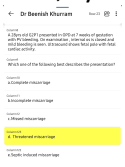
# Reproduction Gynae-Obs

## Miscarriage

- Expulsion or extraction of a fetus weighing **< 500 gm [WHO] or before 24 weeks of gestation** [age of viability] with no evidence of life is known as miscarriage or abortion. The most common sign of miscarriage is **vaginal bleeding**
- **Causes: chromosomal abnormalities** [most common], medical [hypo/hyperthyroidism, DM, HTN] & autoimmune disorders [SLE & antiphospholipid syndrome (APS)], uterine abnormalities, infections [Toxoplasma, cytomegalovirus], Drug/chemical [alcohol, nicotine, cocaine], and amniocentesis or chorionic villus sampling.
- **Classification of Miscarriage:**
  1- Spontaneous Miscarriage
  2- Induced miscarriage



| Types | Ultrasound Scan | Clinical Presentation | Management |
|---|---|---|---|
| **Threatened Miscarriage** | Intrauterine Pregnancy With fetal heartbeat [FH] | Mild vaginal bleeding & abdominal pain.<br>No passage of products of conception<br>**Speculum:** Cervical os **closed** | Supportive, Bed rest & progesterone<br>These women are at increased risk for subsequent miscarriage. |
| **Inevitable Miscarriage** | Intrauterine Pregnancy [No fetal heart beat [FH]<br>Abortion has begun that cannot be stopped | Vaginal bleeding, with back or abdominal pain, indicate abortion is about to happen<br>No passage of products of conception<br>**Speculum:** Cervical os **open** | Expectant, Medical [misoprostol, antibiotics] or surgical [suction evacuation < 12 weeks of gestation]<br>Anti-D (250 units) for Rh -ive women |
| **Incomplete Miscarriage** | In USS, gestational sac is irregularly shaped. Passage of some products of conception | Heavy vaginal bleeding & severe abdominal pain.<br>**Speculum:** Cervical os **open** | Expectant [supportive], Medical or surgical [Evacuation and curettage after starting 30 units of Syntocinon in 1000 ml of dextrose saline] |
| **Complete Miscarriage** | Empty uterus<br>All of the products of conception have passed | Pain & bleeding resolved. Slight bleeding & cramping may continue for several week<br>**Speculum:** cervical os **closed** | Supportive<br>Need serum hCG to exclude ectopic pregnancy if no previous USS |
| **Missed miscarriage** | Intrauterine Pregnancy [No fetal heartbeat [FH]<br>**Nonviable pregnancy** | Asymptomatic, Cervical os **closed**<br>Often diagnosed at booking USS<br>No passage of products of conception. | Expectant, Medical [misoprostol + mifepristone] or surgical [cervical ripening then dilatation & curettage] |

### ➢ Septic abortion:

- In septic abortion, fetal demise has occurred, and intrauterine infection has developed, which has the potential risk of spreading systemically. Clinical features are fever, tenderness over uterus and lower abdomen.
- Immediate & extensive with broad-spectrum antibiotics & evacuation of uterus **after stabilizing patient.**

### ➢ Investigations:

- **Transabdominal/TVUSS:** a single ultrasound scan can diagnose a miscarriage if there is a pregnancy within the uterus
- **Lab studies:** CBC, Hb, blood type [if – ive, give anti-D], & cervical cultures to determine pathogens in case of infection.
- **CBC:** significant bleeding leads to anemia. Both WBCs & ESR may be elevated, even without the presence of infection.

### ➢ Management:

- **Expectant management** allows for the avoidance of surgery. Require unplanned surgery if they start to bleed heavily.
- **Medical management:** It involves administration of a single or repeated, vaginal or sublingual dose of **prostaglandin E1 analogue misoprostol**. A post-treatment pregnancy test is recommended. Anti-D is often given. **Anti-D is not required for threatened, incomplete or complete natural miscarriage.**
- **Surgical management** is preferred if there is persistent excessive bleeding or haemodynamic instability, or if women favour this option. **Vaginal or sublingual misoprostol** is frequently used to ripen the cervix.
- **Treatment of miscarriage before 12 weeks of gestation:**
  - **Evacuation and curettage is treatment of choice if Internal os is open [Inevitable, Incomplete]**
  - **Dilatation & curettage under GA is done if internal os is closed [Missed, Threatened & Complete]**
- **Treatment of miscarriage after 12 weeks of gestation:**
  - Induce labor by vaginal, intra & extra amniotic **prostaglandin**, followed by evacuation of uterus if required.
- All rhesus-negative women who have a surgical procedure to manage an EP or miscarriage should be offered anti-D immunoglobulin at a dose of **250 IU** as soon as possible and **within 72 hours of the surgery.**

## ➢ Recurrent miscarriage:

- Recurrent miscarriage is defined as the loss of ≥ 3 consecutive pregnancies and it affects 1% of couples.
- **Risk factors**: advancing maternal & paternal age, obesity, chromosomal translocations, uterine anomalies & APS.
- Scar tissue within uterine cavity [leads to infertility/recurrent miscarriage] is known as **Asherman's syndrome.** These are most commonly found **after dilation & curettage.** Treatment is **resection of adhesions using hysteroscopy**
- **Aspirin and low-dose heparin** can reduce the miscarriage rate in women with APS by 50%.
- **Induced abortion:** Forced extraction or expulsion of fetus before 24 weeks of gestation or weighing < 500 mg.

