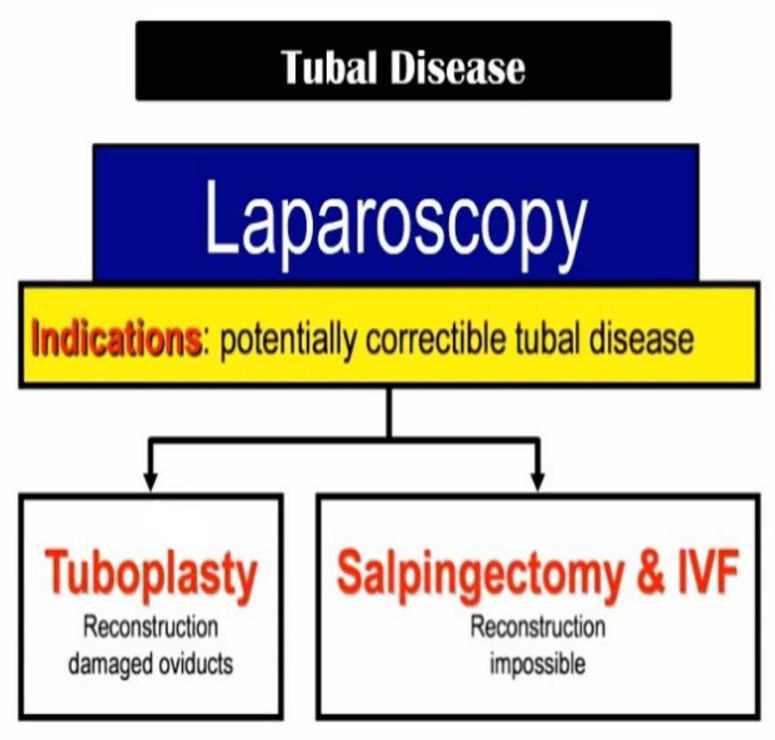
- Hysterosalpingogram and Laparoscopy

- Tubal Disease: Assessment of fallopian tube abnormalities is the next step if the semen analysis is normal and ovulation is confirmed.

- Hysterosalpingogram (HSG):
  - In this imaging procedure, a catheter is placed inside the uterine cavity, and contrast material is injected. The contrast material should be seen on x-ray images spilling bilaterally into the peritoneal cavity.
  - No further testing is performed if the HSG shows normal anatomy.
  - If abnormal findings are seen, the extent and site of the pathology are noted and laparoscopy considered.
- Laparoscopy:
  - If potentially correctible tubal disease is suggested by the HSG, the next step in management is to visualize the oviducts and attempt reconstruction if possible (tubo-plasty).
  - If tubal damage is so severe → Salpingectomy & IVF should be planned.



Normal HSG



4. Unexplained Infertility:

- Definition: This diagnosis is reserved for couples in which the semen analysis is normal, ovulation is confirmed, and patent oviducts are noted.
- Outcome: Approximately 60% of patients with unexplained infertility will achieve a spontaneous pregnancy within the next 3 years.

- Management:
  - Treatment consists of controlled ovarian hyperstimulation (COH) with clomiphene, and appropriately timed preovulatory intrauterine insemination (IUI).
  - It's comparable with IVF with a significantly lower cost and risk.

- In Vitro Fertilization:
  - With IVF, eggs are aspirated from the ovarian follicles using a transvaginal approach with the aid of an ultrasound. They are fertilized with sperm in the laboratory, resulting in the formation of embryos.

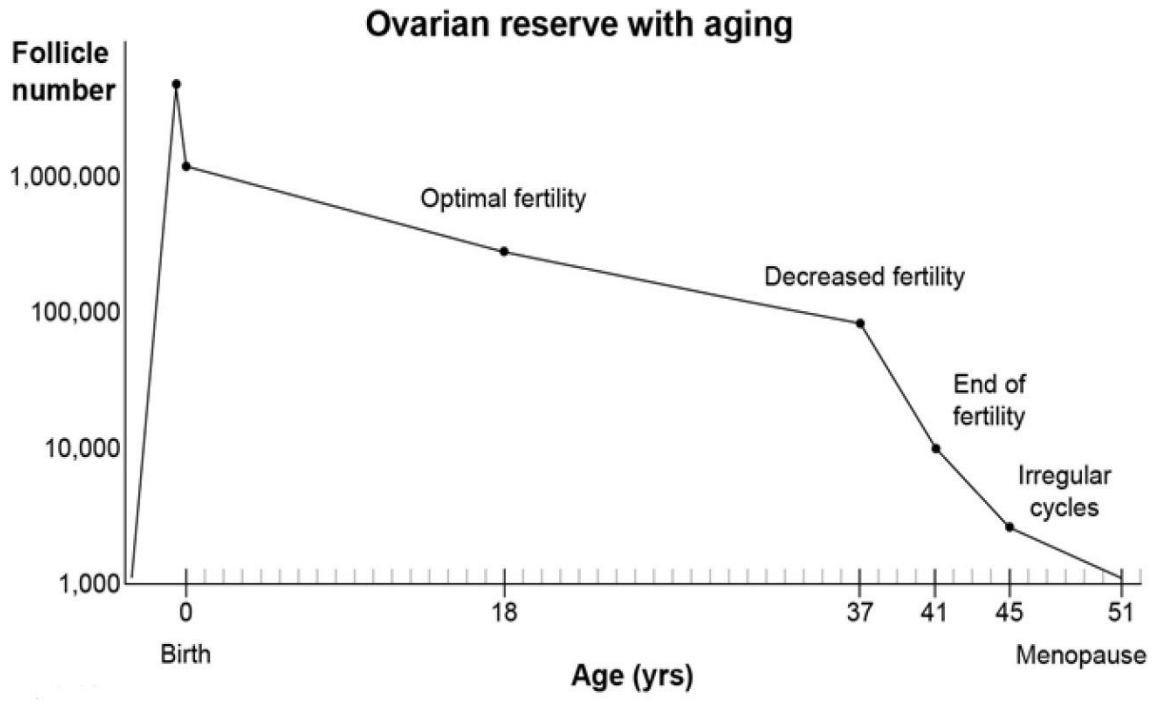
- Ovarian Reserve Testing (ORT):
- This assessment is mostly reserved for the infertile woman aged 35 or over.

- Definition: ORT refers to assessment of the capacity of the ovary to provide eggs that are capable of fertilization. These tests help predict whether a woman will respond to ovarian stimulation or whether it would be best to proceed directly to in-vitro fertilization (IVF).

- This can occur due to diminished ovarian reserve, characterized by regular menstrual cycles and decreased oocyte number and quality. Regular menstrual periods still occur due to continuing ovulation, but fecundability (conception rate) decreases due to diminished oocyte quality.

- As ovarian reserve and function decline estradiol and inhibin production decreases, and the normal negative feedback mechanism is suppressed.

- This causes FSH levels to become increasingly elevated as ovarian function decreases. Therefore, day 3 (early follicular phase) FSH testing can be performed to assess ovarian function.



❖ N.B:

- Ovarian hyperstimulation syndrome (OHSS) is a rare but life-threatening complication of ovulation induction.
- Ovulation trigger agents (hCG injection) stimulate artificial maturation of multiple ovarian follicles in patients undergoing infertility treatment and can cause an exaggerated ovarian response (bilateral enlarged, cystic ovaries with multiple follicles) as well as overexpression of vascular endothelial growth factor (VEGF), causing increased vascular permeability and capillary leakage.
- This causes massive extravascular fluid shifts (third spacing) and VEGF leakage into the intraperitoneal cavity, leading to ascites and abdominal distension.
- Affected patients typically develop OHSS 1-2 weeks after ovulation induction.
- Symptoms include nausea, vomiting, and abdominal pain.
- Other features include pleural effusions (tachypnea, decreased breath sounds) and intravascular volume depletion (tachycardia, hemoconcentration, leukocytosis) due to third spacing, which in severe cases can result in thromboembolism, renal failure, and death.

CHAPTER 12

Menopause

Menopause

- Definition:

- Menopause is a retrospective diagnosis and is defined as 12 months of amenorrhea.

- This is associated with the elevation of gonadotropins (FSH and LH).

- The mean age of menopause is 51.

- Smokers experience menopause up to 2 years earlier.

- Clinical Findings:

- The lack of estrogen is responsible for the majority of menopausal symptoms and signs:

A. Amenorrhea:
   - The most common symptom is secondary amenorrhea.
   - Menses typically become anovulatory and decrease during a period of 3-5 years known as perimenopause.

B. Hot flashes:
   - Unpredictable profuse sweating and sensation of heat are experienced by 75% of menopausal women.
   - This is probably mediated through the hypothalamic thermoregulatory center.
   - Obese women are less likely to undergo hot flashes owing to peripheral conversion of androgens to estrone in their peripheral adipose tissues.

C. Reproductive tract: Low estrogen leads to decreased vaginal lubrication, increased vaginal pH, and increased vaginal infections.

D. Urinary tract: Low estrogen leads to increased urgency, frequency, nocturia, and urge incontinence.

E. Psychic: Low estrogen leads to mood alteration, emotional lability, insomnia, and depression.

F. Cardiovascular disease: This is the most common cause of mortality (50%) in postmenopausal women, with prevalence rising rapidly after menopause.

G. Osteoporosis: This a disorder of decreased bone density leading to pathologic fractures when density falls below the fracture threshold.

- Diagnosis:

- The laboratory diagnosis of menopause is made through serial identification of elevated gonadotropins.

❖ N.B:

- Primary ovarian insufficiency, cessation of ovarian function at age <40 may present with infertility, irregular menses, and menopausal symptoms.
- It is characterized by elevated gonadotropin-releasing hormone and FSH levels and a low estrogen level.
- The elevation of FSH is generally greater than that of LH, this is due to slower clearance of FSH from the circulation.
- A markedly elevated FSH level in a woman under age 40 who has experienced ≥ 3 months of amenorrhea confirms the diagnosis of premature ovarian failure.
- Causes of premature ovarian failure include chemotherapy, radiation, autoimmune ovarian failure, and Turner's syndrome.

Primary ovarian insufficiency	
Clinical features	• Amenorrhea at age <40 • Hypoestrogenic symptoms (eg, hot flashes) • ↑ FSH • ↓ Estrogen
Major causes	• Turner syndrome (45,XO) • Fragile X syndrome (*FMR1* premutation) • Autoimmune oophoritis • Anticancer drugs • Pelvic radiation • Galactosemia
Management	• Estrogen therapy (with progestin if intact uterus)

FMR1 = fragile X mental retardation 1.

Selective estrogen receptor modulators (SERMs)

- In patients with contraindications to estrogen-replacement therapy, SERMs can be used.
- These are medications with estrogen agonist effects in some tissues, and estrogen antagonist effects on others.

A. Tamoxifen:

- Tamoxifen is an SERM with endometrial and bone agonist effects, but breast antagonist effects.
- Tamoxifen is an estrogen antagonist on breast tissue and is used in the treatment and prevention of breast cancer.
- Tamoxifen has estrogen agonist activity in the uterus and can stimulate excessive endometrial proliferation.
- Tamoxifen use is associated with endometrial polyps in premenopausal women as well as endometrial hyperplasia and cancer in postmenopausal women. These risks last for the duration of therapy and resolve after discontinuation of treatment.
- However, the benefit of improved survival from breast cancer due to tamoxifen outweighs the increased risk of endometrial cancer → used as adjuvant therapy for breast cancer.
- Hot flashes are the most common side effect. Tamoxifen is theorized to exhibit antiestrogenic activity in the central nervous system and to cause thermoregulatory dysfunction in the anterior hypothalamus via a mechanism similar to the pathophysiology of menopausal hot flashes

B. Raloxifene:

- Raloxifene is a selective estrogen receptor modulator with estrogen antagonist activity in the breast and uterus and agonist activity in the bone. It is used to treat osteoporosis.
- Although less effective than alendronate, raloxifene is frequently used for osteoporosis management in postmenopausal women who cannot tolerate bisphosphonates or are at high risk for invasive breast cancer.
- All medicines with estrogen agonist activity, including oral contraceptives, hormone replacement therapy, and all SERMs increase the risk for venous thromboembolism (VTE). Consequently, current or prior VTE disorders (pulmonary embolism, deep vein thrombosis, retinal vein thrombosis) are contraindications to both raloxifene and tamoxifen use.

Drug	Bone	Breast	Endometrium
Tamoxifen	Agonist	Antagonist	Agonist
Raloxifene	Agonist	Antagonist	Antagonist

Selective estrogen receptor modulators	
Drugs	• Tamoxifen • Raloxifene
Mechanism of action	• Competitive inhibitor of estrogen binding • Mixed agonist/antagonist action
Indications	• Prevention of breast cancer in high-risk patients • Tamoxifen: Adjuvant treatment of breast cancer • Raloxifene: Postmenopausal osteoporosis
Adverse effects	• Hot flashes • Venous thromboembolism • Endometrial hyperplasia & carcinoma (tamoxifen only)

CHAPTER 13

Pelvic organ prolapse (POP)

Pelvic organ prolapse (POP)

- Etiology:

- The etiology of pelvic relaxation is most commonly related to childbirth.

- The mechanical trauma of childbirth stresses and tears the supporting ligaments of the pelvic retroperitoneum in the pelvis whose main function is to support the pelvic viscera.

- Classification:

- The components of pelvic relaxation include uterine prolapse, cystocele, rectocele, and enterocele. Lesser forms of pelvic relaxation include vaginal or vault prolapse.

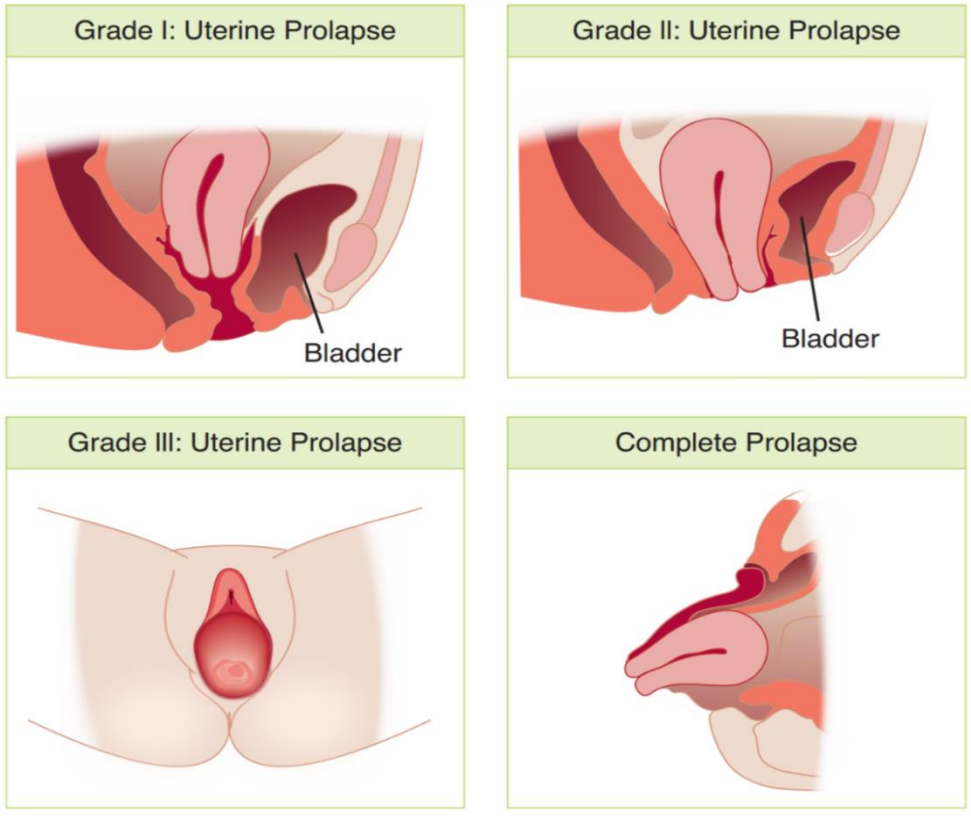
A. Uterine prolapse:

- Grade I: Cervix descends half-way to the hymen.

- Grade II: Cervix descends to the hymen.

- Grade III: Cervix extends halfway past the hymen.

- Grade IV or procidentia: The entire uterus, as well as the anterior and posterior vaginal walls, extends outside the introitus.

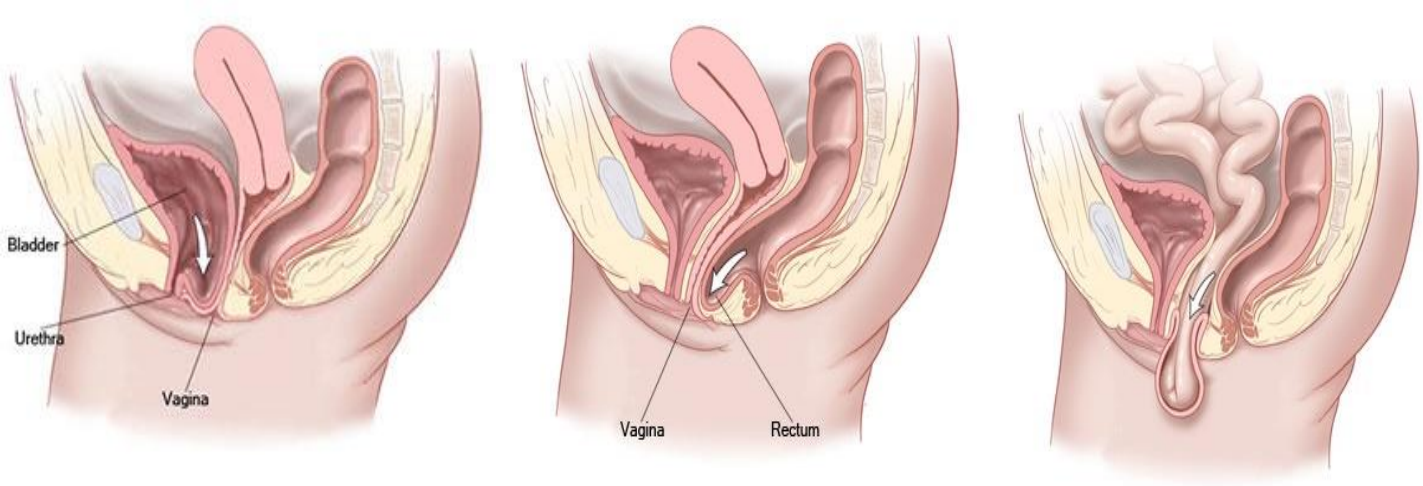


B. Vaginal prolapse:

- Cystocele: Herniation or bulging of the anterior vaginal wall and overlying bladder base into the vaginal lumen.

- Rectocele: Herniation or bulging of the posterior vaginal wall and underlying rectum into the vaginal lumen.

- Enterocele: Herniation of the pouch of Douglas containing small bowel into the vaginal lumen.



- Diagnosis:

- The prolapsed vagina, rectum, and uterus are easily visualized particularly as the patient increases intraabdominal pressure by straining.

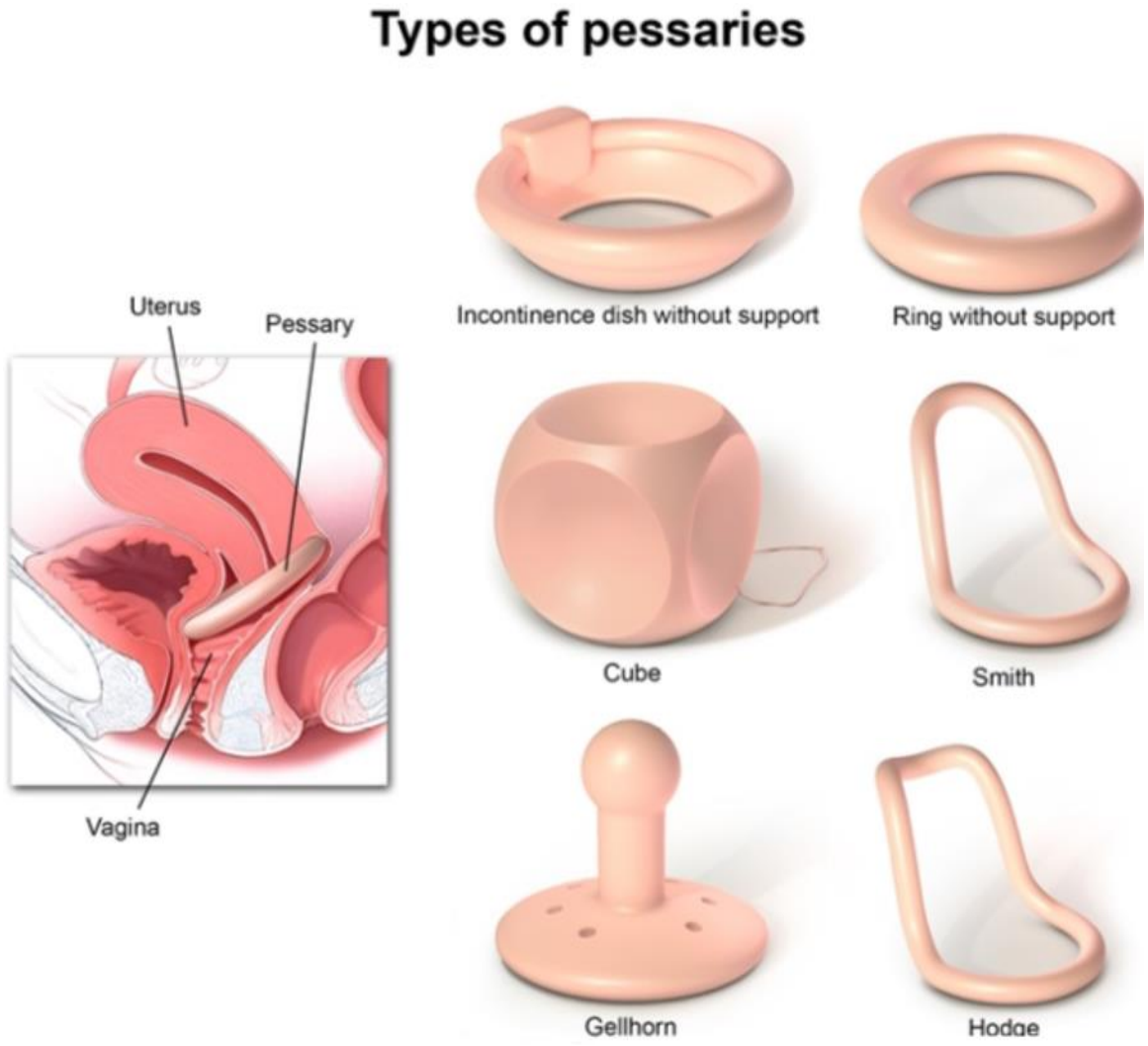
- Management:

A. Non-surgical:

- Used when there is a minor degree of relaxation:
  - Kegel exercises involve voluntary contractions of the pubococcygeus muscle.
  - Estrogen replacement may be useful in postmenopausal women.
  - Pessaries are objects inserted into the vagina that elevate the pelvic structures into their more normal anatomic relationships.