# Ectopic Pregnancy

- It is defined as implantation of the fertilized ovum in a site other than the uterine endometrium
- Over 98 % implant in Fallopian tube [mostly in ampulla]

**Aetiological factors:**

- Fallopian tube damage [pelvic infection (Chlamydia/Gonorrhoea), previous ectopic pregnancy & previous tubal surgery]
- Functional alterations in the Fallopian tube due to smoking and increased maternal age
- Additional risk factors include previous abdominal surgery (e.g., appendicectomy, caesarean section), subfertility, IVF, use of intrauterine contraceptive devices, endometriosis, conception on oral contraceptive/morning after pill.

## ➢ Clinical presentation:

- **Classical Triad of ectopic pregnancy:** Amenorrhea, pain in abdomen & irregular vaginal bleeding
- **Early signs include:** Pain in lower abdomen, pain while urinating & having bowel movement
- Adnexal and/or **cervical motion tenderness** is also a common finding.
- **Rarely,** patients present with rupture of EP & massive intraperitoneal bleeding. Free blood in peritoneal cavity can cause **diaphragmatic irritation & shoulder tip pain [Kehr's sign]**. Diagnosis of ruptured EP is usually clear as they present with signs of an **acute abdomen & hypovolaemic shock with a positive PT.**
- **Signs of shock:** Pallor, low BP [90/60 mmHg], weak & raised pulse [110/min], raised RR [> 20/min], sweating, cold skin, tender distended abdomen with rebound tenderness & signs of intraperitoneal fluid i.e., fluid thrill & shifting dullness. Altered mental status and confusion & oliguria followed by anuria.

## ➢ Investigations:

- **TVUSS: empty uterus with an adnexal mass. Bagel' sign** – Hyperechoic ring around gestational sac in adnexal region
- **Serum hCG** doubles every 48 hours in a normal pregnancy. In patients with EP, **rise of β-HCG is < 66 % in 48 hours.**
- An **empty uterine cavity by transvaginal ultrasound with ß hCG > 1500 - 2000 mIU/ml is diagnostic.**
- **A serum progesterone** level < 15 ng/ml is suggestive of ectopic pregnancy

## ➢ Management:

**Expectant management:**

- Suitable for haemodynamically stable [no rupture], tubal pregnancies, with adnexal mass < 3.5 cm & initial B-hCG value < 1500 IU/l & falling [Single best]. The patient requires serial hCG measurements until levels are undetectable.

**Medical management:** Intramuscular methotrexate is a treatment option for

1. Patients with minimal symptoms
2. An adnexal mass < 40 mm in diameter
3. Current serum hCG concentration under 3,000 IU/l.

- **Methotrexate** is a folic acid antagonist that inhibits DNA synthesis, particularly affecting trophoblastic cells. The dose is calculated based on the patient's body surface area and is **50 mg/m$^2$.**
- After methotrexate treatment serum hCG is usually routinely measured on **days 4, 7 and 11, then weekly** thereafter until undetectable (levels need to **fall by 15% between day 4 and 7,** & continue to fall with treatment).
- If hCG levels do not drop appropriately, a 2$^{nd}$ dose or surgical intervention is advised. Again, check B-hCG on day 11 & 14
- **The few contraindications to medical treatment include** chronic liver, renal or haematological disorder, active infection, immunodeficiency & breastfeeding.
- It is important to advise women to **avoid sex during treatment** & to avoid conceiving for 3 mths after methotrexate treatment because of teratogenicity. Also, avoid alcohol & prolonged exposure to sunlight during treatment.

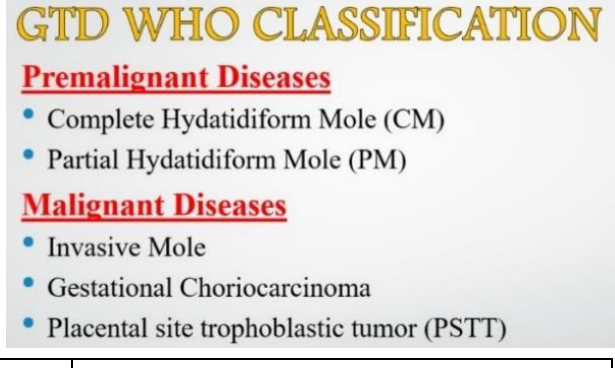
**Surgical management:**

- The **operation of choice** is **removal of the Fallopian tube and the EP within laparoscopically (salpingectomy)**
- In some cases, a small opening can be made over the site of the EP & the EP extracted via this opening (salpingostomy).