B. Surgical:

- Used when more conservative management has failed:
  - The vaginal hysterectomy repairs the uterine prolapse.
  - The anterior and posterior colporrhaphy uses the endopelvic fascia that supports the bladder and the rectum, and a plication of this fascia restores normal anatomy to the bladder and to the rectum.


Types of pessaries
Uterus
Pessary
Vagina
Incontinence dish without support
Ring without support
Cube
Smith
Gellhorn
Hodge

CHAPTER 14

Urine incontinence

Urine incontinence

- Definition:

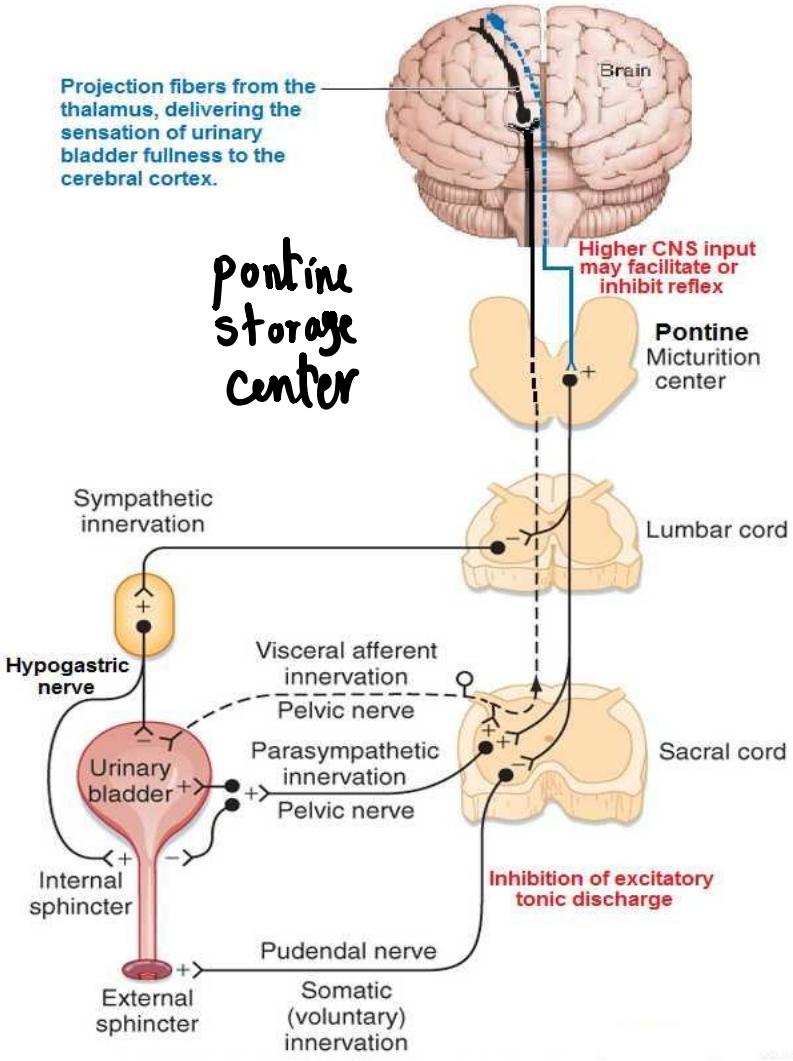
- Urinary incontinence is the inability to hold urine, producing involuntary urinary leakage.

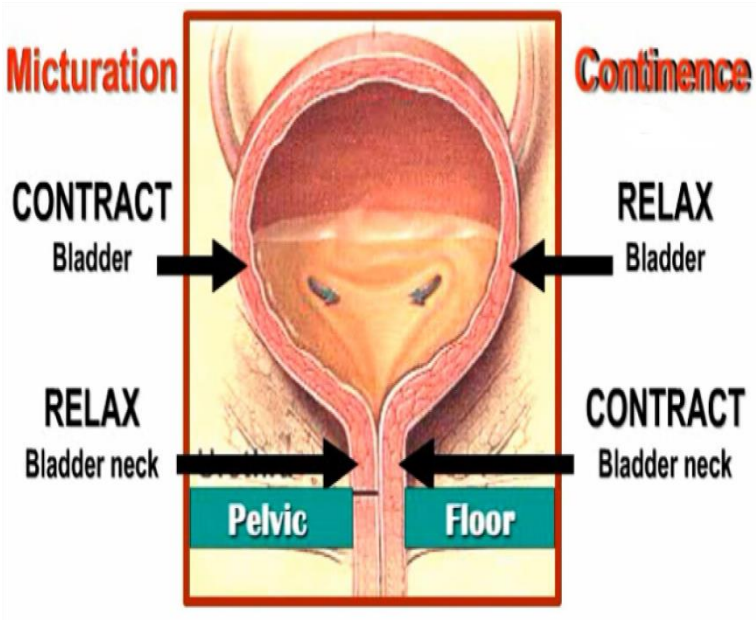
- Physiology of Continence:

- Continence and micturition involve a balance between urethral closure and detrusor muscle activity.

- Urethral pressure normally exceeds bladder pressure, resulting in urine remaining in the bladder. The proximal urethra and bladder are normally both within the pelvis. Intraabdominal pressure increases (from coughing and sneezing) are transmitted to both urethra and bladder equally, leaving the pressure differential unchanged, resulting in continence.

- Normal voiding is the result of changes in both of these pressure factors: urethral pressure falls, and bladder pressure rises. Spontaneous bladder muscle (detrusor) contractions are normally easily suppressed voluntarily.





- Pharmacology of Incontinence:

A. α-adrenergic receptors:

- These are found primarily in the urethra and when stimulated cause contraction of urethral smooth muscle, preventing micturition.

- α-adrenergic blockers or antagonists relax the urethra, enhancing micturition.

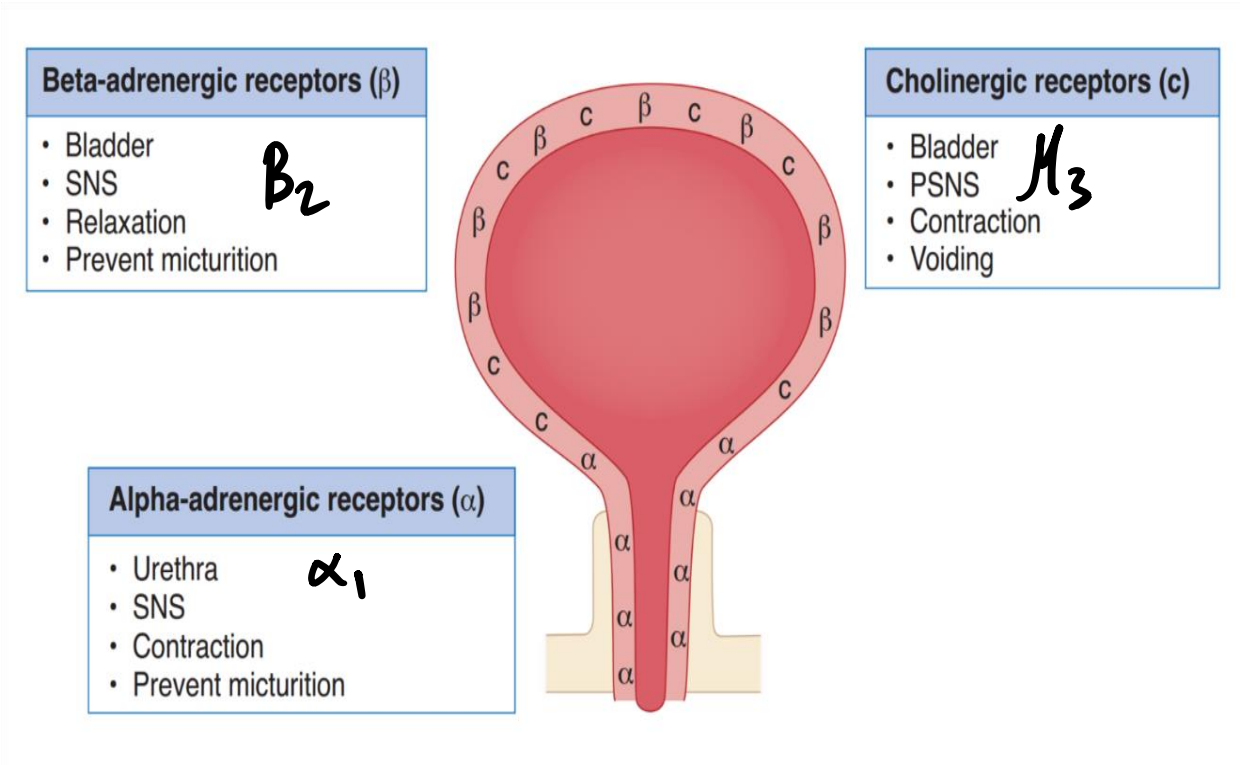
B. B_2-adrenergic receptors:

- These are found primarily in the detrusor muscle and when stimulated cause relaxation of the bladder wall, preventing micturition.

C. Cholinergic (M_3) receptors:

- These are found primarily in the detrusor muscle and when stimulated cause contraction of the bladder wall, enhancing micturition.
  - Drugs: bethanechol (Urecholine) and neostigmine (Prostigmine).

- Anticholinergic medications block the receptors, inhibiting micturition.
  - Drugs: oxybutynin.



- Cystometric studies:

- Basic office cystometry begins with the patient emptying the bladder as much as possible.

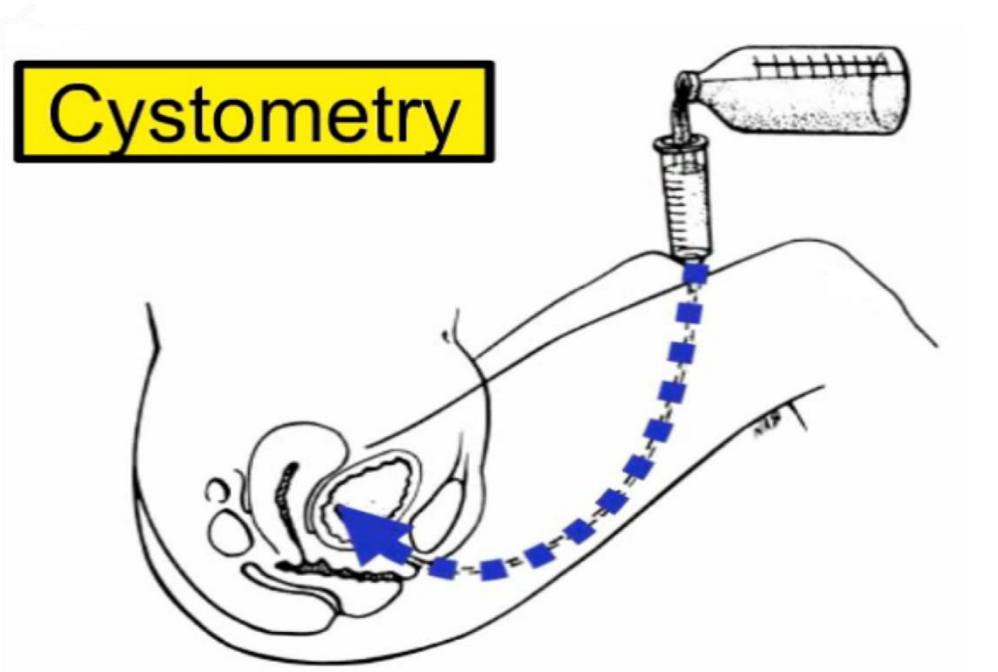
- A urinary catheter is first used to empty the bladder and then left in place to infuse saline by gravity, with a syringe into the bladder retrograde assessing the following:

A. Residual volume: How much is left in the bladder? Normal is <100 mL.

B. Sensation-of-fullness volume: How much infusion (in mL) until the patient senses fluid in her bladder? Normal is 200–225 mL.

C. Urge-to-void volume: How much infusion (in mL) until the patient feels the need to empty the bladder? Normal is 400–500 mL.

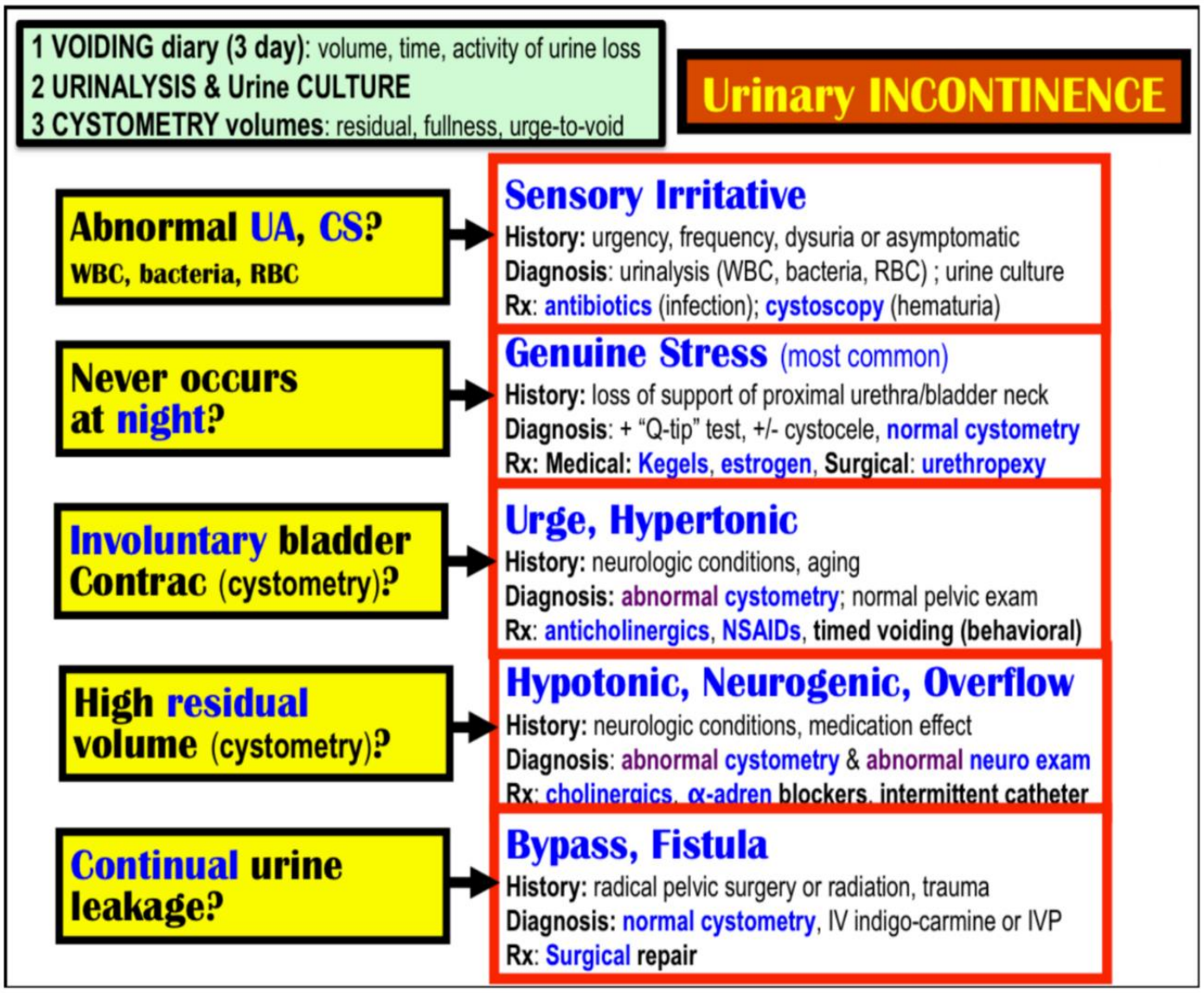
D. Involuntary bladder contractions: By watching the saline level in the syringe rise or fall, involuntary detrusor contractions can be detected. The absence of contractions is normal.

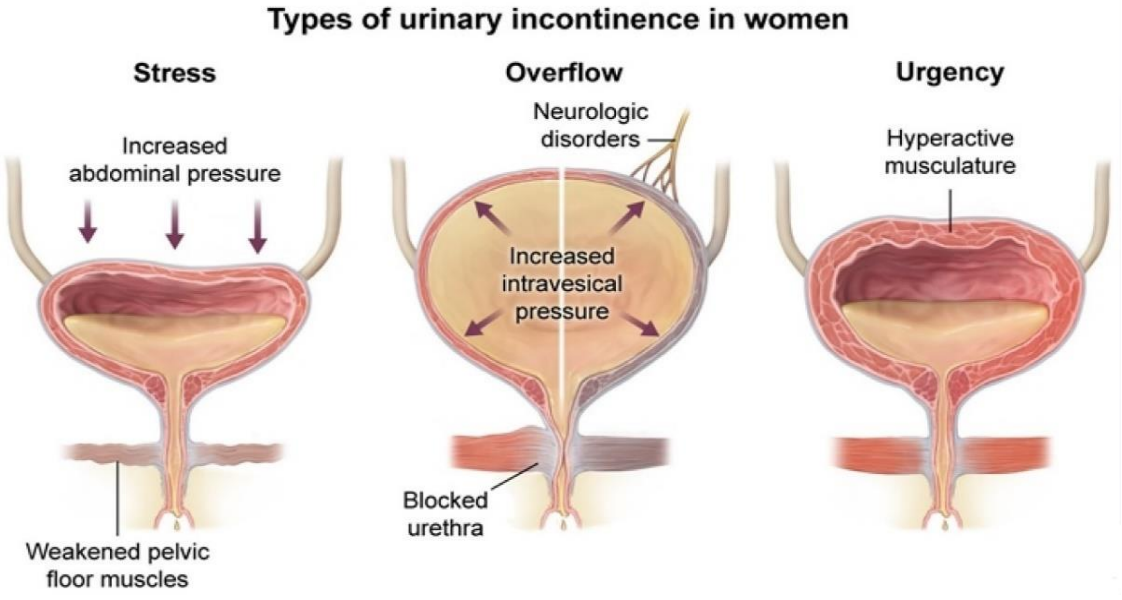


Cystometric Volume Measurements

Post-void residual	<100 mL
Sensation of fullness	200–225 mL
Urge to void	400–500 mL

- Classification of Incontinence:





1. Stress Incontinence:

- This is the most common incontinence in young women.

- Etiology:

- The pelvic floor (levator ani) muscles form a U-shaped sling around the pelvic viscera and hold the bladder and urethra in the appropriate anatomic position.

- Injury to the pelvic floor muscles can result in urethral hypermobility and urethral prolapse out of the pelvis.

- Stress incontinence typically results from pelvic floor weakness, often in association with obesity, multiparity, and pelvic surgery → weakens urethral support, resulting in urethral hypermobility.

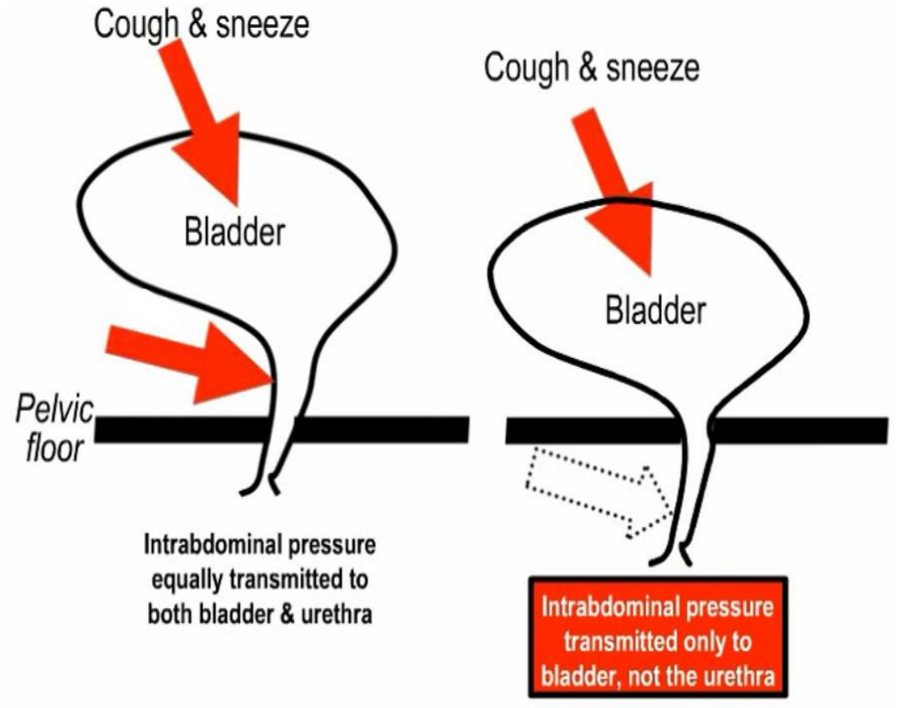
- Stress incontinence can be a presenting symptom of leiomyoma (fibroids) due to direct pressure on the bladder from an irregularly enlarged uterus.

- Rises in bladder pressure because of intraabdominal pressure increases (coughing and sneezing) are not transmitted to the proximal urethra because it is no longer a pelvic structure owing to loss of support from pelvic relaxation.

- History:

- Loss of urine occurs in small spurts simultaneously with coughing or sneezing.

- It does not take place when the patient is sleeping.

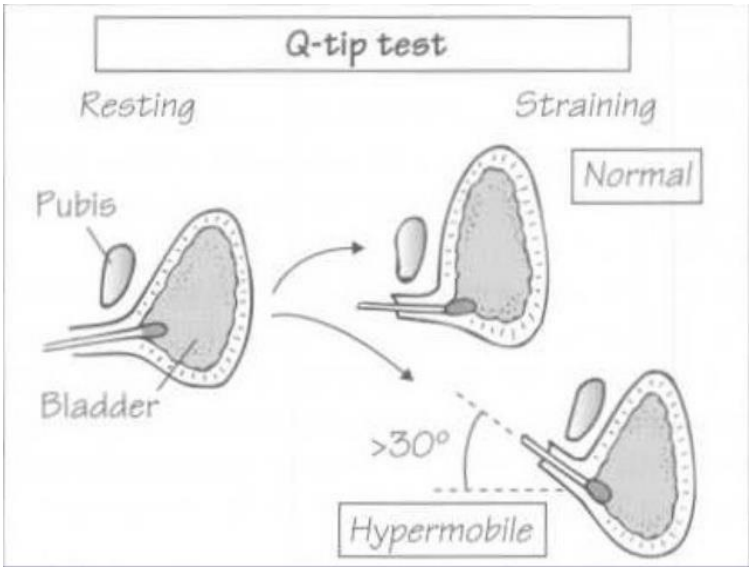


- Examination:

- Pelvic examination may reveal a cystocele.

- Neurologic examination is normal.

- The Q-tip test is positive when a lubricated cotton-tip applicator is placed in the urethra and the patient increases intraabdominal pressure, the Q-tip will rotate >30 degrees.



- Investigative studies:

- Urinalysis and culture are normal.

- Cystometric studies are normal.

- Management:

- Medical therapy includes Kegel exercises and estrogen replacement in postmenopausal women.

- Kegel exercises should be advised in all patients with stress incontinence to improve pelvic floor strength.

- The most beneficial long-term treatment is urethral sling surgery, which has high cure rates.

- A vaginal pessary may also be a useful noninvasive therapy to provide urethral support in patients with urethral hypermobility, but it is generally reserved for those who are poor surgical candidates.

2. Urge (Hypertonic) Incontinence:

- This is the most common incontinence in older women.

- Etiology: Involuntary rise in bladder pressure occur from idiopathic detrusor contractions that cannot be voluntarily suppressed.

- History:

- The most common symptom is urgency.

- Loss of urine occurs in large amounts often without warning.

- This can take place both day and night.

- Examination:

- Pelvic examination shows normal anatomy.

- Neurologic examination is normal.

- Investigative studies:

- Urinalysis and culture are normal.

- Cystometric studies show normal residual volume, but involuntary detrusor contractions are present even with small volumes of urine in the bladder.

- Management:

- First-line treatments for urgency incontinence are bladder training and pelvic floor muscle exercises. Nonresponders can use an antimuscarinic agent (oxybutynin) to decrease detrusor activity.

3. Overflow (Hypotonic) Incontinence:

- Etiology:

- Rises in bladder pressure occur gradually from an overdistended, hypotonic bladder.

- When the bladder pressure exceeds the urethral pressure, involuntary urine loss occurs but only until the bladder pressure equals urethral pressure.

- The bladder never empties. Then the process begins all over.

- This may be caused by denervated bladder (diabetic neuropathy, multiple sclerosis) or systemic medications (epidural anesthesia, anticholinergics).

- Epidural anesthesia and perineal edema are risk factors for postpartum urinary retention and overflow incontinence. Urethral catheterization is indicated for diagnosis and treatment.

- History:
- Loss of urine occurs intermittently in small amounts.
- This can take place both day and night.
- The patient may complain of pelvic fullness.

- Examination:
- Pelvic examination may show normal anatomy; however, the neurologic examination will show decreased pudendal nerve sensation.

- Investigative studies:
- Urinalysis and culture are usually normal.
- Cystometric studies show markedly increased residual volume.

- Management:
- Intermittent self-catheterization may be necessary.
- Discontinue the offending systemic medications.
- Cholinergic medications to stimulate bladder contractions and α-adrenergic blocker to relax the bladder neck.

4. Fistula:

- Fistulas may result from occult bladder injury during pelvic surgery or from tissue ischemia due to excessive surgical dissection or radiotherapy for cancer.

- Etiology: The normal urethral-bladder mechanism is intact but is bypassed by urine leaking out through a fistula from the urinary tract.

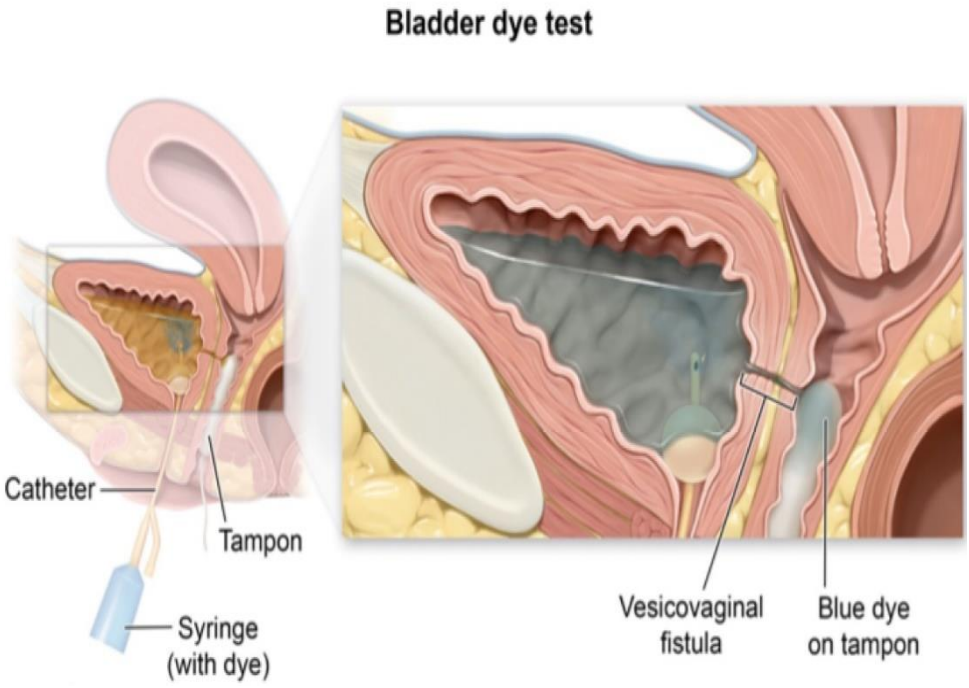
- History:
- The patient usually has a history of radical pelvic surgery or pelvic radiation therapy.
- Loss of urine occurs continually in small amounts.
- This can take place both day and night.

- Examination: Pelvic examination may show normal anatomy and normal neurologic findings.

- Investigative studies:
- Urinalysis and culture are normal.

- Dye tests and/or cystourethroscopy may be performed to identify a small fistula that is difficult to detect on visual inspection.

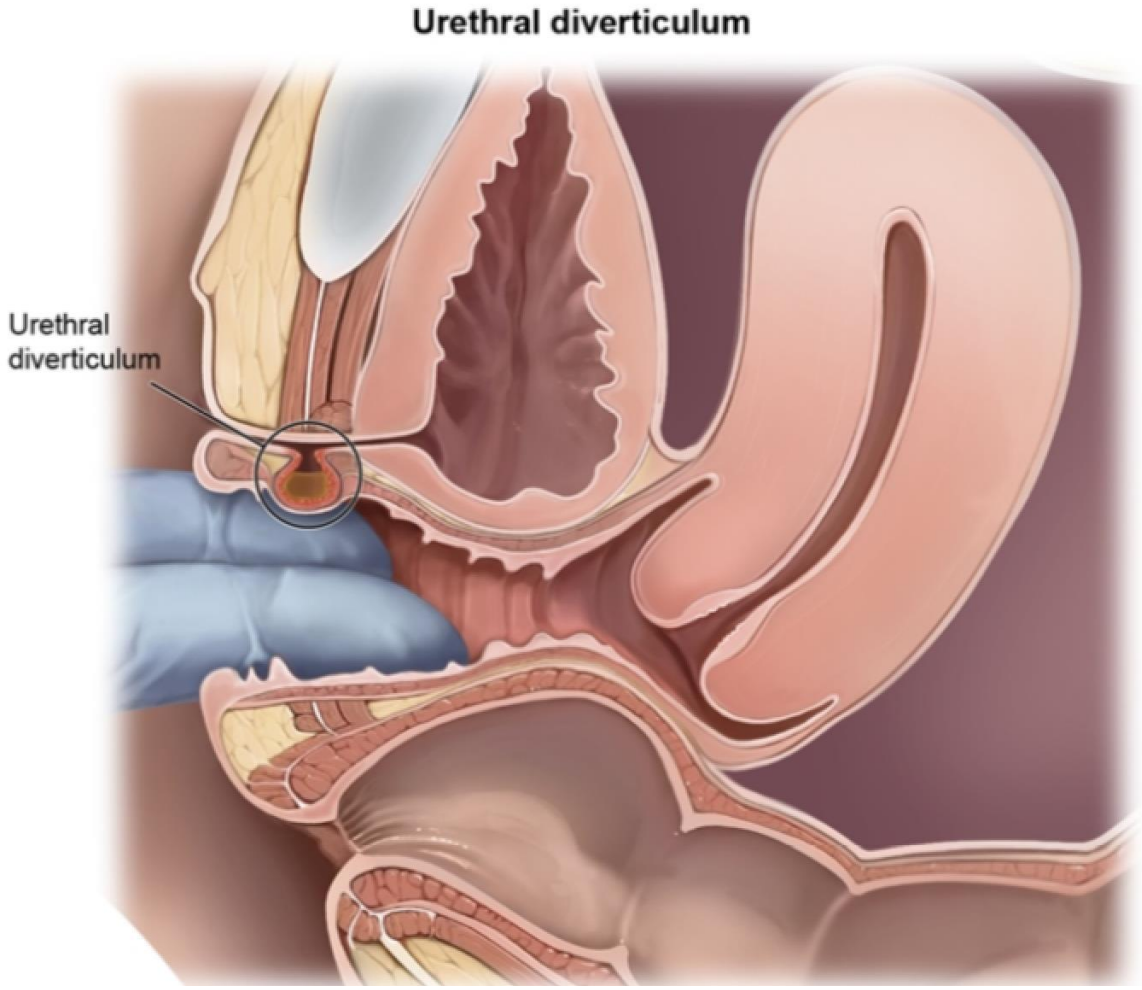
- Management: Surgical repair of the fistula.



Urinary incontinence		
Type	**Symptoms**	**Treatment**
Stress	Leakage with Valsalva (coughing, sneezing, laughing)	• Lifestyle modifications • Pelvic floor exercises • Pessary • Pelvic floor surgery
Urgency	Sudden, overwhelming, or frequent need to void	• Lifestyle modifications • Bladder training • Antimuscarinic drugs
Mixed	Features of stress & urgency incontinence	• Variable treatment depending on predominant symptoms
Overflow	Constant, involuntary dribbling & incomplete emptying	• Identify & correct underlying cause • Cholinergic agonists • Intermittent self-catheterization

❖ N.B:

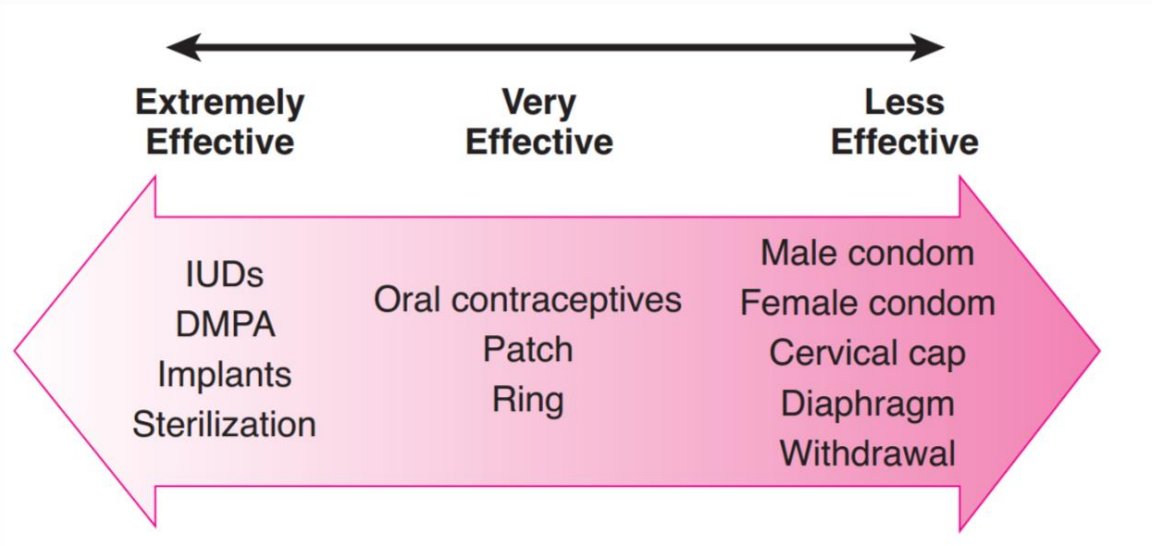
- Urethral diverticulum is an abnormal localized urethral mucosa due to recurrent periurethral gland infection along the anterior vaginal wall.
- The recurrent infection and inflammation of the urethral tissue creates the abnormal outpouching that can collect and store urine, resulting in postvoid dribbling and recurrent lower urinary tract infections (dysuria).
- Infection of the urethral diverticulum can also result in tenderness, often presenting as dyspareunia or a tender anterior vaginal wall mass with an associated expressed purulent or bloody urethral discharge.
- Diagnosis is confirmed with a pelvic MRI, and treatment is via surgical excision of the diverticulum.

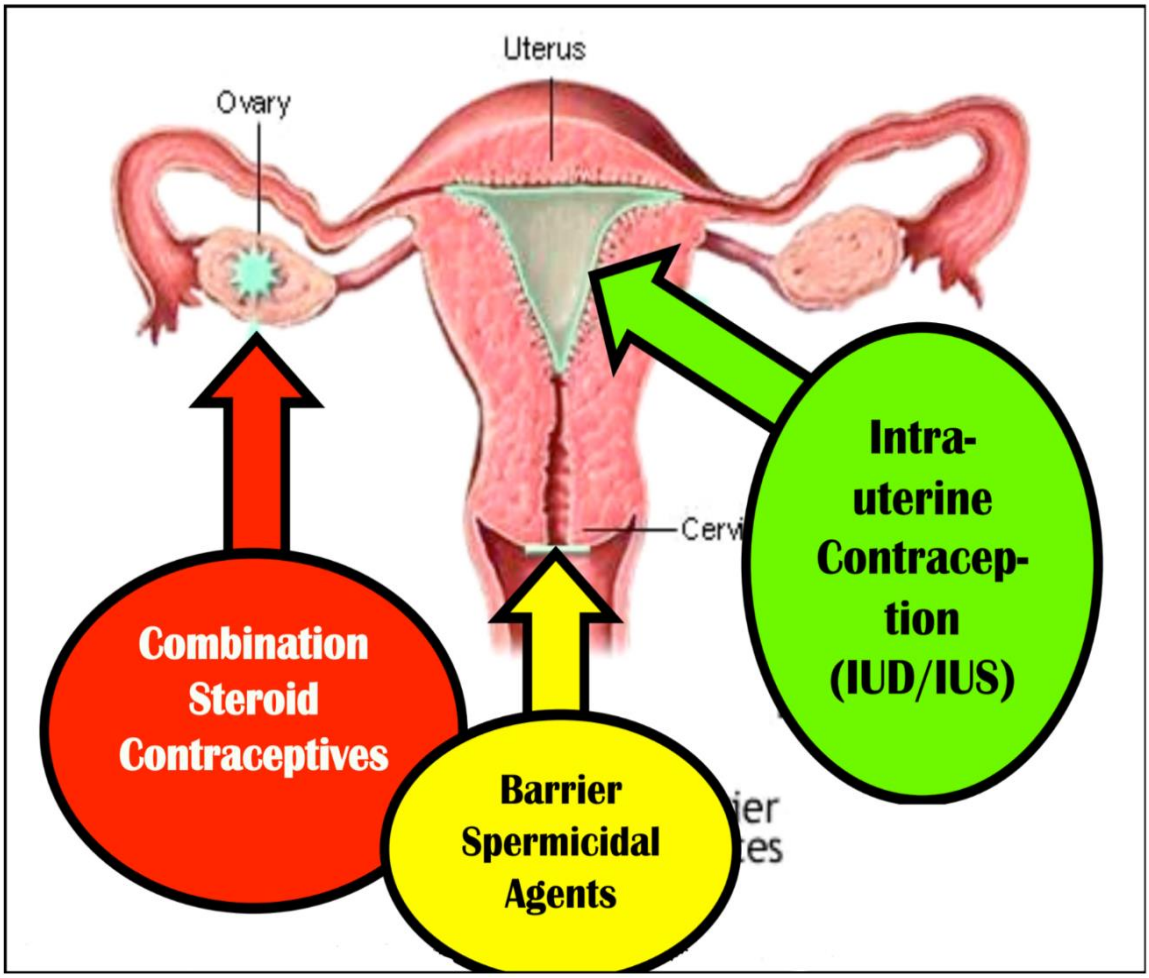


CHAPTER 15

Fertility Control

Fertility Control

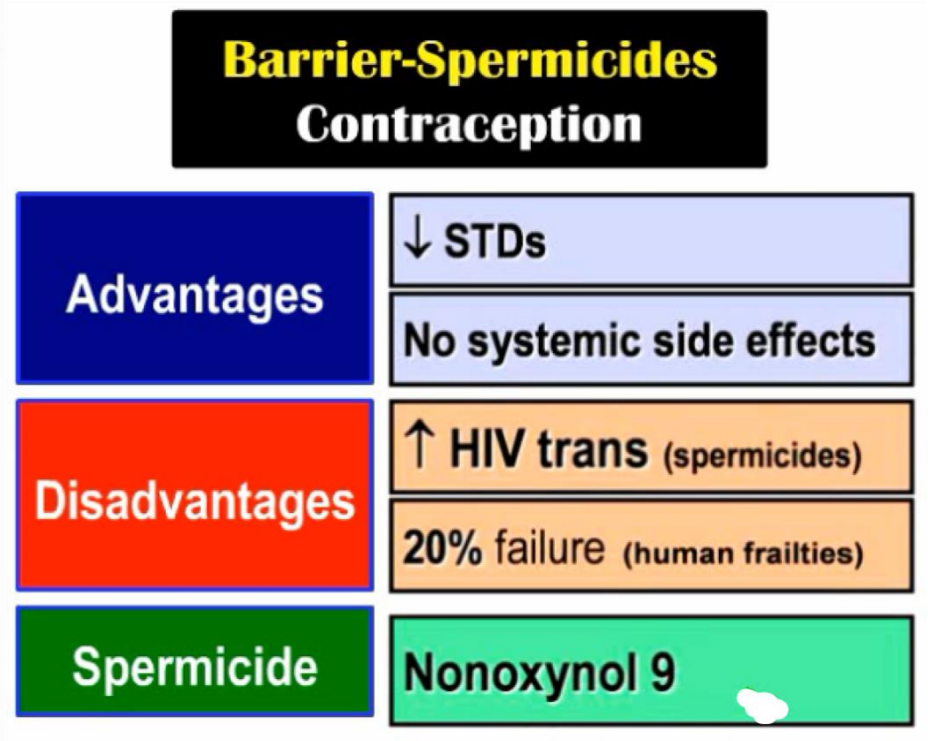


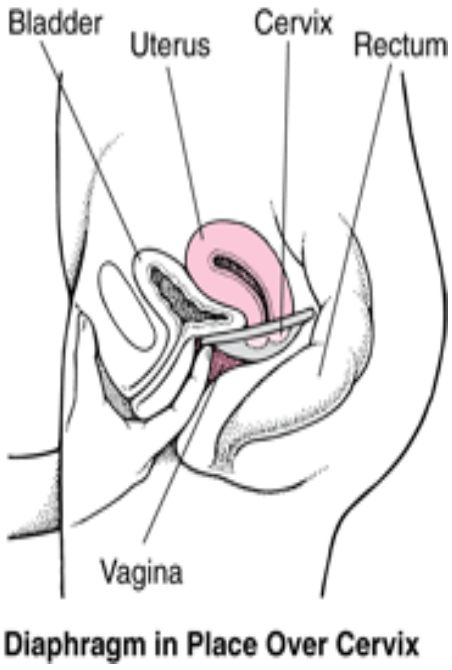


Barrier spermicidal methods

- Mechanisms of Action:

- These are locally active devices preventing entry of sperm in through the cervix, thus preventing pregnancy.





- Specific Types:

A. Condoms:

- They are the most common barrier contraceptive method used.
- These are penile sheaths that must be placed on the erect penis.
- No individual fitting is required.

B. Vaginal diaphragm:

- This is a dome-shaped device placed in the anterior and posterior vaginal fornices holding spermicidal jelly against the cervix.
- It can be placed an hour before intercourse.
- Individual fitting is required.
- If too large a size is used, it can result in urinary retention.

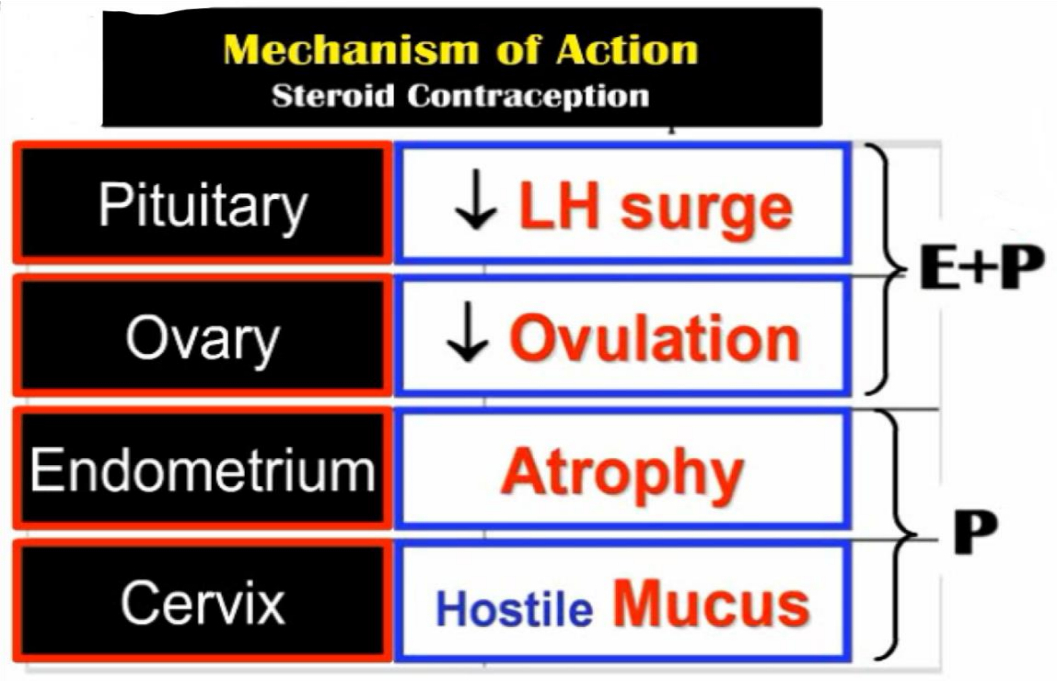
C. Spermicides:

- The active ingredient is nonoxynol-9, a surface-active agent that disrupts cell membranes, thus the possible side effect of genital membrane irritation.
- These can take the form of jellies or foams placed into the vagina.

Steroid contraception

- Mechanisms of Action:

- These include inhibition of the midcycle luteinizing hormone (LH) surge, thus preventing ovulation; alteration of cervical mucus making it thick and viscid, thus retarding sperm penetration; and alteration of endometrium inhibiting blastocyst implantation.



- Estrogen-Mediated Metabolic Effects:

- Increase in hepatic protein production (coagulation factors, carrier proteins, angiotensinogen).

- Fluid retention from decreased sodium excretion.

- Accelerated development of cholelithiasis by promoting hepatic secretion of biliary cholesterol that induces an increase in cholesterol saturation of bile.

- Healthy lipid profile changes (increase in high-density lipoproteins [HDL], Decrease in low-density lipoproteins [LDL]).