- Salpingostomy is recommended only if the contralateral tube is absent or visibly damaged, and it is associated with a **higher rate of subsequent EP.**
- Immediate surgery is indicated [laparotomy & salpingectomy] when diagnosis of a ruptured ectopic pregnancy is made.
- All rhesus-negative women who have a surgical procedure to manage an EP or miscarriage should be offered anti-D immunoglobulin at a dose of **50 µg (250 IU)** as soon as possible and **within 72 hours of the surgery**

# Gestational Trophoblastic Diseases

- GTDs arise from **abnormal proliferation of placental trophoblast.**
- First and only disseminated solid tumors curable by chemotherapy




**Hydatidiform Mole:**

- **Most common form of GTD** and is benign in nature.
- Higher in women < 20 & > 40 years of age, in nulliparous women, in patients of low socioeconomic status, and in women whose diets are deficient in protein, folic acid, and carotene. Blood group A women impregnated by group O men have an almost 10-fold greater risk.
- **2 distinct forms of hydatidiform mole exist: complete & partial.**

| Features | Complete Mole | Partial Mole |
|---|---|---|
| Karyotype | Diploid **[46, XX (96%)** or 46, XY]. Paternal only | Triploid [69, XXX or 69, XXY] |
| Fetus | Absent | Often present |
| Uterine size | Large for dates | Small for dates |
| Placental villi | Diffusely hydropic | Focally hydropic |
| Trophoblasts | Diffuse hyperplasia | Mild focal hyperplasia |
| Fetal RBCs | Absent, blood vessels absent | Present, blood vessels present |
| b-hCG [mIU/L] | High [> 100,000] | Slight elevation [< 100,000] |
| Malignant changes | 16 % | Rare [0.5 %] |

- **Grossly, multiple grapelike vesicles** filling & distending the uterus, usually in absence of intact fetus.

**Clinical Findings**

- **Abnormal uterine bleeding,** usually at the end of first trimester, is the most common presenting symptom [90 %]
- **Nausea and vomiting,** 10 % have severe enough to require hospitalization **[Hyperemesis Gravidarum]** MCQ
- Preeclampsia in 1st trimester or early 2nd trimester has been said to be pathognomonic for a molar pregnancy.

**Diagnosis:**

- **Serial β-hCG levels** [Serum/urine] are best monitored in the same laboratory using the same immunoassay technique
- **Ultrasound: [diagnostic method of choice]** In **complete molar pregnancy, "snowstorm" pattern** is seen.

## ➢ Treatment:

- After the diagnosis has been confirmed, blood type, hematocrit, and thyroid, liver, and renal function tests should be obtained. A chest radiograph can rule out metastasis to lungs. Subsequently, molar pregnancy should be **terminated.**
- **Suction curettage** under general anesthesia is the **method of choice** once the patient is deemed stable. **Intravenous oxytocin** should be administered after **dilation of the cervix** but before the start of evacuation.
- **Anti-D prophylaxis is not required in complete mole. It is required in** Partial mole due to presence of RBCs
- **Hysterectomy** for candidates not desirous of future pregnancy & older women [> 40 years] (develop malignancy).

**Surveillance:**

- After evacuation, patient should undergo serial hCG determinations, **beginning within 48 hours** after evacuation & **then at weekly intervals** until hCG values **decline to undetectable levels (< 5 mIU/ml) on 3 successive assays**.

**Optimum follow up period following normalization of B-hCG:**

- **If β-hCG has reverted to normal in**
  - ≤ 56 days (8 weeks) of the pregnancy event: follow up is for 6 months from the date of uterine evacuation.
  - > 56 days of the pregnancy event: follow up is for 6 months from normalisation of hCG level.

**Contraception:** A woman should not conceive until follow up is complete.

**Role of prophylactic chemotherapy:**

- It may be useful in the high-risk cases when follow up are unavailable or unreliable.
- **High risk factors [high risk of malignant sequelae]:**
  1. hCG level > 100,000 mIU/ml

2. Excessive uterine enlargement
3. Theca lutein cysts 6 cm in diameter [cause enlargement of one or both ovaries [15-30 %] & may be a source of pain]
4. Age > 40 years
5. Medical complications of molar pregnancy [hyperthyroidism & trophoblastic embolization (villi in brain or lungs)
6. Repeat hydatidiform mole

## ➢ Choriocarcinoma:

- Second most common GTN. **40 %** arise after molar pregnancy & **60 %** arise after non-molar pregnancy
- It is **pure epithelial tumor of syncytiotrophoblastic** & **cytotrophoblastic cells**. Distinct **absence of chorionic villi**
- It usually presents as **late vaginal bleeding in the postpartum period** or **lower abdominal pain.**
- The most common site of metastasis in gestational trophoblastic disease is the **lungs** [Highly malignant]

### FIGO requirement for making diagnosis of GTN:

- A plateau in ≥ 4 hCG values over 3 successive weeks: days 1, 7, 14 and 21
- A rise in hCG levels of 10 % or greater for ≥ 3 values over 2 weeks; days 1, 7, and 14
- Histologic diagnosis of choriocarcinoma
- Persistence of hCG beyond 6 months after mole evacuation
- Presence of metastasis

## ➢ Management of GTN:

- Prognostic score is central to the management of GTN.
- A single universally accepted, anatomical staging & prognostic scoring system for GTN was developed by FIGO in 2000.