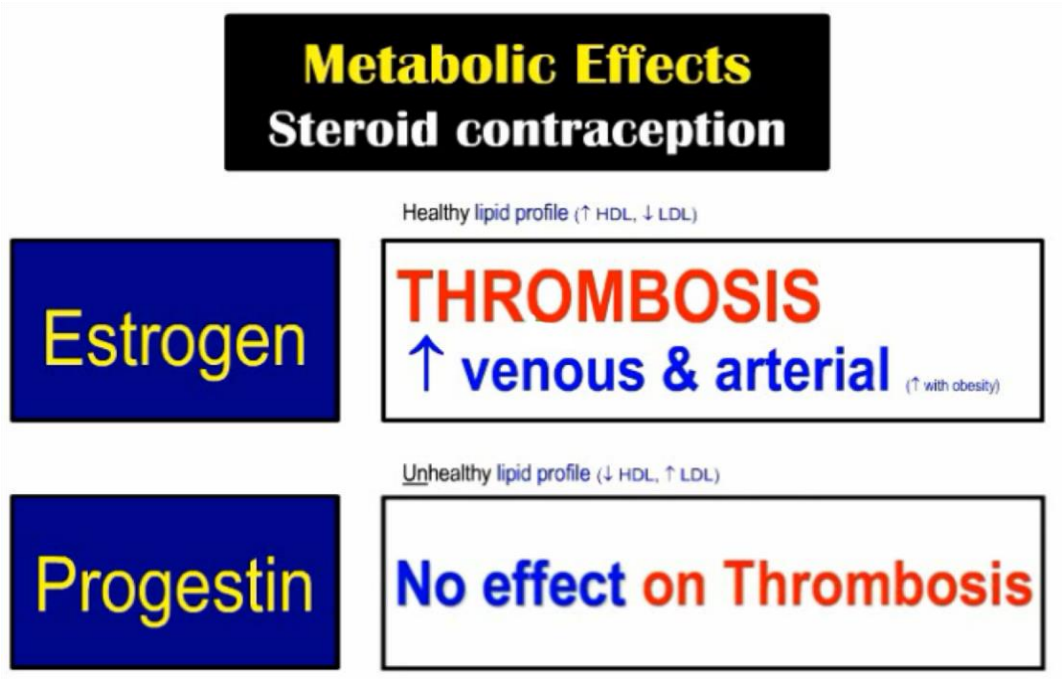
- Increased venous and arterial thrombosis.

- Progestin-Mediated Metabolic Effects:

- These include mood changes and depression from decreased serotonin levels.

- Unhealthy lipid profile changes (decreased HDL, increased LDL).

- Although weight gain as a side effect is a common perception, several studies have shown no significant weight gain, particularly with low-dose formulations.



- Contraindications:

- Pregnancy.

- Acute liver disease (Build up due to decrease of metabolism).

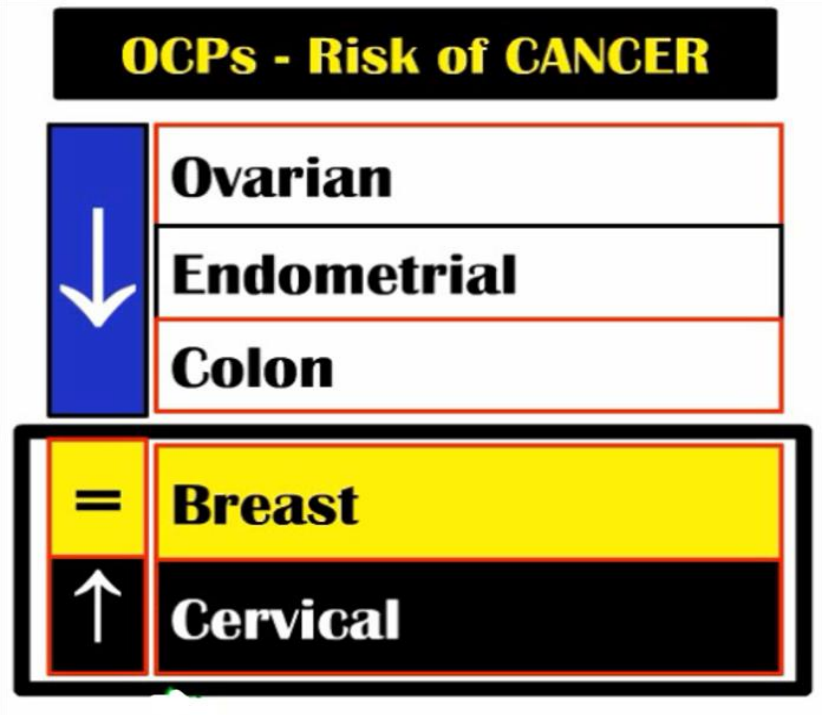
- History of vascular disease (thromboembolism, deep venous thrombosis [DVT], cerebrovascular accident [CVA], systemic lupus erythematosus [SLE]).

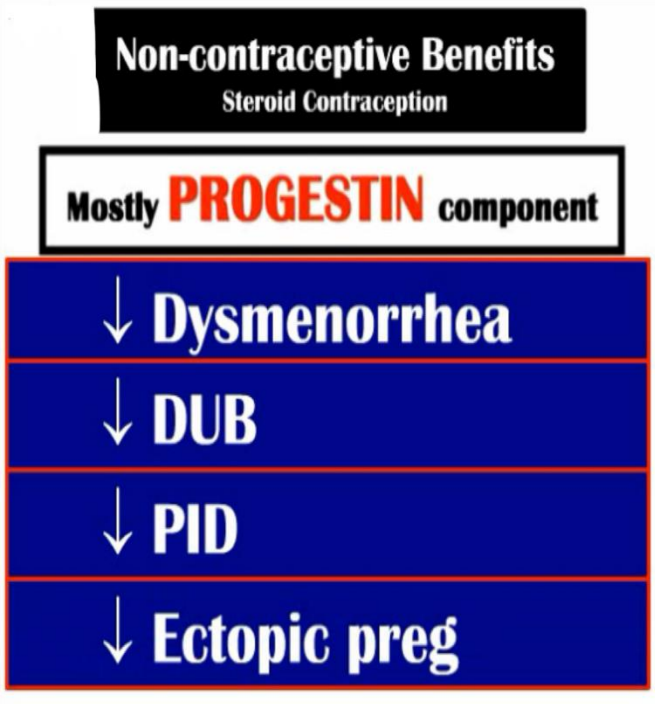
- Hormonally dependent cancer (breast). All hormone-containing contraception is absolutely contraindicated in patients with breast cancer. A copper intrauterine device is a safe, effective, hormone-free, long-term method of contraception.

- Smoker ≥35; uncontrolled hypertension; migraines with aura; diabetes mellitus with vascular disease; and known thrombophilia.

- Noncontraceptive Benefits:

- These include decreased ovarian and endometrial cancer; decreased dysmenorrhea and dysfunctional uterine bleeding; and decreased PID and ectopic pregnancy.





- Combination Modalities:

A. Combination OCPs:

- These contain both an estrogen and a progestin.

- They are administered most commonly in one of two ways:
  - Daily with 21 days on and 7 days off.
  - Daily 24 days on and 4 days off.

- When "off" the hormones, withdrawal bleeding will occur.

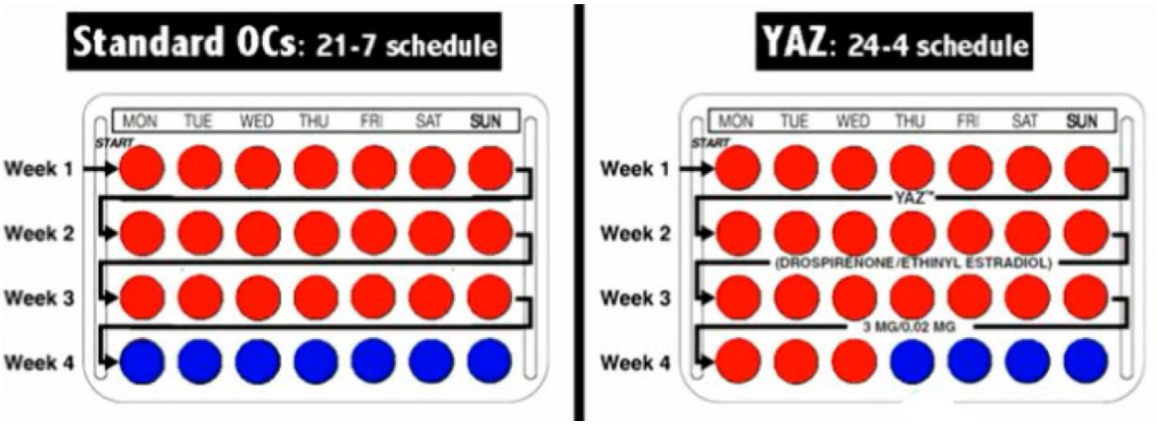
- Of all steroid contraceptives, they are the only one to have regular, predictable menses.

B. Oral Contraceptives:

- A unique combination of OCP (YAZ) reduces severe PMDD symptoms by 50%.

- It contains ethynyl estradiol and a new progestin, drospirenone.

- The dosing is 24 days of active pills then 4 days of placebo, rather than the traditional 21 days, followed by 7 days of placebo.



C. Combination Vaginal Ring:

- Marketed under the trade name of NuvaRing, this device, inserted into the vagina, contains both an estrogen and a progestin.

- It is removed after 3 weeks for 1 week to allow for a withdrawal bleed.

- A major advantage is relatively stable and constant blood levels of hormones.

D. Transdermal Skin Patch:

- Marketed under the trade name of OrthoEvra, this patch contains both an estrogen and a progestin.
- A patch is replaced every week for 3 weeks then removed for 1 week to allow for a withdrawal bleed.
- Levels of steroids are 60% higher than combination OCPs.

▪ Progestin-Only Modalities:

A. Progestin-Only OCPs:

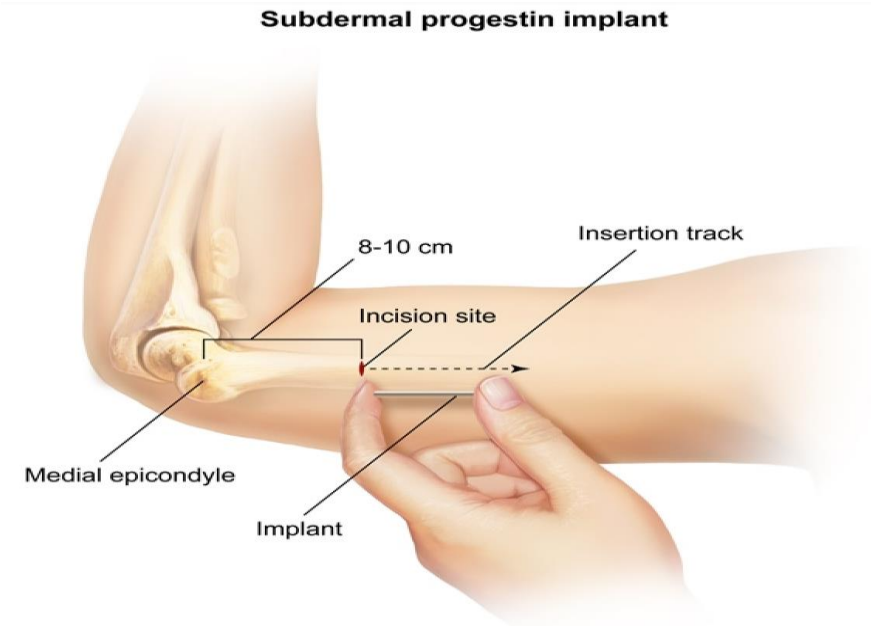
- They contain only progestins and are sometimes called the "minipill".
- They need to be taken daily and continuously.
- A frequent side effect is break-through bleeding.

B. Progestin-Only Injectable:

- Marketed under the trade name of Depo-Provera, this is an IM injection of depo-medroxyprogesterone acetate (DMPA).
- Depot medroxyprogesterone acetate (DMPA) is administered intramuscularly every 3 months to prevent pregnancy by inhibiting the release of gonadotropin-releasing hormone from the hypothalamus and suppressing ovulation.
- A frequent side effect is break-through bleeding.
- Other side effects are prolonged time for fertility return and decreased bone mineral density.

C. Progestin-Only Subcutaneous Implant:

- Marketed under the trade name of Nexplanon, this uses etonogestrel as the active ingredient.
- The core contains a small amount of barium, making it visible on x-ray.
- The continuous release continues for 3 years.
- A frequent side effect is break-through bleeding.



D. "Morning-After" Pill:

- Marketed under the trade name of "Plan B" it uses levonorgestrel tablets.

- This postcoital contraception is administered as one tablet, immediately followed by one additional tablet in 12 h.

Intrauterine contraception

- Intrauterine contraception is a long-acting reversible contraceptive method that involves placement of a small T-shaped object inside the uterus.

- Mechanisms of Action:

- These include inhibition of sperm transport; increased tubal motility causing failure of implantation of immature zygote; inhibition of implantation secondary to endometrial inflammation; phagocytic destruction of sperm and blastocyst; and alteration of cervical mucus (only progesterone IUSs).

- Types of IUD available in the United States:

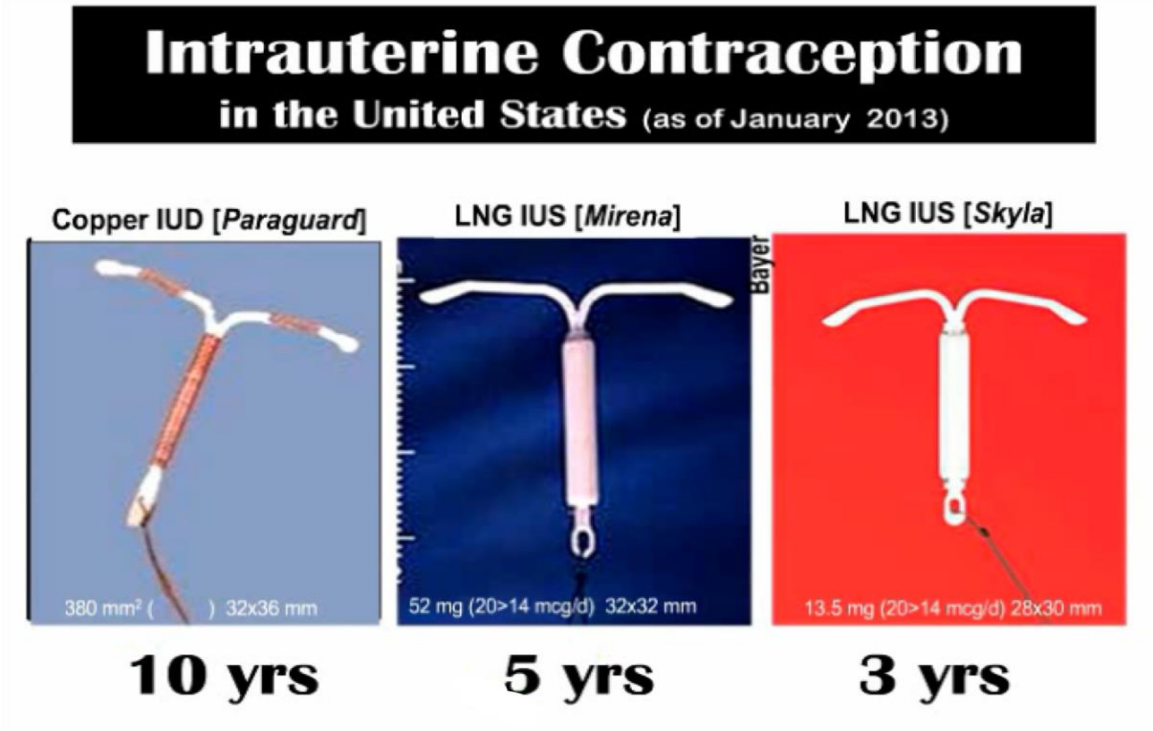
A. Copper IUD:

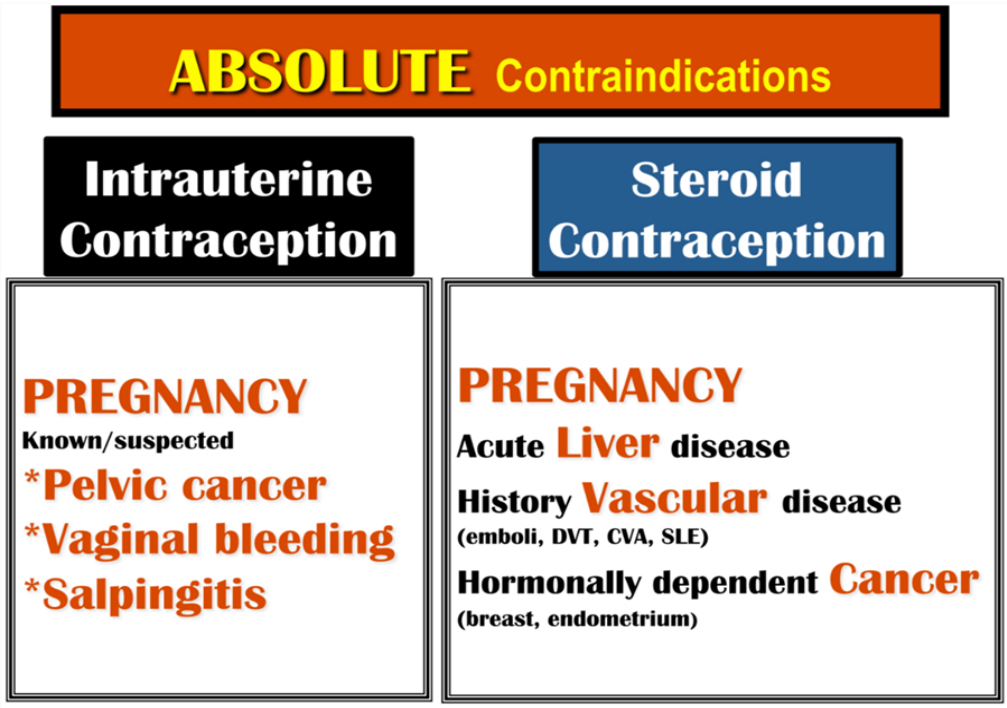
- "Paragard" contains copper, approved for 10 years.

B. Levonorgestrel (LNg) IUDs:

- "Mirena" contains LNg, approved for 5 years.

- ""Skyla" contains LNg, approved for 3 years.





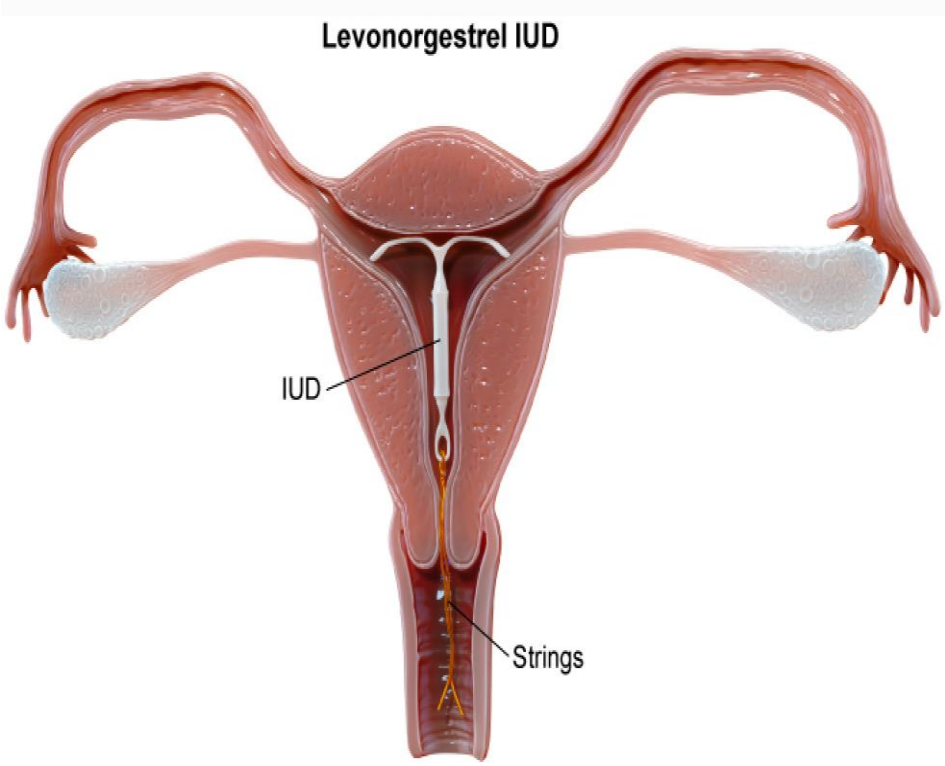
❖ N.B:

1. Unexplained, abnormal vaginal bleeding is a contraindication to intrauterine device insertion because it may indicate an underlying condition (endometrial cancer, sexually transmitted infection).

- Patients with unexplained vaginal bleeding require further evaluation (endometrial biopsy).

2. The levonorgestrel-containing intrauterine device (IUD) is a long-acting, reversible contraceptive that prevents pregnancy by releasing levonorgestrel (a progestin), which creates a physical barrier by thickening cervical mucus and impairing implantation through decidualization of the endometrium.

- A common side effect is amenorrhea which can be used to improve anemia and abnormal uterine bleeding.
- A small percentage of women experience systemic side effects (mood changes, breast tenderness, headaches). Weight gain is not a side effect.



3. "Emergency" (or postcoital) contraception refers to medications or devices used after intercourse to prevent pregnancy by delaying ovulation or impairing implantation.

- They are not effective after implantation (when pregnancy has started).
- Oral levonorgestrel (also known as Plan B) is the most readily available emergency contraception that prevents pregnancy by delaying ovulation. Because the efficacy of oral levonorgestrel decreases over the course of 72 hours, it should be administered as soon as possible to patients seeking emergency contraception after unprotected intercourse.
- Another oral emergency contraception option is ulipristal, an antiprogestin that delays follicular rupture, inhibits ovulation and impairs implantation. It is more effective than levonorgestrel and can be taken up to 5 days after unprotected intercourse. However, ulipristal is more difficult to obtain in some medical settings.
- The most effective emergency contraception is the copper intrauterine device, which works by creating an inflammatory response that is toxic to sperm and ova thereby preventing fertilization.It may be inserted up to 5 days following unprotected intercourse. Age and parity are not contraindications: therefore, it may be used in nulligravid adolescents. However, acute cervicitis and pelvic inflammatory disease are contraindications.

Emergency contraception			
Method	**Timing after intercourse**	**Efficacy**	**Contraindications**
Copper-containing intrauterine device	0-120 hr	≥99%	• Acute pelvic infection • Severe uterine cavity distortion • Wilson disease • Complicated organ transplant failure
Ulipristal	0-120 hr	98%-99%	• None
Levonorgestrel	0-72 hr	59%-94%	• None
Oral contraceptives*	0-72 hr	47%-89%	• None
*Combined estrogen/progestin oral contraceptives containing levonorgestrel or norgestrel.			

Natural family planning (periodic abstinence)

- This method is based on avoiding sexual intercourse around the time of predicted ovulation.
- It assumes the egg is fertilizable for 12 to 24 hours and sperm is capable of fertilizing the egg for 24 to 48 hours.
- Requires high degree of discipline from both sexual partners.
- Prediction or identification of ovulation may be inferred from: menstrual records, basal body temperature charting (temperature rise from thermogenic effect of progesterone), change in cervical mucus from thin and watery to thick and sticky (reflects the change from estrogen dominance preovulation to progesterone dominance postovulation).
- Disadvantages:

- Inaccurate prediction of ovulation.
- High failure rate because of human frailities and the passions of the moment.

Coitus interruptus

- In this practice, also known as withdrawal or pull-out method, the man withdraws his penis from the woman's vagina prior to orgasm and ejaculation.
- It is one of the oldest contraceptive methods described.
- Disadvantages:

- High failure rates.
- Semen can enter vagina and cervical mucus prior to ejaculation.

Vaginal douche

- With vaginal douche, plain water, vinegar and other products are used immediately after orgasm to theoretically flush semen out of the vagina.
- Disadvantages:

- High failure rates.
- Sperm can enter the cervical mucus within 90 seconds of ejaculation.

lactation

- With lactation, elevated prolactin levels with exclusive breast feeding inhibit pulsatile secretion of GnRH from the hypothalamus.

- Effectiveness is dependent on the frequency (at least every 4-6 hours day & night) and intensity (infant suckling rather than pumping) of milk removal.

- Disadvantages:

- High failure rate if not exclusively breast feeding.

- Reliable for only up to 6 months.

Sterilization

- Mechanisms of Action:

- These are surgical procedures usually involving ligation of either the female oviduct or male vas deferens.

- After the procedure is performed, there is nothing to forget and nothing to remember.

- They are to be considered permanent and irreversible.

A. Tubal Ligation:

- Destruction or removal of a segment of the oviduct is performed in an operating room through a transabdominal approach usually using a laparoscopy.

- This is the most common modality of pregnancy prevention in the United States.

- If the procedure fails and pregnancy results, an ectopic pregnancy should be ruled out.

B. Vasectomy:

- Destruction or removal of a segment of vas deferens is performed as an outpatient procedure using local anesthesia.

- A successful procedure can be confirmed by absence of sperm on a semen specimen obtained 12 ejaculations after the surgery.

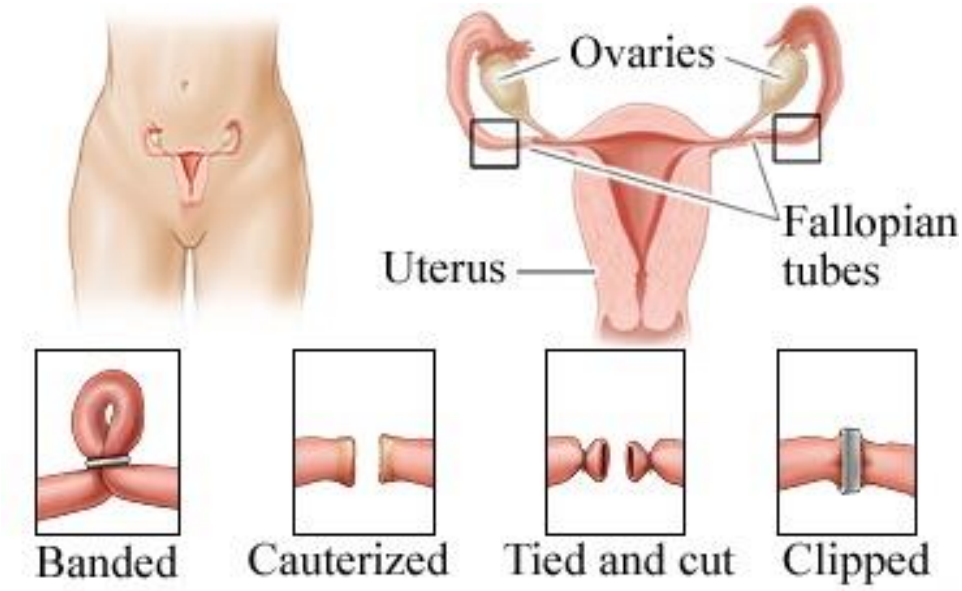
C. Hysteroscopic sterilization [Essure]:

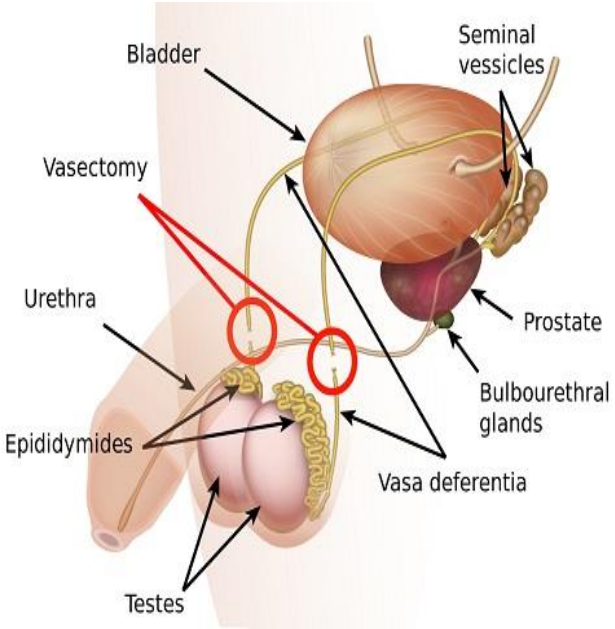
- This a permanently implanted device for female sterilization which requires no surgical incision.

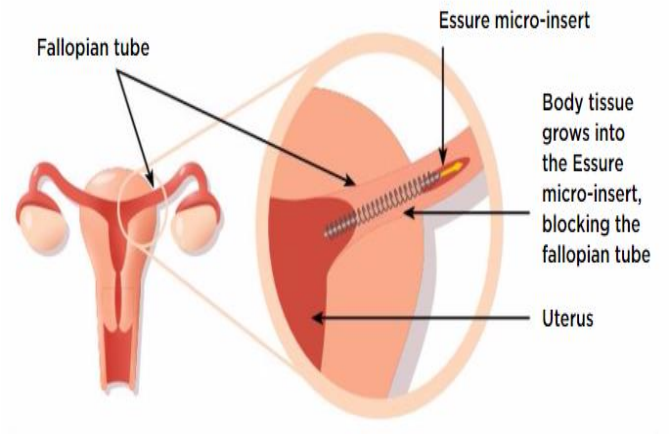
- In an office procedure, flexible coils are hysteroscopically placed through the vagina and uterus into the isthmic portion of the fallopian tubes.

- Over about 3 months, scar tissue forms around the inserts. The build-up of tissue creates a barrier that keeps sperm from reaching the eggs, thus preventing conception.

- A hysterosalpingogram is used to confirm tubal blockage.





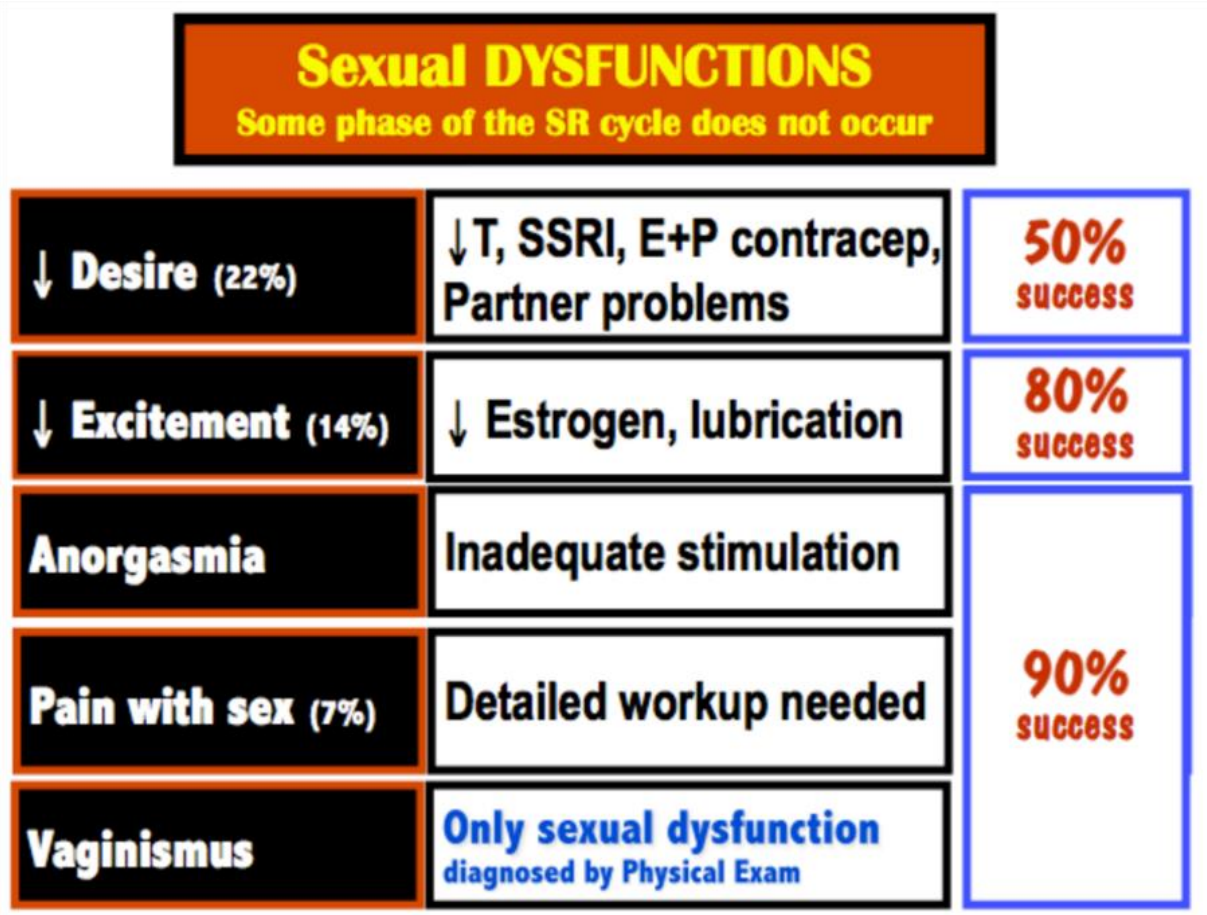


CHAPTER 16

Sexual dysfunction

Sexual dysfunction

- Each phase of the sexual response cycle can be dysfunctional.



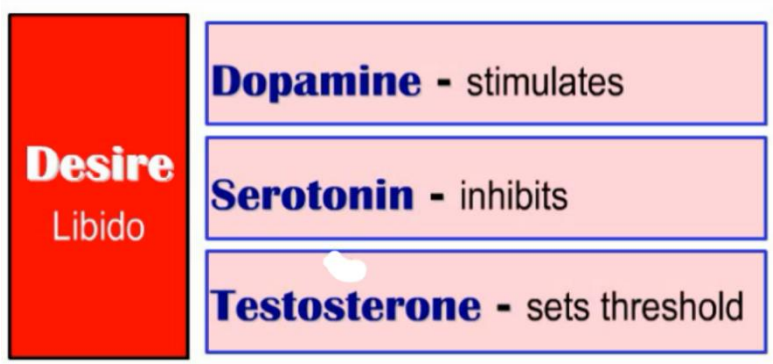
- <u>Desire disorders:</u>

- Decreased sexual desire is the most common female sexual complaint.

- It may be organic (low androgens), medication related (selective serotonin reuptake inhibitors [SSRIs]), or psychological (poor partner relationship).

- Diagnosis requires ruling out psychological, medical, and substance/medication-related issues that may affect sexuality (depression, diabetes, use of selective serotonin reuptake inhibitors [SSRIs], chronic alcohol abuse).

- Treatment can be difficult if it is relational in etiology.



- Excitement disorders:

- This usually results in difficulty in vaginal lubrication.

- The most common cause is estrogen deficiency.

- Female sexual interest/arousal disorder is a sexual dysfunction commonly seen in postmenopausal women.

- Treatment is highly successful.

- Anorgasmia:

- This can be primary or secondary.

- Inadequate clitoral stimulation is the most common cause.

- Treatment is highly successful using initially self-stimulation then partner education.

- Dyspareunia:

- Since pain with intercourse may arise from both psychological or physical causes, a thorough history and physical examination is essential.

- Treatment is directed at the specific cause found.

- Genito-pelvic pain/penetration disorder (Vaginismus):

- Genito-pelvic pain/penetration disorder, previously known as vaginismus, characterized by pain on and an aversion to attempted vaginal penetration.

- This occurs with painful reflex spasm of the paravaginal thigh adductor muscles.

- It is the only sexual dysfunction that can be diagnosed on physical examination.

- Treatment is highly successful using vaginal dilators.

CHAPTER 17

The Female Breast

The Female Breast

Benign breast disorders

A. Cystic Breast Mass:

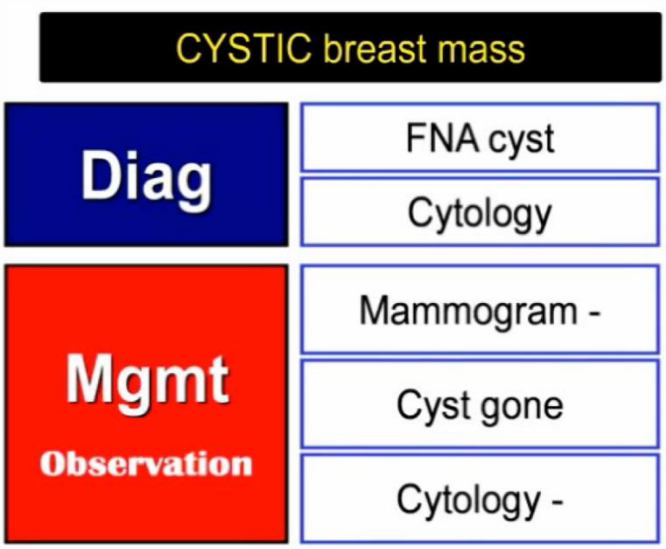
- Diagnosis:

- Cyst aspiration and fine-needle aspiration are important components in the preliminary diagnosis of breast disorders.

- Management:

- Preaspiration mammography should be obtained.

- If the cyst disappears and the cytology is benign, no further workup is required.



B. Fibrocystic Breast Changes:

- Fibrocystic breast changes are a common cause of cyclic breast pain in women of reproductive age.

- Classic clinical findings are diffusely nodular breasts with nonfocal tenderness and no nipple discharge or lymphadenopathy.

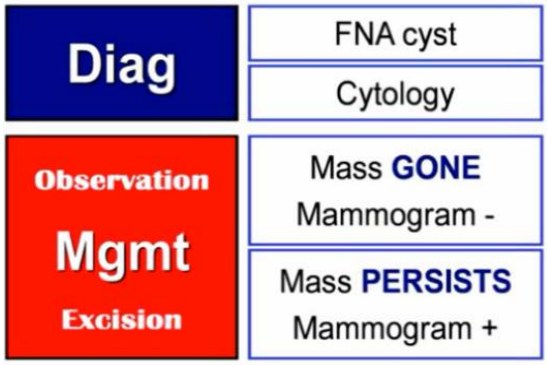
- The changes may develop from fluctuations in estrogen and progesterone during the menstrual cycle.

- Symptoms typically improve during or after menstruation.

- Patients can be offered nonsteroidal anti-inflammatory drugs and/or oral contraceptives (OCs) for symptomatic relief.

- Diagnosis:

- Fine-needle aspiration. The goal of cyst aspiration is complete drainage of the cyst with collapse of the cyst wall.



- Management:

A. Mass disappears:

- If the cyst fluid is clear, it may be discarded.

- If the cyst fluid is grossly bloody, it should be sent for cytologic examination to rule out the possibility of intra-cystic carcinoma.

B. Mass persists:

- A mass that persists requires further workup.

- Definitive evaluation of a persistent mass requires excisional biopsy.

C. Breast Fibroadenoma:

- Fibroadenomas are the most common breast tumors found in adolescence and young women.

- The mass is typically rubbery, mobile, and well-circumscribed, and is located in the outer quadrant of the right breast (breast mouse).

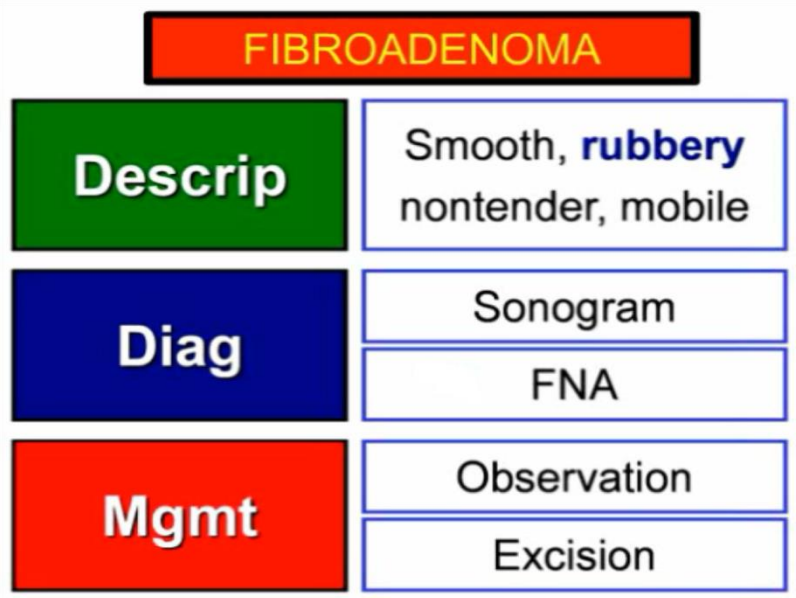
- Premenstrual tenderness is common as the pathogenesis of fibroadenoma is related to fluctuating estrogen and progesterone levels.

- The most distinctive gross feature of fibroadenomas that allows them to be distinguished from other breast lumps is their mobility.

- Diagnosis:

- Although cysts and fibroadenomas may be indistinguishable on palpation, ultrasound examination easily distinguishes cystic from solid lesions.

- On fine-needle aspiration, cysts typically collapse, whereas samples from a fibroadenoma present a characteristic combination of epithelial and stromal elements.



- Management:

- Because primary breast cancer is very rare in children and adolescents, a young woman with a suspected fibroadenoma can be reexamined over at least one menstrual cycle. If the mass decreases in size and/or tenderness after the menstrual period, the patient can be reassured that the probability of benign disease is very high.

- Patients who are not adolescents or who have a persistent mass should undergo ultrasonography. If results are consistent with a fibroadenoma, most adolescents do not require further workup. Excisional biopsy (surgical removal of the entire lesion) should be considered in older patients or those with very large masses.

Fibroadenoma	
Epidemiology	Age <30
Clinical features	• Single, unilateral, mobile, well-circumscribed mass • ↑ Pain &/or size prior to menses
Management	• Observation & reassurance (adolescent) • Ultrasound for a persistent mass or older patient

D. Mammography Microcalcifications:

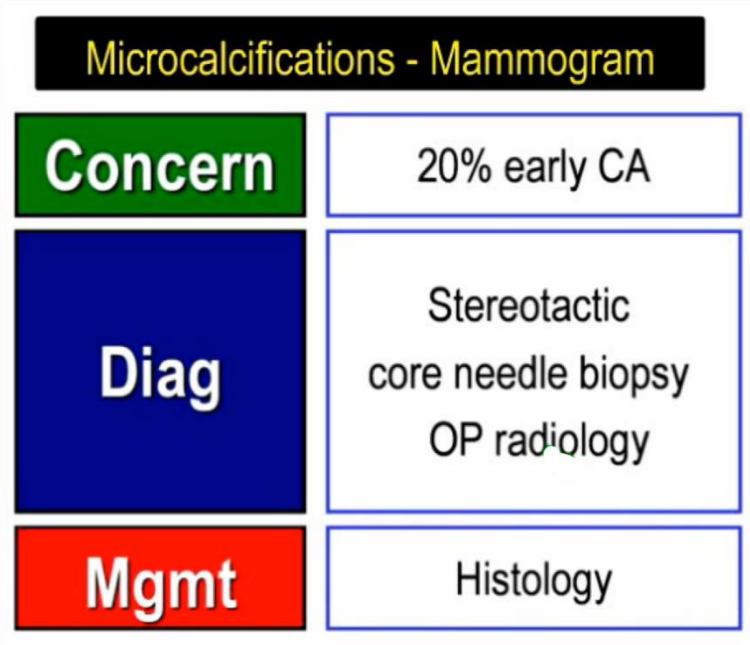
- Diagnosis:

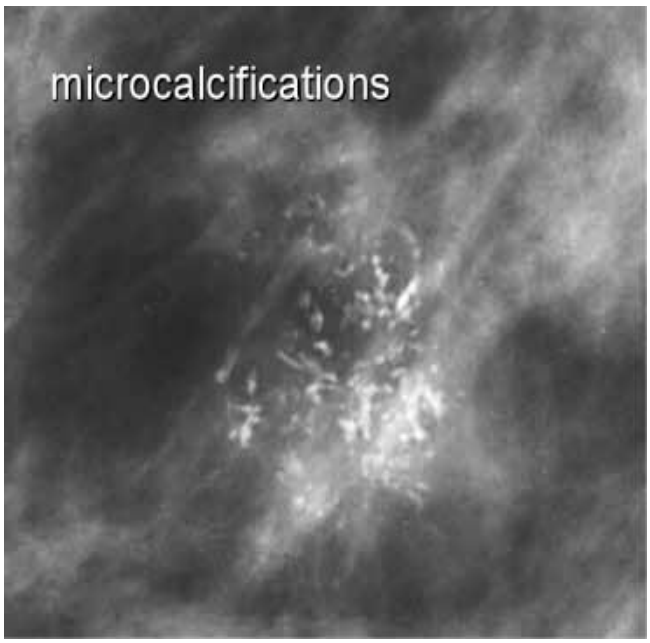
- A geographic cluster of microcalcifications is nonpalpable.

- Although most of these lesions are benign, approximately 15-20% represent early cancer.

- An occult lesion requires stereotactic needle localization and biopsy under mammographic guidance.

- Management: Treatment is based on the established histologic diagnosis.





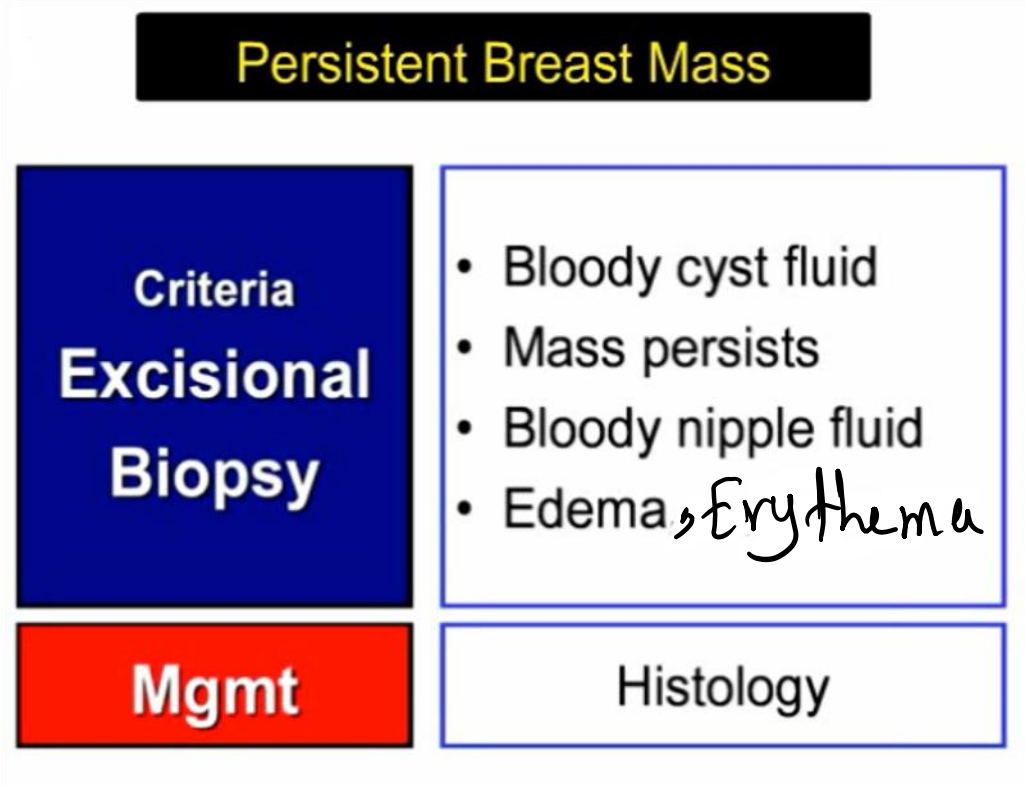
E. Persistent Breast Mass:

- Diagnosis:

- Excisional biopsy has the advantage of a complete evaluation of the size and histologic characteristics of the tumor before definitive therapy is selected.