### Low risk GTN

1. FIGO score 6 or less
2. FIGO stage I, II & III.

- Single agent chemotherapy [Methotrexate or Actinomycin-D]
- **Role of hysterectomy**
  - If patient does not wish to preserve fertility hysterectomy with adjuvant single agent chemotherapy given.
  - In case of stage-I PSTT [resistant to chemotherapy]

**FIGO prognostic score (2000)**

| | 0 | 1 | 2 | 4 |
|---|---|---|---|---|
| Age (years) | < 39 | > 39 | | |
| Antecedent pregnancy | Hydatidiform mole | Abortion | Term pregnancy | |
| Interval from index pregnancy, months | < 4 | 4-6 | 7-12 | > 12 |
| Pretreatment hCG (mIU/ml) | $< 10^3$ | $10^3$-$10^4$ | > $10^4$-$10^5$ | > $10^5$ |
| Largest tumour size, including uterus | 3-4 cm | 5 cm | | |
| Site of metastases | | Spleen, kidney | GI tract | Brain, liver |
| Previous failed chemotherapy | | | Single | Two or more drugs |

Low risk (Score 0-6) and high risk (score > 7)

**Anatomic FIGO staging system for GTN (2000)**

| Stage | Criteria |
|---|---|
| I. | Disease confined to the uterus |
| II. | Disease outside of uterus but is limited to the genital structures |
| III. | Disease extends to the lungs with or without known genital tract involvement |
| IV. | All other metastatic sites |

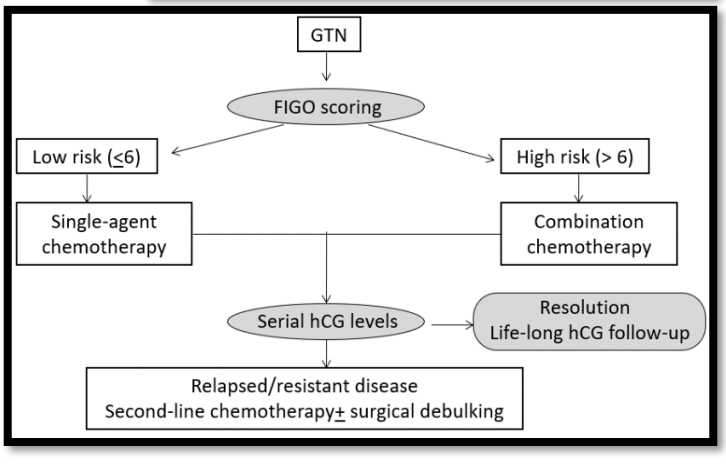
### Follow up in low risk GTN:

- Weekly β-hCG titer until normal for 3 consecutive weeks then monthly β HCG level for 12 consecutive months.

### High risk GTN:

1. Stage I, II, III with FIGO score 7 or greater or Stage IV

- Primary intensive combination chemotherapy and selective use of radiation and surgery.
- **Regimes given:**
  - EMA-CO [Etoposide, methotrexate, actinomycin D, alternating weekly with cyclophosphamide and oncovin]
  - EMA-EP




### Follow up in high risk GTN:

- Weekly β-hCG until normal for 3 consecutive weeks.
- Monthly β-hCG for 24 consecutive months.
- Contraception in follow up period.

# Antenatal Care

### First Visit:

- Confirmation of pregnancy [Urine pregnancy test]
- Booking history (past medical, obstetric, gynaecological & family history)
- Booking examination [BMI, BP etc]
- Investigations (blood group, CBC, urinalysis [MSU], Hbs-Ag, Anti-HCV, rubella)

- Dating the pregnancy (LMP, Ultrasound). Dating scan & first trimester screening is performed at the end of 1st trimester
- Start folic acid
- Educate (nausea, dizziness, heart burn)
- For normal weight women (BMI 18.5-24.9 kg/m$^2$), recommended total weight gain in pregnancy is **11-16 kg (25-35 lb)**

**Second Trimester:**

- **Anomaly scan (18-22 weeks)** [For spina bifida, major congenital anomalies, diaphragmatic hernia & renal agenesis].
- Ask about maternal perception of movement is called **quickening.** 16-18 wks in primigravida, 12-16 wks in multigravida
- Iron & Calcium supplements
- Abdominal Pain / Vaginal bleeding / Discharge
- Hypertension: Headache / Blurring of vision, Anemia, Diabetes
- Tetanus prophylaxis [vaccination]

**Subsequent Visit Schedule**

Generally
- At interval of 4 weeks up to 28 weeks
- At interval of 2 weeks up to 36 weeks
- At weekly interval up to EDD

As per WHO recommendation at least 4 visit
- 1st visit around 16 weeks
- 2nd visit between 24-28 weeks
- 3rd visit at 32 weeks
- 4th visit at 36 weeks

**Third Trimester:**

- **Growth Scan** (At every 2 weeks for high-risk pregnancy)
- Iron & Calcium supplements
- Polyuria / Dysuria / Burning micturition
- Recurrent infection
- **Labor Pain:** Duration, Intensity, Interval (Painful uterine contractions with decreasing interval and increasing intensity)
- Vaginal bleeding (antepartum hemorrhage), & vaginal discharge [Duration, Color, Amount, Associated pain]
- Anti-D prophylaxis

# Fetal Growth Restriction

- FGR is the **2nd leading cause of perinatal mortality** after preterm delivery.
- FGR is defined as a **failure of a fetus to achieve its genetic growth potential.** Usually results in a fetus that is SGA.
- Fetus that is < 10th centile is described as being **small for gestational age or** > 2 SDs below mean for gestational age