- An excisional biopsy is usually recommended in the following circumstances:
  - Cellular bloody cyst fluid on aspiration.
  - Failure of a suspicious mass to disappear completely upon fluid aspiration.
  - Bloody nipple discharge, with or without a palpable mass.
  - Skin edema and erythema suggestive of inflammatory breast carcinoma, and a needle core biopsy cannot be performed.

- Management: Treatment is based on the established histologic diagnosis.



F. Bloody Nipple Discharge:

- Bloody discharge without a corresponding breast mass or nipple changes in the setting of normal mammography is the classic presentation of intraductal papilloma, a benign breast condition.

- The most common cause of unilateral bloody discharge without a coexisting breast mass is an intraductal papilloma.

- Typically, this benign condition is nonpalpable on clinical breast examination due to the small size of the papilloma Inside the duct.

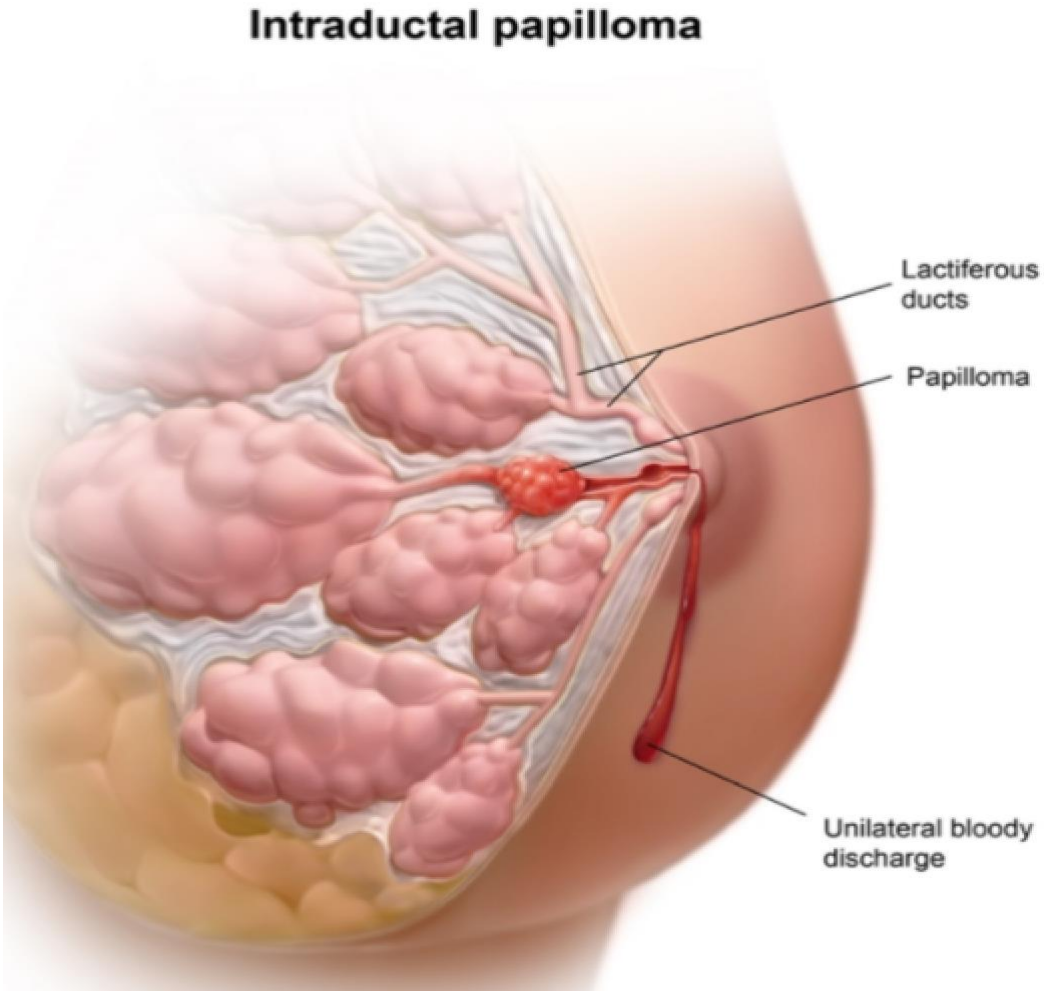
- Diagnosis:

- Diagnostic workup for pathologic (unilateral and/or bloody) nipple discharge should begin with mammography to rule out carcinoma even without the presence of a palpable breast mass.

- Ultrasound is also Indicated for evaluation of ductal pathology and may demonstrate a dilated duct due to the space-occupying papilloma.

- Management:

- The treatment is total excision of the duct and papilloma through a circumareolar incision.



Intraductal papilloma	
Clinical features	• Unilateral bloody nipple discharge • No associated mass or lymphadenopathy
Management	• Mammography & ultrasound • Biopsy, +/- excision

❖ N.B:

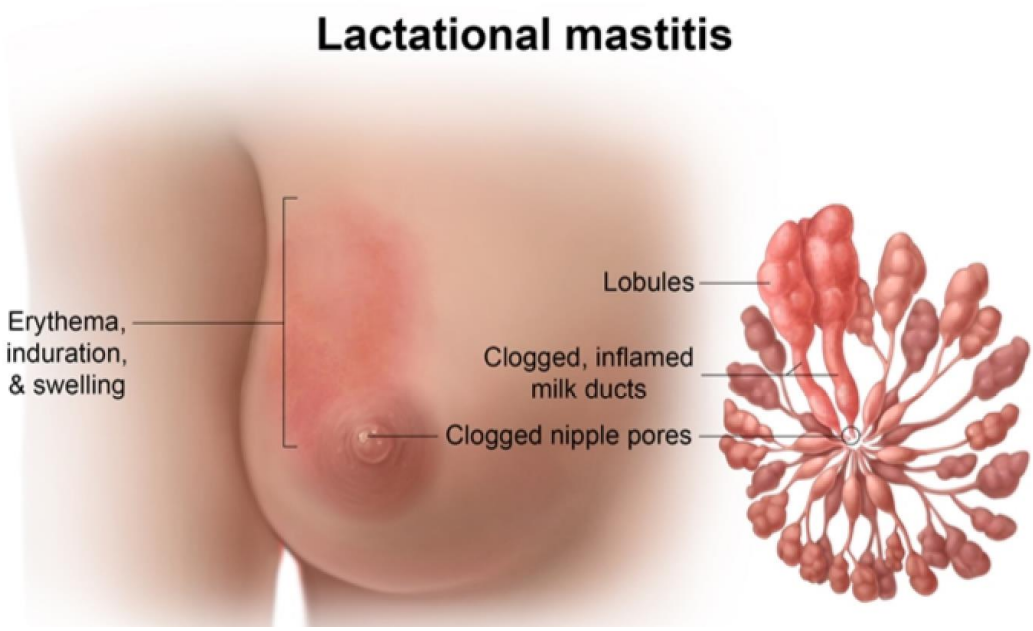
1. Fat necrosis can mimic breast cancer in its clinical and radiographic presentation because it commonly presents as a fixed mass with skin or nipple retraction and gives the appearance of calcifications on mammography.

- This benign condition is associated with breast surgery (breast reduction/reconstruction) and trauma (seatbelt injury).
- Biopsy is diagnostic and typically shows fat globules and foamy histiocytes.
- Despite benign biopsy results, the entire mass is often excised due to concerning findings of calcifications on mammography and a fixed irregular mass on clinical examination.
- No further workup is indicated for excised lesions.
- Once the diagnosis is confirmed with pathologic analysis, routine annual screening is sufficient as the risk of breast cancer is not increased.

Benign breast disease	
Diagnosis	**Clinical features**
Breast cyst	• Solitary, well-circumscribed, mobile mass • +/- Tenderness
Fibrocystic changes	• Multiple, diffuse nodulocystic masses • Cyclic premenstrual tenderness
Fibroadenoma	• Solitary, well-circumscribed, mobile mass • Cyclic premenstrual tenderness
Fat necrosis	• Post-trauma/surgery • Firm, irregular mass • +/- Ecchymosis, skin/nipple retraction

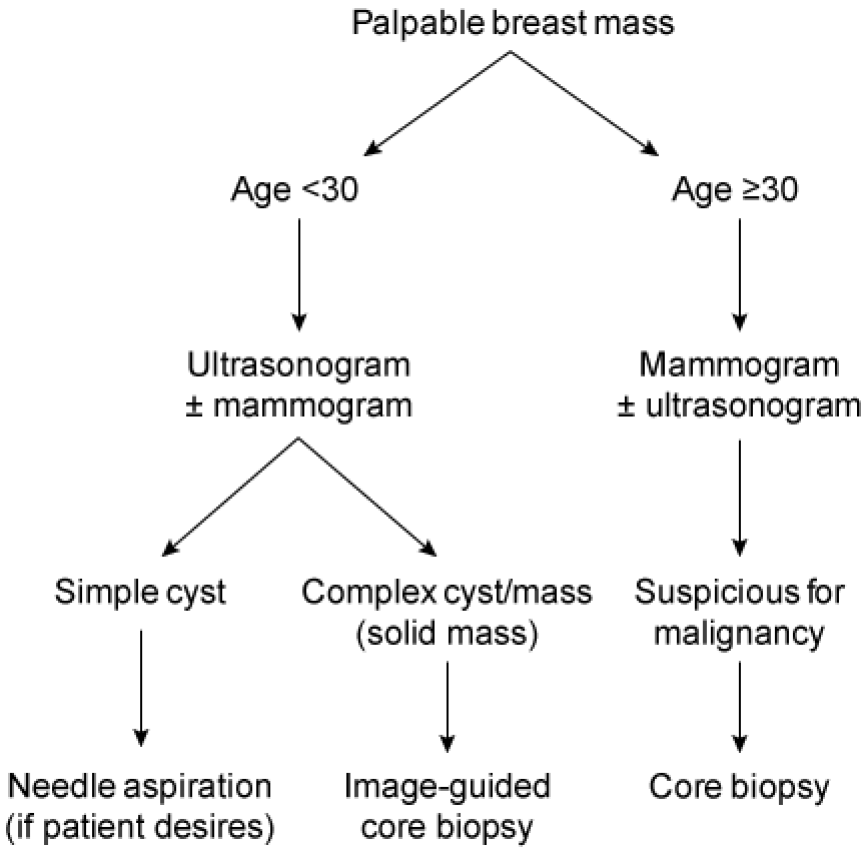
2. lactational mastitis is a common infection in breastfeeding women due to inadequate milk duct drainage from pumping breast milk (instead of directly breastfeeding) or poor latch.

- Additional risk factors include infrequent feedings, nipple excoriations, and rapid weaning from breastfeeding.
- Patients with lactational mastitis are diagnosed clinically and typically have flulike symptoms (feverr myalgias), focal unilateral breast pain with surrounding erythema and induration, and axillary lymphadenopathy.
- Lactational mastitis occurs when bacteria from the infant's nasopharynx or from the maternal skin are transmitted through the nipple and multiply in stagnant milk.
- The most common pathogen is Staphylococcus aureus, and treatment is empiric therapy against methicillin-sensitive S aureus with either dicloxacillin or cephalexin. In addition to antibiotics and analgesics (ibuprofen), patients should continue breastfeeding every 2-3 hours because direct feeding from the bilateral breasts drains the milk ducts.



3. A tender, mobile mass in a young patient is most likely benign.

- In a patient age <30 with a clinically benign mass, breast ultrasound is the first-line imaging study.
- The presentation of a simple breast cyst is variable, ranging from no symptoms to severe, localized pain.
- Symptomatic patients may benefit from aspiration, which should yield clear fluid and result in the disappearance of the mass and thereby confirm the diagnosis.
- As cystic fluid can reaccumulate, the patient should return in 2-4 months for a follow-up clinical breast examination.
- Mammography is the first-line imaging study for assessing a palpable breast mass in women age >30. Ultrasound may be added for better characterization of the mass. Tissue biopsy is required to confirm the diagnosis if suspicious for malignancy.


Palpable breast mass
Age <30
Age ≥30
Ultrasonogram
± mammogram
Mammogram
± ultrasonogram
Simple cyst
Complex cyst/mass
(solid mass)
Suspicious for
malignancy
Needle aspiration
(if patient desires)
Image-guided
core biopsy
Core biopsy

Breast cancer

- Presentation:

- Breast cancer is usually painless. Breast cancer is found in asymptomatic women on screening mammography or by the palpation of a mass by the patient or a physician.

- When breast cancer presents as a palpable mass, it is hard to the touch. It may also be associated with retraction of the nipple because ligaments in the breast will withdraw and pull the nipple inward.

- Diagnostic Tests:

- Biopsy is the best initial test. The different methods of biopsy are:

A. Fine needle aspiration (FNA):

- FNA is usually the best initial biopsy.

- The false positive rate is less than 2%. However, because FNA is a small sample, the disadvantages are a false negative rate of 10%.

- You cannot test for estrogen or progesterone receptors or HER2/neu on an FNA.

B. Core needle biopsy:

- This is a larger sample of the breast.

- It is more deforming, but you can test for estrogen receptors (ER), progesterone receptors (PR), and HER 2/neu.

- Difficulties include greater deformity with the procedure and the possibility that the needle will miss the lesion.

C. Open biopsy:

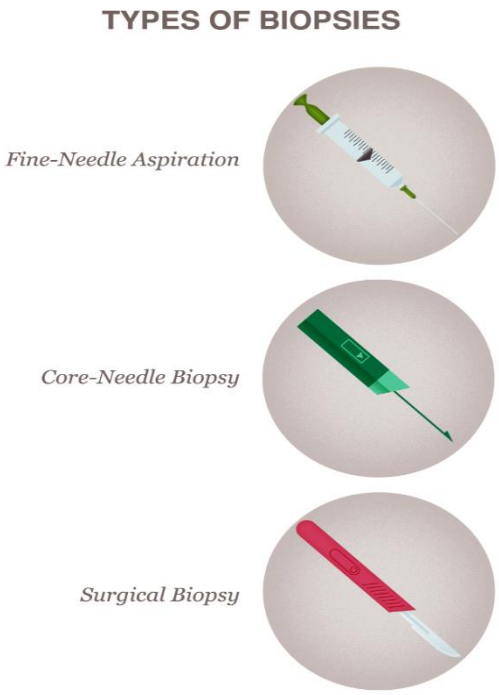
- The "most accurate diagnostic test".

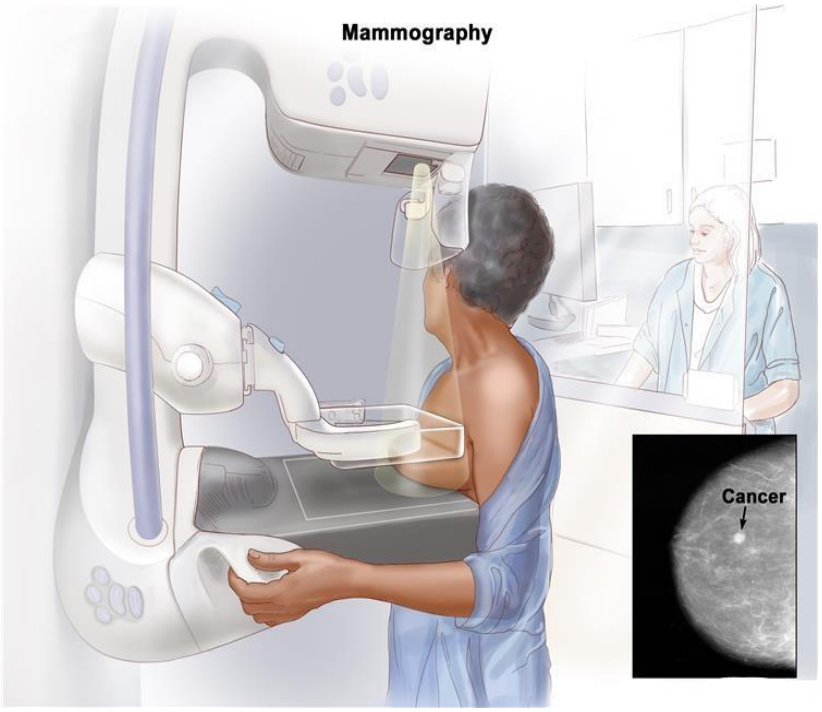
- Open biopsy allows for frozen section to be done while the patient is in the operating room followed by immediate resection of cancer followed by sentinel node biopsy.

- Mammography:

- Mammography is indicated to screen for breast cancer in the general population starting at the age of 50.

- If breast biopsy is going to be performed, what is the point in doing a screening test like mammography? The answer is: 5% to 10% of patients have bilateral disease. In addition, there is a huge difference in the management of the patient if there is a single lesion or multiple lesions within the same breast.





- <u>When Is Ultrasound the Answer?</u>

- Clinically indeterminant mass lesions. It tells cysts versus solid lesions.

- Answer ultrasound if the lesion:
  - Is painful.
  - Varies in size or pain with menstruation.

- <u>When Is PET Scan the Answer?</u>

- To determine the content of abnormal lymph nodes that are not easily accessible to biopsy. Cancer increases uptake on PET scan.

- <u>When Is BRCA Testing the Answer?</u>

- BRCA is definitely associated with an increased risk of breast cancer, particularly within families.

- BRCA is also associated with ovarian cancer and pancreatic cancer.

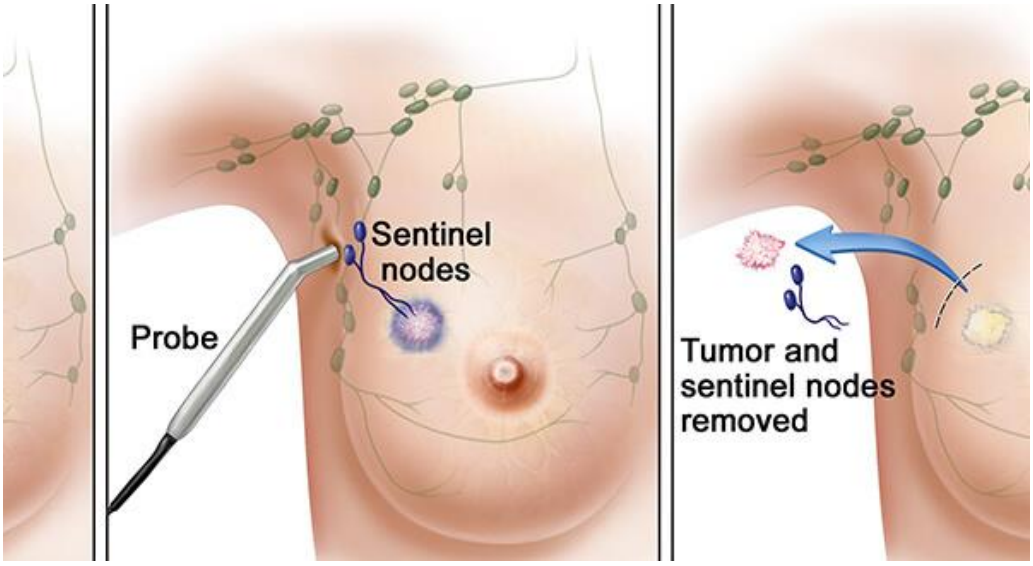
- <u>When Is Sentinel Lymph Node Biopsy the Answer?</u>

- The first node identified near the operative field of a definitively identified breast cancer is the sentinel node.

- Contrast or dye is placed into the operative field and the first node identified that it travels to is the sentinel node.

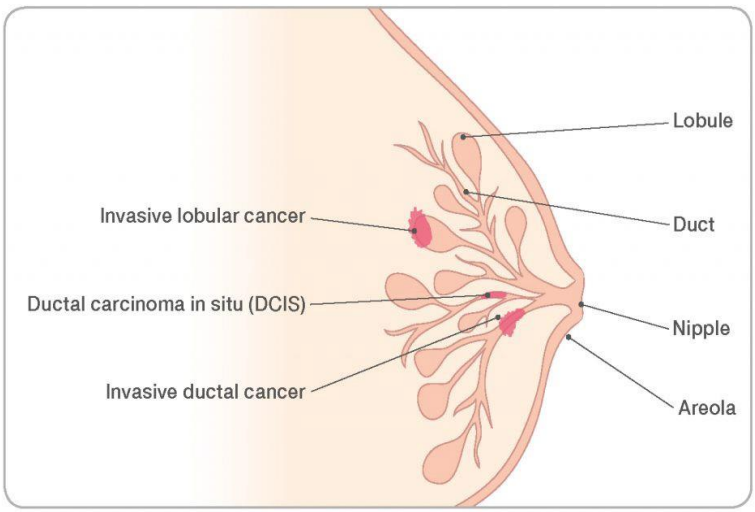
- Sentinel node biopsy is done routinely in all patients at the time of lumpectomy or mastectomy.

- A negative sentinel node eliminates the need for axillary lymph node dissection.



- <u>When Are Estrogen and Progesterone Receptors Tested?</u>
- Estrogen receptor (ER) and progesterone receptor (PR) testing is routine for all patients.
- Hormone manipulation therapy is done if either test is positive.

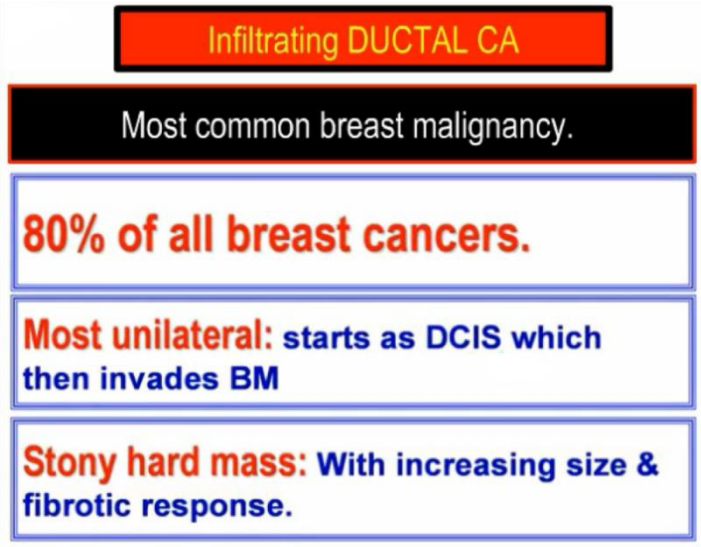
❖ HER-2 neu is an epidermal growth factor receptor on the surface of a cell that transmits growth signals to the cell nucleus. Approximately 25-30% of breast cancers overexpress HER-2, and overexpression of the receptor is associated with poor prognosis.



Types of breast cancer

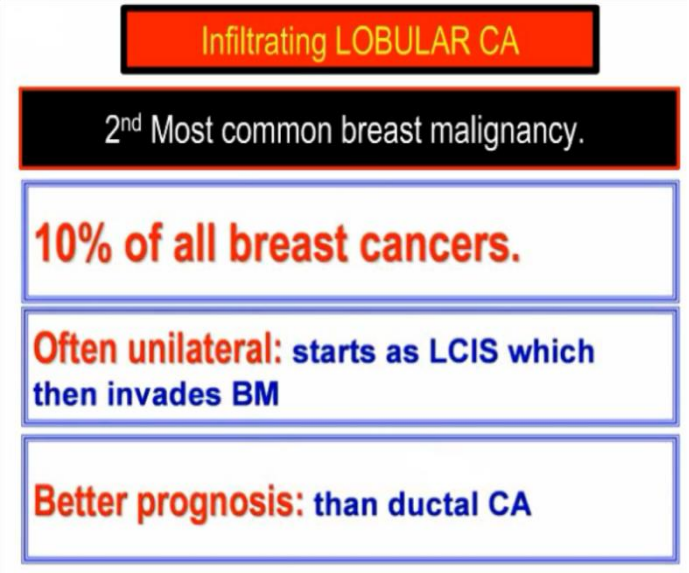
A. Infiltrating Ductal Carcinoma:

- This is the most common breast malignancy accounting for 80% of breast cancers.
- Most are unilateral and start as atypical ductal hyperplasia which may progress to ductal carcinoma in situ (DCIS) which then may break through the basement membrane and progress to invasive ductal carcinoma.
- Over time the tumor will become a stony hard mass as it increases in size and undergoes a fibrotic response.



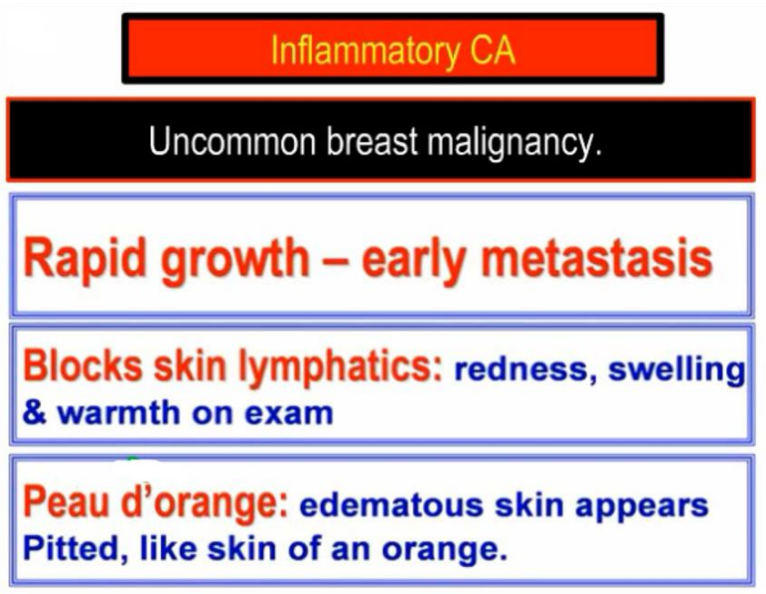
B. Infiltrating Lobular Carcinoma:

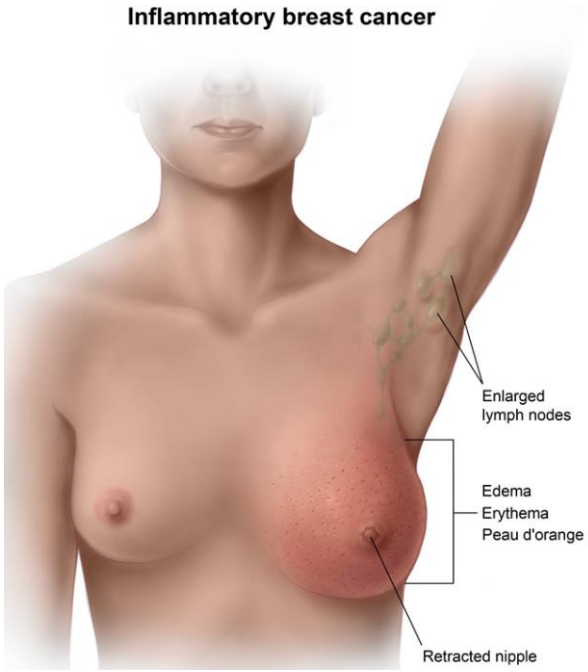
- This is the second most common breast malignancy accounting for 10% of breast cancers.
- Most are unilateral and start as lobular carcinoma in situ (LCIS) which then may break through the basement membrane and progress to invasive lobular carcinoma.
- The prognosis is better with lobular than with ductal carcinoma.



C. Inflammatory Breast Cancer:

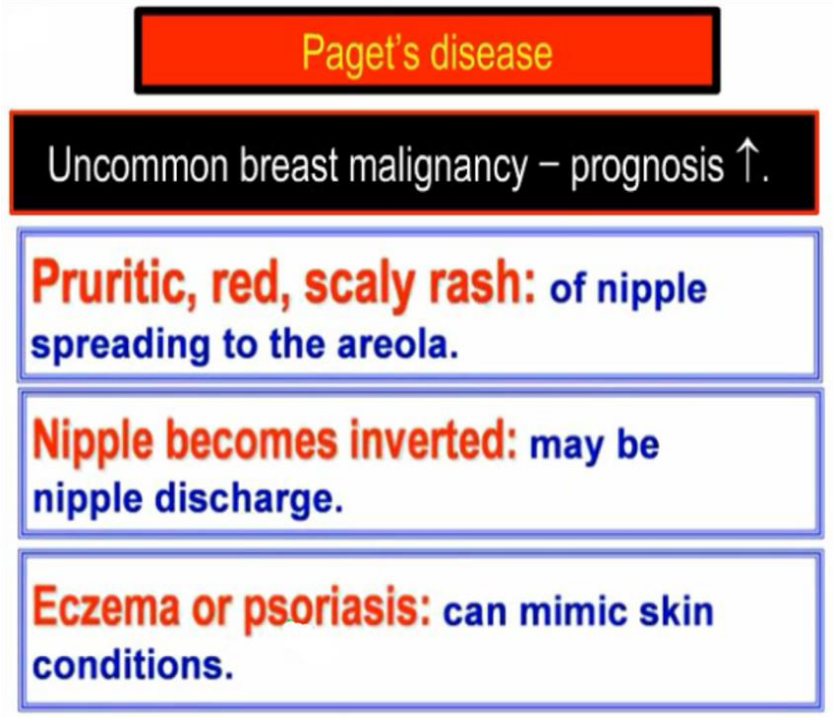
- This is an uncommon breast malignancy that can mimic mastitis.
- Diffuse breast erythema, warmth, pain, and edema with a peau d'orange (superficial dimpling, fine pitting) appearance are hallmark features of inflammatory breast carcinoma. This is an aggressive form of breast cancer that may be metastatic on initial presentation.
- Itching, a palpable breast mass and nipple changes (flattening/retraction) may also be present. Patients commonly have axillary lymphadenopathy suggesting metastatic disease.
- This malignancy causes lymphatic obstruction and tissue swelling when collections of neoplastic cells plug the dermal lymphatic channels.

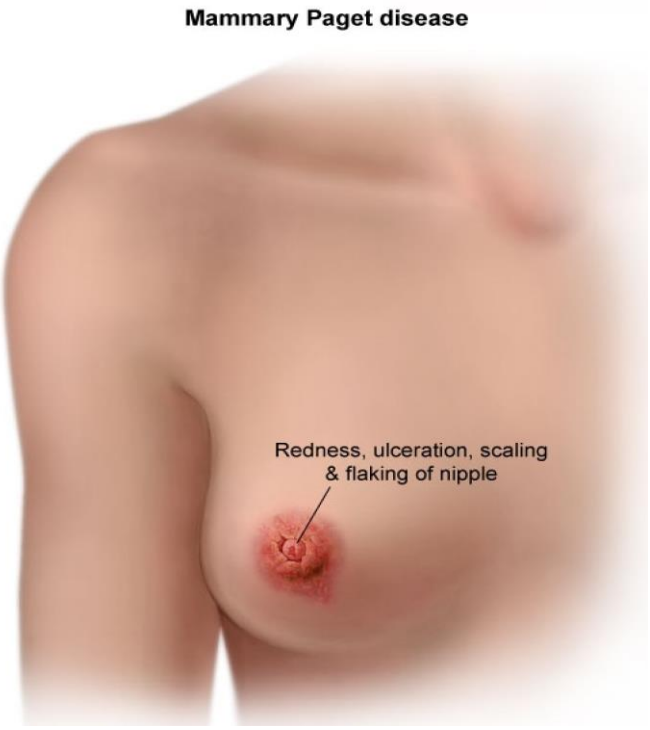




D. Paget Disease of the Breast/Nipple:

- Mammary Paget disease is suspected when a persistent, eczematous and/or ulcerating rash is localized to the nipple and spreads to the areola.
- Other characteristic findings include vesicles, scales bloody discharge, and nipple retraction. Patients experience pain, itching, and burning of the affected nipple and no resolution with topical corticosteroids.
- Approximately 85% of patients with Paget disease of the breast have an underlying breast cancer, although a mass is not always palpable. Adenocarcinoma, which refers to carcinoma that starts in glandular tissue, is generally the most common type of breast cancer and is also found in Paget disease.
- The nipple changes of Paget disease are thought to be caused by migration of neoplastic cells through the mammary ducts to the nipple surface.





- Treatment:

A. Surgery:

- Lumpectomy with radiation is equal in efficacy to modified radical mastectomy but much less deforming. The addition of radiation to lumpectomy is not a small issue. Radiation at the site of the cancer is indispensable in preventing recurrences at the breast. Lumpectomy is contraindicated if the cancer is multifocal or radiation is contraindicated.

- Radical mastectomy is always the wrong answer.

B. Hormonal Manipulation:

- All ER or PR positive patients should receive tamoxifen, raloxifene, or one of the aromatase inhibitors (anastrazole, letrozole, exemestane).

- Aromatase inhibitors seem to have a slight superiority in efficacy. If both are among the answer choices, aromatase inhibitors are the answer to the "most likely to benefit the patient" question.
- Aromatase inhibitors are generally for postmenopausal women. Tamoxifen is better in premenopausal patients.

- Use tamoxifen when multiple first-degree relatives have breast cancer. It lowers the risk of breast cancer.

- Tamoxifen gives endometrial cancer and clots (tamoxifen is a selective ER modifier). Aromatase inhibitors give osteoporosis (aromatase inhibitors inhibit estrogen effect everywhere, even the good effects, like on bone density).

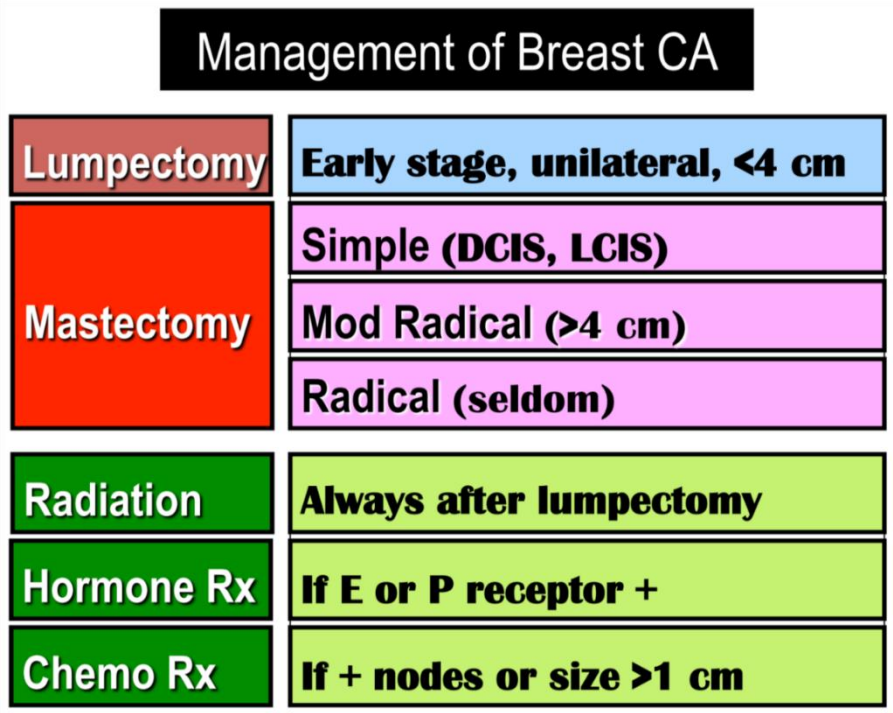
- When Is Trastuzumab (also known as Herceptin) the Answer?
  - All breast cancers should be tested for Her 2/neu. This is an abnormal estrogen receptor. Those who are positive should receive anti-Her 2/neu antibodies known as trastuzumab. Trastuzumab decreases the risk of recurrent disease and increase survival.

  - An echocardiogram is recommended before beginning treatment as there is a risk of developing cardiotoxicity, particularly in patients with baseline low ejection fractions.

- When Is Adjuvant Chemotherapy the Answer?
  - "Adjuvant" chemotherapy is not prophylactic, since patients already have the disease. It is not treatment since the term implies there are no clearly identified metastases. Adjuvant means an additional therapy to clean up presumed microscopic cancer cells too small in amount to be detected.

  - Adjuvant chemotherapy is the answer when:

a) Lesions are larger than 1 cm.
b) Positive axillary lymph nodes are found.



❖ N.B:

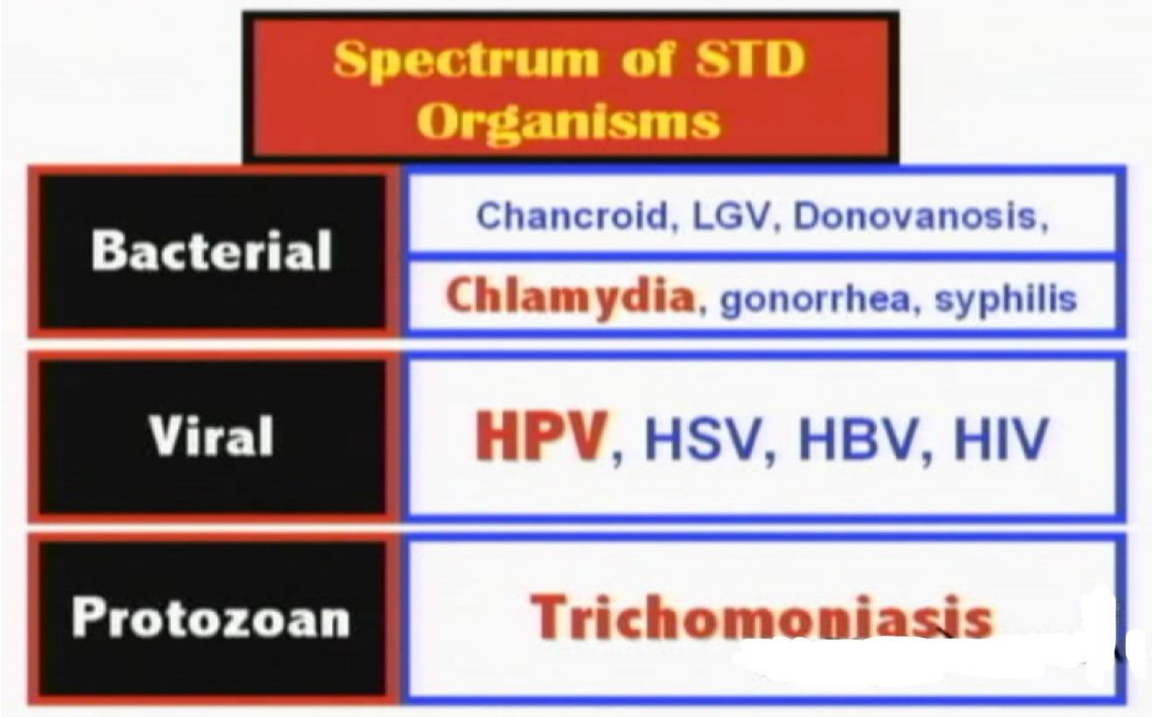
- Breast cancer is the second most common cancer (after skin cancer) and the second most common cause of cancer death (after lung cancer) in American women.
- Screening mammography is generally initiated at age >50 due to increasing risk of breast cancer with age.
- Other important risk factors include nulliparity, obesity, and prolonged hormone replacement therapy, all of which contribute to increased lifetime estrogen exposure.
- Alcohol consumption has a known dose-dependent causal effect on breast cancer. A decrease in alcohol consumption will reduce risk of breast cancer.

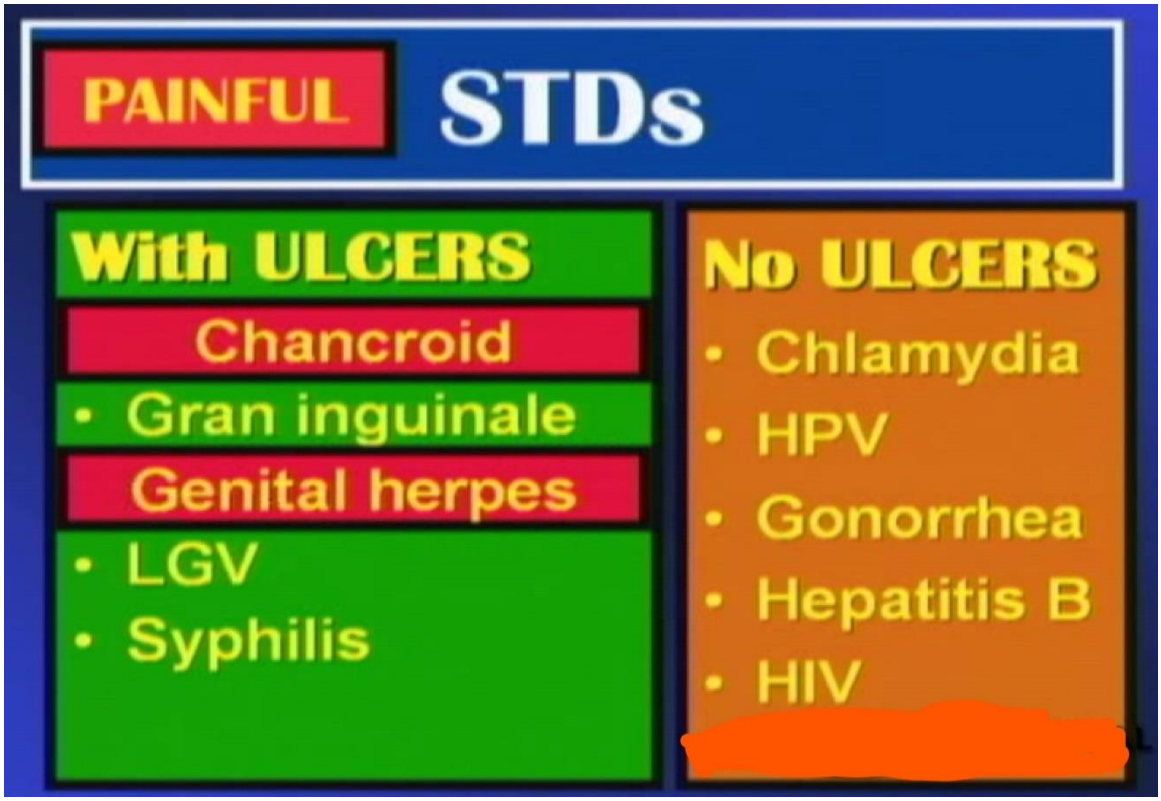
Breast cancer risk factors	
Modifiable	• Hormone replacement therapy • Nulliparity • Increased age at first live birth • Alcohol consumption
Non-modifiable	• Genetic mutation or breast cancer in first-degree relatives • White race • Increasing age • Early menarche or later menopause

CHAPTER 18

Genital and sexually transmitted infections

Genital and sexually transmitted infections





Urethritis

- Urethritis is not always sexually transmitted, but a person with multiple sexual partners has a greater risk of exposure.

- Urethritis is inflammation of the urethra:

- Gonococcal urethritis caused by Neisseria gonorrhoeae.

- Nongonococcal urethritis caused by either Chlamydia trachomatis (50%), Ureaplasma urealyticum (20%), Mycoplasma hominis (5%), Trichomonas (1%), herpes simplex.

- Risk factors:

- Risk factors for Neisseria gonorrhoeae infection are shared with many other sexually transmitted pathogens and include age <25, new or multiple sexual partners, substance abuse, and men who have sexual encounters with men.

- Finding:

- Patients present with purulent urethral discharge, dysuria, urgency, and frequency in urination.

- Diagnosis:

- The best initial test may be a urethral swab for Gram stain. This can only detect gonorrhea (gram-negative diplococci are seen under microscope). This is sufficient evidence of Neisseria gonorrhoeae to initiate treatment.

- Urine testing for nucleic acid amplification can also detect gonorrhea and chlamydia.

- In the absence of identifiable bacteria on culture or Gram stain, a mucopurulent urethral discharge in a patient who is sexually active suggests chlamydial urethritis (obligate intracellular organism). The diagnosis can be made with nucleic acid amplification testing of a first-catch urine sample without pre-cleaning the genital area.

- Treatment:

- Single-dose ceftriaxone intramuscularly and single-dose azithromycin orally is now the treatment of choice.

- An alternative regimen with doxycycline for 7 days can also be used.

Cervicitis

- Acute cervicitis is most commonly caused by Chlamydia trachomatis and Neisseria gonorrhoeae.

- Infection by these pathogens is most prevalent in women age <25.

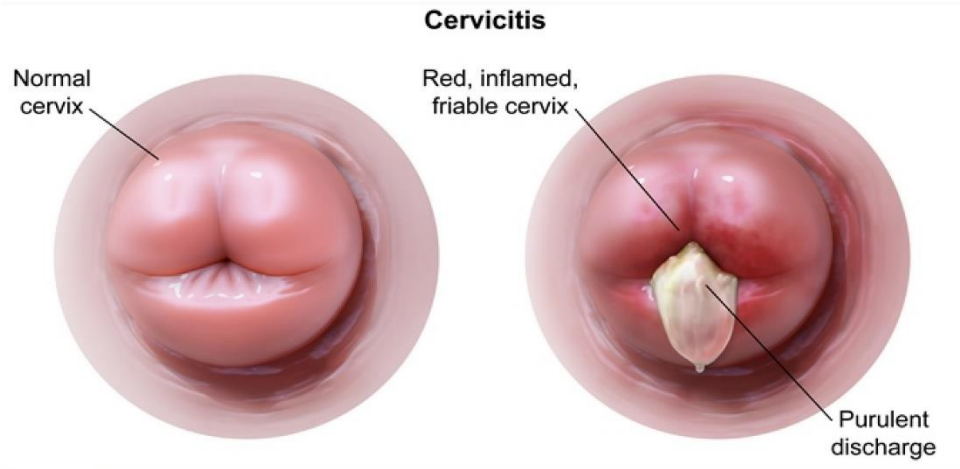
- Diagnosis:

- Acute cervicitis is diagnosed clinically by a pelvic examination that shows a mucopurulent discharge and a friable cervix (bleeds easily on contact), but nucleic acid amplification testing should also be performed for infection confirmation.