**Causes of fetal growth restriction:**

- **Reduced fetal growth potential**
  1. Aneuploidies, e.g., trisomy 18
  2. Single gene defects (e.g., Seckel's syndrome)
  3. Structural abnormalities (e.g., renal agenesis)
  4. Intrauterine infections (e.g., cytomegalovirus, toxoplasmosis)
- **Reduced fetal growth support**
- **Maternal factors:**
  1. Undernutrition – **globally the major cause of FGR** (e.g., poverty, eating disorders, BMI < 20)
  2. Maternal hypoxia (e.g., living at altitude, cyanotic heart disease)
  3. Drugs (e.g., alcohol, cigarettes, cocaine)
  4. **Hypertension** is **most common maternal complication causing IUGR.**
- **Placental factors:**
  1. Reduced uteroplacental perfusion **[In developed countries, most common cause of FGR],** sickle cell disease, antiphospholipid syndrome, multiple gestation)
  2. Reduced fetoplacental perfusion (e.g., single umbilical artery, twin-to-twin transfusion syndrome)

**Pregnancies at risk of FGR:**

- Multiple pregnancies
- History of FGR in previous pregnancy
- Current heavy smokers
- Current drug users
- Women with underlying medical disorders:
  - Hypertension
  - Diabetes
  - Cyanotic heart disease
  - Antiphospholipid syndrome
- Pregnancies where the SFH is less than expected

| Symmetrical IUGR | Asymmetrical IUGR |
|---|---|
| Incidence is 20 % | Incidence is 80 % |
| Effects begin early in gestation<br>Impairment of early fetal cellular hyperplasia [cell number] | Affects fetus in late second/third trimester<br>Growth inhibition in hypertrophic stage [cell size] |
| Most commonly intrinsic factors [fetal infections, chromosomal abnormality]. Decreased cellular immunity [due to small thymus]. | Uteroplacental insufficiency that leads to reduced $O_2$ transfer to fetus & impaired excretion of $CO_2$ by placenta |
| Irreversible | Reversible |
| Uniformly effect all organ systems. Head: abdomen ratio normal | Relative brain sparing. Head: abdomen ratio increased |
| Body/head circumference, length, weight reduced proportionally | Head circumference [normal], length [near normal], weight [significantly affected]. Abdominal circumference is affected to a greater degree than is HC |
| Ponderal index [birthweight/crown-heel length$^3$] is normal | Ponderal index is low |
| Poor prognosis | Good prognosis |

## ➢ Management:

- The **most precise way of assessing fetal growth is by ultrasound biometry-gold standard (**biparietal diameter [BPD], head circumference [HC], **abdominal circumference [AC] – most sensitive** and femur length [FL]**)** serially at set time intervals (usually of 4 weeks & no less than 2 weeks).
- **Low-dose aspirin** may have a role in the prevention of FGR in high-risk pregnancies but is not effective in treatment
- **Magnesium sulfate** has a neuroprotective role [decreases perinatal mortality, cerebral palsy & gross motor dysfunction]
- **Phosphodiesterase inhibitor, Sildenafil citrate** has the potential to increase uteroplacental circulation & perfusion.
- When growth restriction is severe & fetus is too immature, **bed rest in hospital [Left lateral position]** is usually advised to maximize placental blood flow. The aim of these interventions is to gain as much maturity as possible.

**Surveillance of the FGR fetus:**

- **Symphysiofundal height:** simple and inexpensive tool that can be used as the **primary screening strategy for FGR.** Symphysiofundal height normally increases by 1 cm per week between 14 and 32 wks. A lag in fundal height of 4 weeks is a sign of moderate IUGR and over 6 wks is a sign of severe IUGR
- **In the FGR fetus dynamic tests of fetal wellbeing include: [combination of these tests gives better result]**

1. **Umbilical artery Doppler wave form analysis [best test]:** Absence or reversal of diastolic flow in the UA is a sign of severe **hypoxemia & acidemia** & requires delivery in the near future.
2. **Fetal cardiotocography**
3. **The biophysical profile (BPP)**
4. **Daily fetal movement count (DFMC):** simple and inexpensive tool that may decrease the risk of stillbirth in pregnancies with FGR

## ➢ Delivery:

| Gestation | Indication for delivery | Mode of delivery |
|---|---|---|
| **<37 weeks** | Absent/reverse end-diastolic flow on Doppler | C-section |
| **By 37 weeks** | Abnormal UAD or MCA Doppler | Can offer induction |
| **At 37 weeks** | Normal UAD | Can offer induction |

- Every IUGR pregnancy must be individually assessed for optimal time of delivery. Most obstetricians recommend delivery from 34 wks & beyond
- **Absolute indications for delivery** irrespective of gestational age include biophysical profile or CTG/NST abnormalities, or severe pre-eclampsia, HELLP syndrome, or other types of end organ damage.
- **Vaginal delivery** can be allowed for mild FGR with no obstetric indication for C-section & normal fetal heart rate
- Administer glucocorticoids to women likely to deliver before 34 weeks, as would be done with any other pregnancy.
- **C-section indications:** fetal compromise, malpresentation, or where traumatic vaginal delivery might be expected.

# Rh Incompatibility

- Rhesus system comprises at least 40 antigens, the most clinically important of which are **C, D and E**. The d (little d) antigen has not been identified so it is probable that woman who is lacking Rh(D) is known as Rh-negative.
- Only anti-D and anti-c regularly cause HDFN & **anti-D is much more common** than anti-c.
- Occurrence of **haemolytic disease of the fetus & newborn [HDFN]** due to rh isoimmunization involves **3 key steps:**

1. **Firstly,** a rhesus-negative mother must conceive a baby who has inherited rhesus-positive phenotype from the father.
2. **Secondly,** fetal RBCs gain access to maternal circulation in a sufficient volume to provoke a maternal antibody response
3. **Finally,** maternal antibodies must cross the placenta and cause immune destruction of red cells in the fetus.