- NAAT has high sensitivity and specificity for C trachomatis and N gonorrhoeae detection and has replaced older, less sensitive techniques (culture, microscopy).

- Treatment:

- The treatment is ceftriaxone and azithromycin as a single dose.



❖ N.B:

- All sexually active women age <25 should undergo annual screening for Chlamydia trachomatis and Neisseria gonorrhoeae due to high rates of asymptomatic infection that can lead to infertility if left untreated.
- Nucleic acid amplification testing is the gold standard for the screening and diagnosis of these organisms. For women. NAAT can be obtained by either a vaginal or a cervical swab.

Chlamydia & gonorrhea in women	
Risk factors	• Age <25 • High-risk sexual behavior
Manifestations	• Asymptomatic (most common) • Cervicitis • Urethritis • Perihepatitis (Fitz-Hugh-Curtis syndrome)
Diagnosis	• Nucleic acid amplification testing
Treatment	• Empiric: Azithromycin + ceftriaxone • Confirmed chlamydia: Azithromycin • Confirmed gonorrhea: Azithromycin + ceftriaxone
Complications	• Pelvic inflammatory disease • Ectopic pregnancy • Infertility

Pelvic Inflammatory Disease

- Pelvic inflammatory disease (PID) describes a group of infections involving the fallopian tubes, uterus, ovaries, or ligaments of the uterus.

- PID is typically preceded by Neisseria gonorrhoeae and Chlamydia trachomatis cervicitis, which disrupts the barrier to the upper genital tract (uterus, fallopian tubes), allowing polymicrobial vaginal bacteria to infect the normally sterile area.

- Intrauterine devices predispose to PID.

- Finding:
- Fever, lower abdominal pain, purulent cervical discharge, and cervical motion and adnexal tenderness.

- If untreated, infection can progress to tubo- ovarian abscess, abscess rupture, perihepatitis, and sepsis.

- Diagnostic Tests:
- Cervical swab for culture, nucleic acid amplification test (NAAT) is done to confirm the etiology of PID.

- Laparoscopy in PID:
- The most accurate test for PID is laparoscopy, although it is only rarely needed.

- Laparoscopy is needed only if the diagnosis is unclear, symptoms persist despite therapy, or there are recurrent episodes for unclear reasons.

- Treatment:
- Outpatient therapy is with single-dose ceftriaxone intramuscularly and doxycycline orally for 2 weeks.

- Doxycycline and cefoxitin (or cefotetan) for inpatient therapy.

- Indications for inpatient treatment of PID with parenteral antibiotics include high fever, inability to take oral antibiotics, and risk of nonadherence to treatment.

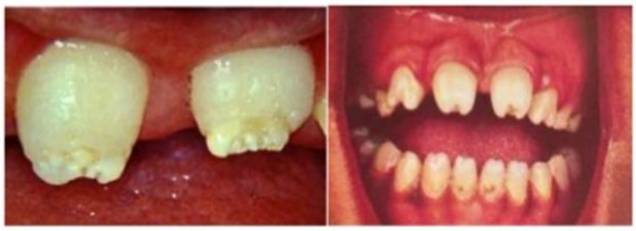
- Complications:
- Complications of PID include infertility and ectopic pregnancy.

Pelvic inflammatory disease	
Symptoms	• Lower abdominal pain • Abnormal bleeding
Physical examination	• Cervical motion tenderness • Fever >38.3 C (>100.9 F) • Mucopurulent cervical discharge
Treatment	• Third-generation cephalosporin ***plus*** • Azithromycin ***or*** doxycycline
Complications	• Tubo-ovarian abscess • Infertility • Ectopic pregnancy • Perihepatitis

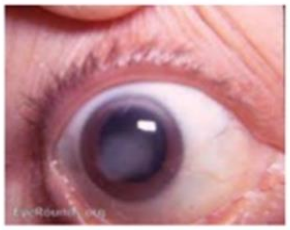
Syphilis

- Syphilis is a systemic contagious disease caused by a spirochete (Treponema pallidum).
- Syphilis can be classified as being congenital or acquired.
- Congenital:

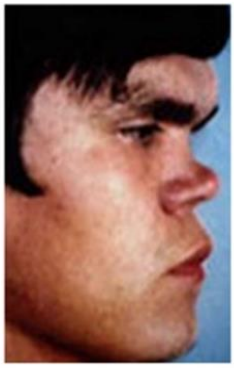
- Treponema pallidum readily crosses the placenta and is associated with many adverse fetal outcomes, including intrauterine growth restriction, fetal death, and congenital infection.
- Congenital syphilis presents with facial abnormalities such as rhagades (linear scars at angle of mouth), snuffles (nasal discharge), saddle nose, notched (Hutchinson) teeth, mulberry molars, and short maxilla; saber shins; CN VIII deafness.
- To prevent, treat mother early in pregnancy, as placental transmission typically occurs after first trimester.



Hutchinson's teeth:
widely spaced, pegged teeth

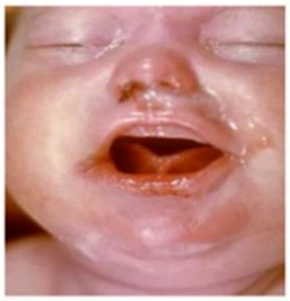


Keratitis



Frontal bossing
Saddle nose

Snuffles



- Acquired:

1. Primary stage:

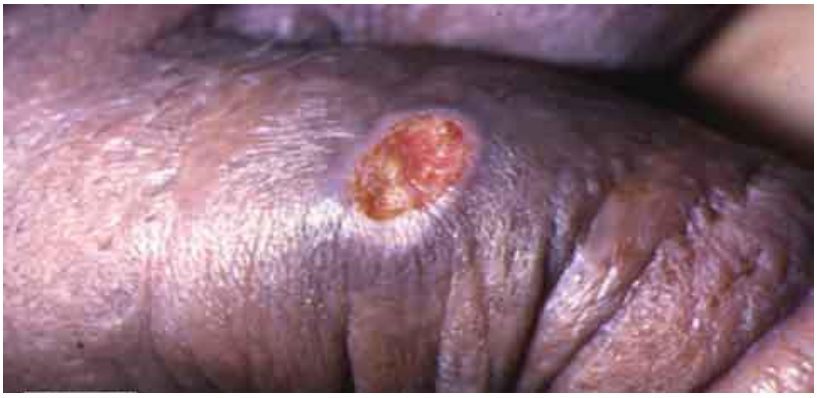
- Chancre appears by week 3 and disappears in 10-90 days; this is usually manifested as a single hard, painless ulcer called chancre.

- The chancre represents the primary site of initial multiplication.

- It usually appears on the penis, labia, cervix, anorectal region, or around the mouth.

- The regional lymph nodes also become enlarged (painless).

- The chancre heals within 4-6 weeks, even without treatment.



2. Secondary stage:

- Cutaneous rashes appear 6-12 weeks after infection, this stage has four cardinal features:
  - Disseminated disease with constitutional symptoms.
  - Maculopapular rash (including palms and soles).
  - Condylomata lata (smooth, moist, painless, wart-like white lesions on genitals).
  - Widespread lymphadenopathy (particularly epitrochlear).
- Secondary syphilis = Systemic.
- The symptoms usually last 4-6 months and disappear spontaneously.

3. Latent stage:

- There are neither symptoms nor lesions during this stage, and the serology is positive.
- This stage can range from a few months to a lifetime.

4. Tertiary syphilis:

- This may occur in about 40% of untreated cases.
- This stage is characterized by gumma formation (chronic granulomas) in the internal organs and bones and syphilitic lesions that may lead to cardiovascular syphilis and neurosyphilis (tabes dorsalis).
- Aortitis (vasa vasorum destruction).
- Neurosyphilis (tabes dorsalis, general paresis), Argyll Robertson pupil (constricts with accommodation but is not reactive to light; also called “prostitute’s pupil” since it accommodates but does not react).
- Signs: broad-based ataxia, ⊕ Romberg, Charcot joint.
- Serology is positive.

- Diagnosis:

- Screening tests are the VDRL and RPR; specific tests are the FTA-ABS, MHA-TP, and Darkfield exam of chancre.

- If dark-field is positive for spirochetes, no further testing for syphilis is necessary.

- False-Positive results on VDRL with:
  - Pregnancy.
  - Viral infection (Infectious Mononucleosis, Hepatitis).
  - Drugs.
  - Rheumatic fever.
  - Lupus and Leprosy.

Syphilis - diagnostic serology	
Nontreponemal (RPR, VDRL)	• Antibody to cardiolipin-cholesterol-lecithin antigen • Quantitative (**titers**) • **Possible negative result in early infection** • Decrease in titers confirms treatment
Treponemal (FTA-ABS, TP-EIA)	• Antibody to treponemal antigens • Qualitative (**reactive/nonreactive**) • **Greater sensitivity in early infection** • Positive even after treatment

FTA-ABS = fluorescent treponemal antibody absorption; **RPR** = rapid plasma reagin;
TP-EIA = *Treponema pallidum* enzyme immunoassay.

- Treatment:

- Penicillin is the drug of choice for all stages of syphilis.

- Penicillin-allergic patients receive doxycycline for primary and secondary syphilis but must be desensitized in tertiary syphilis.

- Pregnant patients with syphilis require treatment with penicillin as alternate antibiotic choices are ineffective, contraindicated, or have limited data in pregnancy. Patients with penicillin allergy should have a penicillin skin test to evaluate for the presence of an IgE-mediated response. If the test is positive, patients are desensitized to penicillin prior to receiving treatment with intramuscular penicillin G benzathine.

- All patients with syphilis require nontreponemal titers (RPR) at the time of treatment and at 6-12 months to ensure treatment response (a 4-fold drop in titers). This is especially crucial in patients receiving alternate treatment as the risk of treatment failure is much higher than the risk in those who receive penicillin.

❖ N.B:

- Patients with Neisseria gonorrhoeae are at high risk of simultaneous coinfection with several other sexually transmitted pathogens, including Chlamydia trachomatis, HIV, Treponema pallidum (syphilis), and hepatitis B virus.
- Patients with gonococcal infection should be screened for these infections, counseled on safe sexual practices, and encouraged to inform recent partners of infection (with a recommendation to get tested).

Chancroid

- Chancroid is an acute, localized, contagious disease characterized by painful genital ulcers and suppuration of the inguinal lymph nodes.

- It is caused by Haemophilus ducreyi.

- Diagnosis:

- Diagnosis is made on clinical findings; do a Gram stain initially with culture to confirm.

- Treatment:

- Treatment is azithromycin single dose or ceftriaxone intramuscularly (single dose).

Lymphogranuloma Venereum

- Lymphogranuloma venereum is a contagious, sexually transmitted disease having a transitory primary lesion followed by suppurative lymphangitis.

- It is caused by Chlamydia trachomatis serotypes L1-L3.

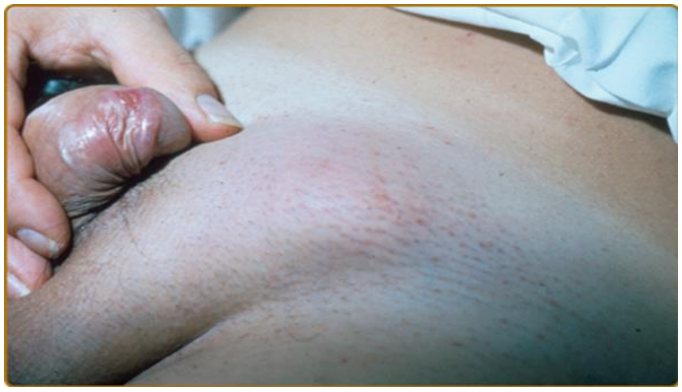
- Clinical findings include the following:

- LGV is a chronic disease characterized by an initial painless small ulcer on the genital mucosa that contains cells infected with C. trachomatis.

- The painless nature of this ulcer helps distinguish LGV from other entities.

- This ulcer is followed weeks later by swollen, painful inguinal nodes that coalesce, ulcerate, and rupture; these are referred to as buboes.

- If left untreated, this condition can cause fibrosis, lymphatic obstruction, and anogenital strictures and fistulas.



- Diagnosis:

- Diagnosis is made by clinical examination, history, and a high or rising titer of complement fixing antibodies.

- Isolate chlamydia from pus in buboes.

- Treatment:

- Treat with doxycycline or erythromycin.

Granuloma Inguinale

- Granuloma inguinale is a chronic granulomatous condition, probably spread by sexual contact. It is caused by Donovania granulomatis.

- A painless, red nodule will develop into an elevated granulomatous mass.

- In men, it is seen on the penis, scrotum, groin, and thighs (In homosexual men, the anus and buttocks are common areas).

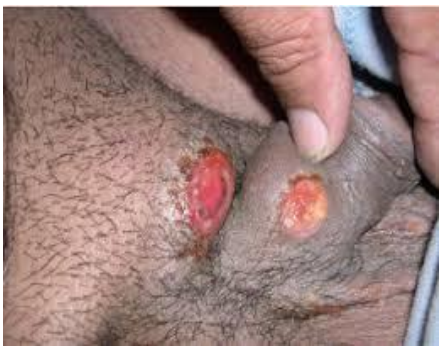
- In women it is found on the vulva, vagina, and perineum.

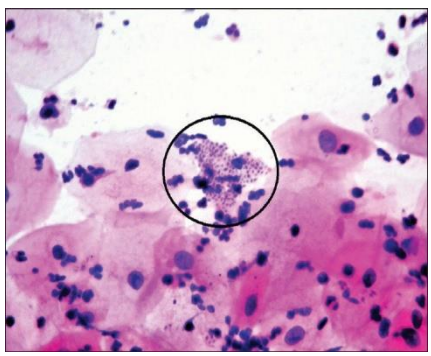
- Diagnosis:

- Diagnosis is made clinically and by performing a Giemsa or Wright stain (Donovan bodies) or smear of lesion.

- Treatment:

- Treat with doxycycline, ceftriaxone, or TMP/SMZ.





Genital Herpes

- Genital herpes is generally the herpes virus type II, although type I may be seen.

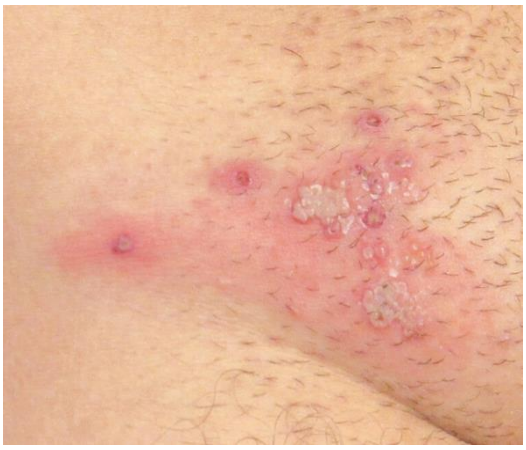
- Finding:

- HSV lesions initially appear as a group of painful vesicles on an erythematous base that evolve into a group of shallow ulcers that eventually crust over.

- Patients can have painful urination (dysuria) due to urine contact on the open ulcers and a sterile pyuria (leukocytes on urinalysis but negative urine culture) due to vulvar inflammation.

- Inguinal lymphadenopathy.

- Lesions are commonly seen on the penis (men) and on the labia, clitoris, perineum, vagina, and cervix (women).



- Diagnosis:

- Suspected clinical diagnosis of genital HSV requires laboratory confirmation via viral culture or PCR testing.

- Treatment:

- Treat with oral acyclovir, famciclovir, or valacyclovir.

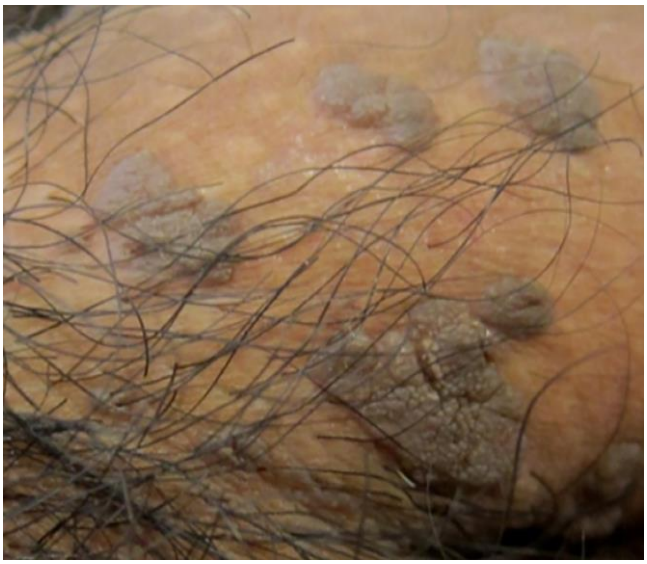
- Foscarnet for acyclovir-resistant herpes.

❖ N.B:

- The risk for neonatal HSV infection is drastically increased if the infant passes through the vaginal canal and is directly exposed to an active HSV eruption.
- Cesarean delivery is recommended to all women who are in labor with active genital HSV lesions or prodromal symptoms (burning, pain).

Genital Warts

- Genital warts are also known as condylomata acuminata or venereal warts.
- Condyloma acuminata occur due to persistent infection with low-risk HPV strains 6 and 11.
- Genital warts are commonly found on warm, moist surfaces in the genital areas. They appear as soft, moist, minute, pink, or red swellings which grow rapidly and become pedunculated.
- Their cauliflower appearance makes them unique in appearance.



- Diagnosis:

- Diagnosis is made by clinical appearance.
- Wrong answers include biopsy, serology, stain, smear, and culture.

- Treatment includes the following:

- Small anogenital warts are treated with topical agents that either chemically injure the lesion (trichloroacetic acid, podophyllin resin) or stimulate an immune response to it (imiquimod).
- Surgical excision may be required for larger lesions.
- Recurrence rates are high, regardless of treatment modality.

- Presentation of STDs:

History and physical findings	Most likely diagnosis
Painless ulcer	Syphilis
Painful ulcer	Chancroid (Haemophilus ducreyi)
Lymph nodes tender and suppurating	Lymphogranuloma venereum
Vesicles prior to ulcer and painful	Herpes simplex

- Diagnosis:

Diagnosis	Diagnostic Test
Syphilis	Dark-field microscopy VDRL or RPR (75% sensitive in primary syphilis) FTA or MHA-TP (confirmatory)
Chancroid (Haemophilus ducreyi)	Stain and culture on specialized media
Lymphogranuloma venereum	Complement fixation titers in blood Nucleic acid amplification testing on swab
Herpes simplex	PCR is the most accurate test

- Treatment:

Diagnosis	Treatment
Syphilis	Single dose of intramuscular benzathine penicillin Doxycycline if penicillin allergic
Chancroid (Haemophilus ducreyi)	Azithromycin (single dose)
Lymphogranuloma venereum	Doxycycline
Herpes simplex	Acyclovir, valacyclovir, famciclovir Foscarnet for acyclovir-resistant herpes

CHAPTER 19

Congenital infections

Congenital infections

- T → Toxoplasma.
- O → Other pathogens (syphilis).
- R → Rubella.
- C → Cytomegalovirus.
- H → Herpes.

Clinical findings of congenital infections	
All	• Intrauterine growth restriction • Hepatosplenomegaly • Jaundice • Blueberry muffin spots
Cytomegalovirus	• Periventricular calcifications
Toxoplasmosis	• Diffuse intracerebral calcifications • Severe chorioretinitis
Syphilis	• Rhinorrhea • Abnormal long-bone radiographs • Desquamating or bullous rash
Rubella	• Cataracts • Heart defects (eg, PDA)

PDA = patent ductus arteriosus.

A. Congenital toxoplasmosis:

- Toxoplasmosis is a systemic infection secondary to the protozoan Toxoplasma gondii.
- Maternal infection is acquired by exposure to feces from infected cats, or ingestion of infected raw meat or unpasteurized goat's milk.
- Approximately 75% of infants are asymptomatic at birth, and 25% to 50% present with complications such as hydrocephalus, chorioretinitis, microcephaly, hepatosplenomegaly and cerebral calcifications. Microphthalmia, microcephaly, hepatomegaly, diffuse lymphadenopathy, jaundice and diffuse petechiae may be seen.
- Laboratory reports show hyperbilirubinemia and thrombocytopenia.
- Remember the classic triad of congenital toxoplasmosis - chorioretinitis, hydrocephalus, and intracranial calcifications.

B. Congenital rubella syndrome (CRS):

- In adults, rubella infection can be asymptomatic or characterized by mild symptoms (fever, arthralgia, maculopapular rash). However, infection during pregnancy is dangerous due to high risk of viral transmission through the placenta into fetal circulation.

- First-trimester infections are particularly threatening as they occur during early development (organogenesis) and can lead to either spontaneous abortion or Congenital Rubella Syndrome (CRS).

- The classic triad of CRS includes a machine-like systolic murmur of patent ductus arteriosus, sensorineural hearing loss, and leukocoria (white pupillary reflex) from cataracts. A probable diagnosis can be made clinically and confirmed by serology (infant IgM). Universal vaccination has reduced, but not eliminated, CRS.

- Routine first-trimester prenatal screening includes testing for maternal IgG to rubella.

- The best way to prevent CRS is by herd immunity through live attenuated rubella vaccination. Immunization should occur prior to conception; rubella immunization is contraindicated during pregnancy due to a theoretical risk for the live vaccine to cause fetal infection.

C. Neonatal herpes simplex virus infection:

- Vertical transmission of the virus typically occurs perinatally during delivery by a mother with active genital lesions. Neonatal HSV may also be contracted in utero (rare and often fatal) or postnatally through direct contact of the infant with an active lesion (cold sore).

- Finding:

A. Skin-eye-mouth disease:

- Mucocutaneous vesicles.

- Keratoconjunctivitis.

B. CNS disease:

- CNS disease, typically presents in the first few weeks of life with signs of encephalitis, including seizure, lethargy, poor feeding, and a full fontanelle (increased intracranial pressure).

- Viral transmission through the olfactory bulb to the temporal lobe results in temporal lobe hemorrhage and edema.

C. Disseminated disease:

- Sepsis, hepatitis, pneumonia.

- Diagnosis:

- HSV PCR in blood and CSF.

- Treatmrnt: Acyclovir.

D. Congenital cytomegalovirus:

- Vertical transmission from mother to infant occurs via placental transfer.

- Clinical features of congenital CMV infection include microcephaly with periventricular calcifications, which are the most specific findings for congenital CMV infection, as well as intrauterine growth restriction, hepatosplenomegaly, jaundice, and thrombocytopenia.