- Rhesus disease **does not affect a first pregnancy** as the **primary response is weak** & consists **primarily of IgM antibodies that do not cross the placenta**. However, in a subsequent pregnancy with a rhesus-positive baby, rhesus-positive rbcs pass from the baby to maternal circulation & cause maternal resensitization. On this occasion, **maternal B-cells** produce a **much larger response,** this time of **IgG antibodies** that can cross the placenta to the fetal circulation. If these antibodies are present in sufficient quantities, fetal haemolysis may occur, leading to **severe anaemia**

**Clinical Findings:**

- **Signs of fetal anaemia:**
  1. Polyhydramnios
  2. **Erythroblastosis fetalis [**extramedullary hematopoiesis, heart failure, edema, ascites & pericardial effusion]
  3. Enlarged fetal heart
  4. Hyperdynamic fetal circulation (detected by Doppler ultrasound by measuring increased velocities in MCA)
  5. Reduced fetal movements
  6. Abnormal CTG with reduced variability, eventually a 'sinusoidal' trace

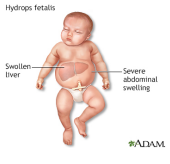
7. The destruction of the red cells continues up to 6 weeks after which the antibodies are not available for Haemolysis.
8. The liver and spleen are enlarged

- High serum bilirubin, with resultant **kernicterus** (bilirubin deposition in basal ganglia, when bilirubin >20mg/100 ml
- On ultrasound, **fetal hydrops** [edema of fetus] may be visualized, defined as presence of **any 2 of following:** pleural effusion, ascites, pericardial effusion, increased skin thickness [> 5 cm], polyhydramnios, or increased placental thickness

## ➢ Preventing rhesus isoimmunization:

- The process of isoimmunization can be prevented by **IM administration of anti-D immunoglobulins to a mother**.
- Anti-D immunoglobulins **clear any circulating rhesus-positive cells** before an immune response is excited in the mother. Administer anti-D after any **potential sensitizing events within 72 hours of exposure to fetal red cells.**

**Potential sensitizing events for rhesus disease:**




1. Miscarriage [Spontaneous/induced abortion]
2. Ectopic gestation
3. Termination of pregnancy
4. Antepartum haemorrhage [Placenta Previa, placental abruption]
5. Invasive prenatal testing (chorion villus sampling, amniocentesis and cordocentesis)
6. Delivery – 46 % [external cephalic version, manual removal of placenta, twin delivery and caesarean section]. Entry of fetal cell into maternal circulation mostly occurs at the time of expulsion of fetus
7. Transfusion of incompatible blood (rare)
8. Abdominal trauma, fetomaternal hemorrhage (through leaks in the placenta - 3rd stage)

- However, if, deadline cannot be met, some protection may still be offered if given **upto 10 days** after sensitizing event.
- **The exact dose is determined by** the **gestation at which sensitization has occurred** and the **size of the feto-maternal haemorrhage**. A **Kleihauer test of maternal blood** determines the proportion of fetal cells present in the maternal sample. It **relies on the ability of fetal RBCs to resist denaturation by alcohol or acid** and it allows calculation of the size of the feto-maternal transfusion and the amount of extra anti-D Ig required.
- **Current guidelines suggest** that all rhesus-negative pregnant women who have not been previously sensitized should be offered antenatal prophylaxis with anti-D, either with a **single dose regimen at around 28 weeks or a two-dose regimen given at 28- and 34-weeks' gestation.**
- If Rh negative, **check husband's blood group**. If husband is rh positive, perform **indirect coomb's test** for antibody screening for all pregnant mothers.

## ➢ Management of sensitizing events in the rhesus-negative pregnant woman:

- **In first trimester of pregnancy,** because the volume of fetal blood is so small, it is unlikely that sensitization would occur, and anti-D is only indicated following **ectopic pregnancy, molar pregnancy, therapeutic termination of pregnancy & heavy uterine bleeding, associated with abdominal pain**. The dose that should be given is **250 IU.**
- **For potentially sensitizing events between 12 & 20-weeks' gestation,** a dose of **250 IU** should be administered **within 72 hours** & a **Kleihauer test should be performed**. Further anti-D can be given if indicated by Kleihauer test.
- **For potentially sensitizing events after 20 weeks' gestation,** a Kleihauer test is required and pending the result, a **minimum anti-D Ig dose of 500 IU** should be administered **within 72 hours** of the event. Further anti-D can be given if indicated by the **Kleihauer test.**

## ➢ Management of rhesus disease in a sensitized woman:

- Once a woman who is D-rhesus negative has been sensitized to the D-rhesus antigen, **no amount of anti-D will ever turn the clock back**. In a subsequent pregnancy, close surveillance is required. Rhesus disease **gets worse** with successive pregnancies, so it is important to note the **severity of the disease in previous pregnancies**.
- If the father is Rh-positive, 2 possibilities exist: he is either homozygous or heterozygous. **If the father is homozygous, all of his children will be Rh-positive; if he is heterozygous, his children will have a 50% chance of being Rh-positive.**

**The management depends on the clinical scenario.**

- **The father of the next baby is D-rhesus negative.** In this situation there is no risk that the baby will be Rh positive
- In a sensitized woman, **if the father is D-rhesus positive,** standard management involves monitoring **antibody levels every 2-4 weeks from booking**. Antibody levels can be described using the titre or by using IU (international units) as a standard quantification method. If antibody levels rise, the baby should be examined for signs of anaemia.
  - **In the past,** amniocentesis has been used to determine amniotic fluid bilirubin levels optically & identify fetuses at risk of **severe anemia;** however, given the invasive nature of repeated amniocenteses [risks of miscarriage/preterm labour & further boosting of alloimmune response], USS for MCA Dopplers has widely replaced amniocentesis for this indication. If amniocentesis is used to monitor the fetus, the results (delta 450) are plotted on a **"Liley" curve.**

- In the last decade, non-invasive **middle cerebral artery (MCA) Dopplers** have been shown to correlate reliably with fetal anaemia. Fetal MCA blood flow is measured at **intervals of 1 to 2 weeks**. The purpose is to **detect high-output heart failure and fetal anaemia. Sensitivity is reported at 100 %** with a false-positive rate of 12 %. A fetus with a raised peak MCA velocity has a high probability of anaemia.

- **Treatment options include** delivery or fetal blood transfusion
- **Delivery** is an option if the fetus is sufficiently mature & generally **should not be before 36–37 weeks'** gestation
- **Fetal blood transfusion** is lifesaving in a **severely anaemic fetus** that is **too premature for delivery.** Intrauterine transfusions are generally performed between 18 and 35 weeks of gestation. Intravenous route [**Into umbilical vein**] is becoming increasingly the preferred method.
- First take a sample to **confirm anaemia** & then infuse the blood during a **single puncture**. **Transfused blood is:**
  - RhD negative
  - Crossmatched with a maternal sample
  - Densely packed (haemoglobin usually around 30 g/l) so that small volumes are used
  - White cell depleted and irradiated
  - Screened for infection including cytomegalovirus (CMV).

# Fetal Surveillance

## ➢ Fetal movement count [FMC]:

- Perception of 10 distinct movements in a period of upto 2 hours is considered reassuring
- Decreased placental perfusion, fetal acidemia & acidosis are associated with decreased fetal movements.

## ➢ Nonstress Test:

- Most commonly used test. The patient is placed in **semi-fowler's position**
- It involves attaching two belts around the belly as the mother lies down. While one belt measures the **baby's heartbeat,** the other one measures **uterine contractions**. When the child kicks or moves, a button needs to be pressed so doctors can see how the baby's heartbeat changes while there is movement. The test lasts for a duration of **20-30 minutes.**

## ➢ Important CTG features:

### 1. Baseline fetal heart rate:

- The normal fetal heart rate at term is 110–160 beats per minute (bpm).

### 2. Baseline variability:

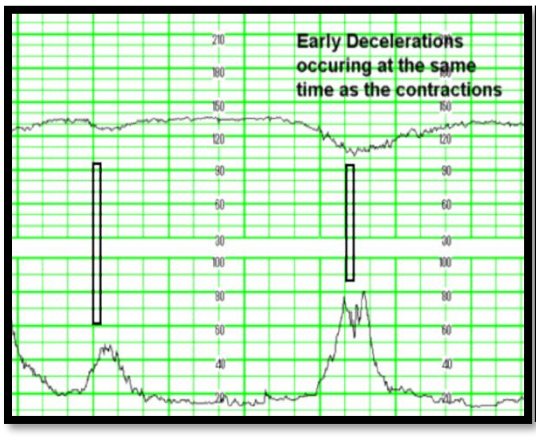
- The presence of moderate FHR variability [6-25 bpm] is reassuring

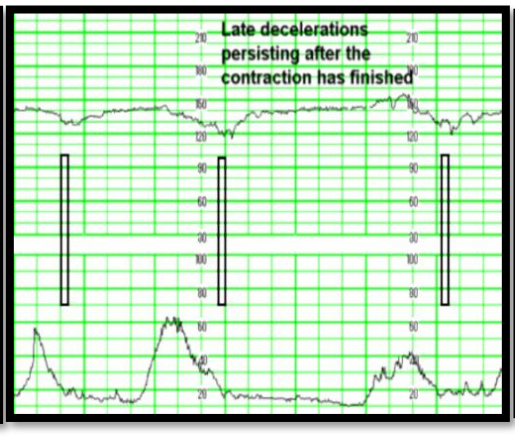
### 3. Fetal heart rate accelerations:

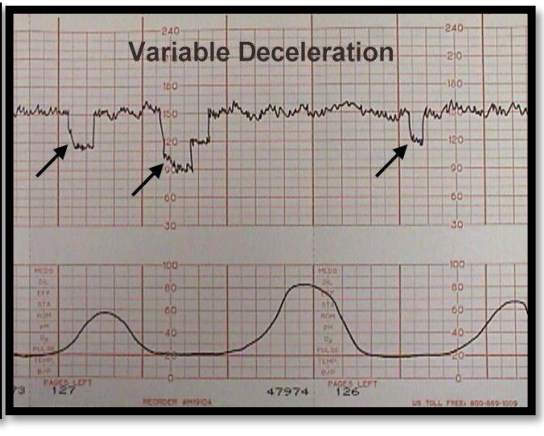
- These are **increases in the baseline fetal heart rate of at least 15 bpm, lasting for at least 15 seconds.**
- The presence of ≥ 2 accelerations on a 20–30-minute CTG defines a reactive trace & is indicative of a non-hypoxic fetus.

### 4. Fetal heart rate decelerations:

- These are **transient reductions in fetal heart rate of 15 bpm or more, lasting for more than 15 seconds.**
  1. **Early deceleration** – Early decelerations start when the uterine contraction begins and recover when uterine contraction stops**.** This is a sign of **head compressions**
  2. **Late decelerations** – Late decelerations begin at the peak of the uterine contraction and recover after the contraction ends**.** It indicates **uteroplacental insufficiency.**
  3. **Variable decelerations** – They are variable in their duration and may not have any relationship to uterine contractions. They are signs of **cord compressions.**



## ➢ Biophysical Profile [BPP]:

- A biophysical profile includes four acute fetal variables: FBMs, fetal gross body movement, fetal tone and CTG & amniotic fluid volume.
- The test uses ultrasound to look at fetal movement, fetal body tone, fetal breathing efforts, and amniotic fluid volume. A high score (8-10) correlates with a fetus in good condition, while a low score (0-4) often indicates a fetus who might be better off receiving appropriate care outside uterus. A score of 6 requires a repeat test within 12-24 hrs.
- Oligohydramnios indicates abnormal BPP regardless of total score.

**Biophysical profile scoring system**

| Parameter | Score 2 | Score 0 |
|---|---|---|
| Non-stress cardiotocograph | Reactive | Fewer than two accelerations in 40 minutes |
| Fetal breathing movements | ≥30 movements in 30 minutes | Fewer than 30 seconds of fetal breathing in 30 minutes |
| Fetal body movements | ≥3 movements in 30 minutes | Two of fewer gross body movements in 30 minutes |
| Fetal tone | One episode of limb flexion | No evidence of fetal movement or flexion |
| Amniotic fluid volume | Large cord-free pocket of fluid over 1 cm | Less than 1cm pocket of fluid |

# Anemia in Pregnancy

- **Anaemia in pregnancy** is defined as a haemoglobin (Hb) < 110 g/l in first trimester, < 105 g/l in second & third trimesters & < 100 g/l in the postpartum period.
- **By WHO,** Hemoglobin < 11 gm/dl (or haematocrit < 32 %).

| | |
|---|---|
| Mild anaemia | 9-10.9 gm/dl |
| Moderate anaemia | 7-8.9 gm/dl |
| Severe anaemia | < 7 gm/dl |
| Very severe anaemia | < 4 gm/dl |

## ➢ Iron Deficiency Anemia:

- Iron deficiency is responsible for **95 %** of the anemias during pregnancy, reflecting the increased demands for iron.
- The symptoms may be vague and nonspecific, including pallor, easy fatigability, headache, palpitations, tachycardia, and dyspnea. Angular stomatitis, glossitis, & koilonychia (spoon nails) may be present in longstanding severe anemia. **Symptoms of severe anemia includes** palpitation, fatigue, giddiness, breathlessness.

**Laboratory findings:**

- The red cells usually are hypochromic and microcytic
- **Serum ferritin concentrations fall** to < 15 µg/dL and transferrin saturation to < 16%.
- Serum iron levels usually are < 60 µg/dL (< 12 micro mol/l)
- TIBC increased
- **RBC Indices:** Low MCV [< 79 fL], MCH, MCHC, PCV

- Iron required for fetus and placenta ------- 500 mg.
- Iron required for red cell increment ------- 500 mg
- Post partum loss --------- 180 mg
- Lactation for 6 months – 180 mg
- Total requirement ------- 1360 mg
- 350 mg subtracted (saved as a result of amenorrhea)
- So actual extra demand --------- 1000 mg
- Full iron stores --------- 1000 mg

**Complications:**

- **Mother:** High output cardiac failure, PPH, predisposes to infection, risk of thrombo-embolism
- **Fetus:** IUGR, preterm birth, LBW, depleted iron store, delayed cognitive function. Severe anemia has been associated with reduced fetal oxygenation, abnormal fetal heart tracing, low amniotic fluid volume, and intrauterine fetal demise.

**Treatment:**

- **Choice of method depends on three main factors:**
  1. Severity of the anaemia
  2. Gestational age
  3. Presence of additional risk factor
- Recommended supplementation for non-anaemic woman with a history of IDA: **30 – 60 mg/day** of elemental iron
- Anaemic gravidas **120 – 240 mg/day.**
- Iron is best absorbed in ferrous or reduced form, from an empty stomach. Administering ascorbic acid via supplement or citrus juice at the time of iron supplementation creates a mildly acidic environment that aids absorption of iron.

■ 1st Trimester
1. Mild Anemia – Oral Iron
2. Moderate Anemia – Oral Iron
3. Severe Anemia/Symptomatic – Blood Transfusion

■ 2nd Trimester
1. Mild Anemia – Oral Iron with Double dose
2. Moderate Anemia – Oral Iron/Parenteral Iron
3. Severe Anemia – Blood Transfusion

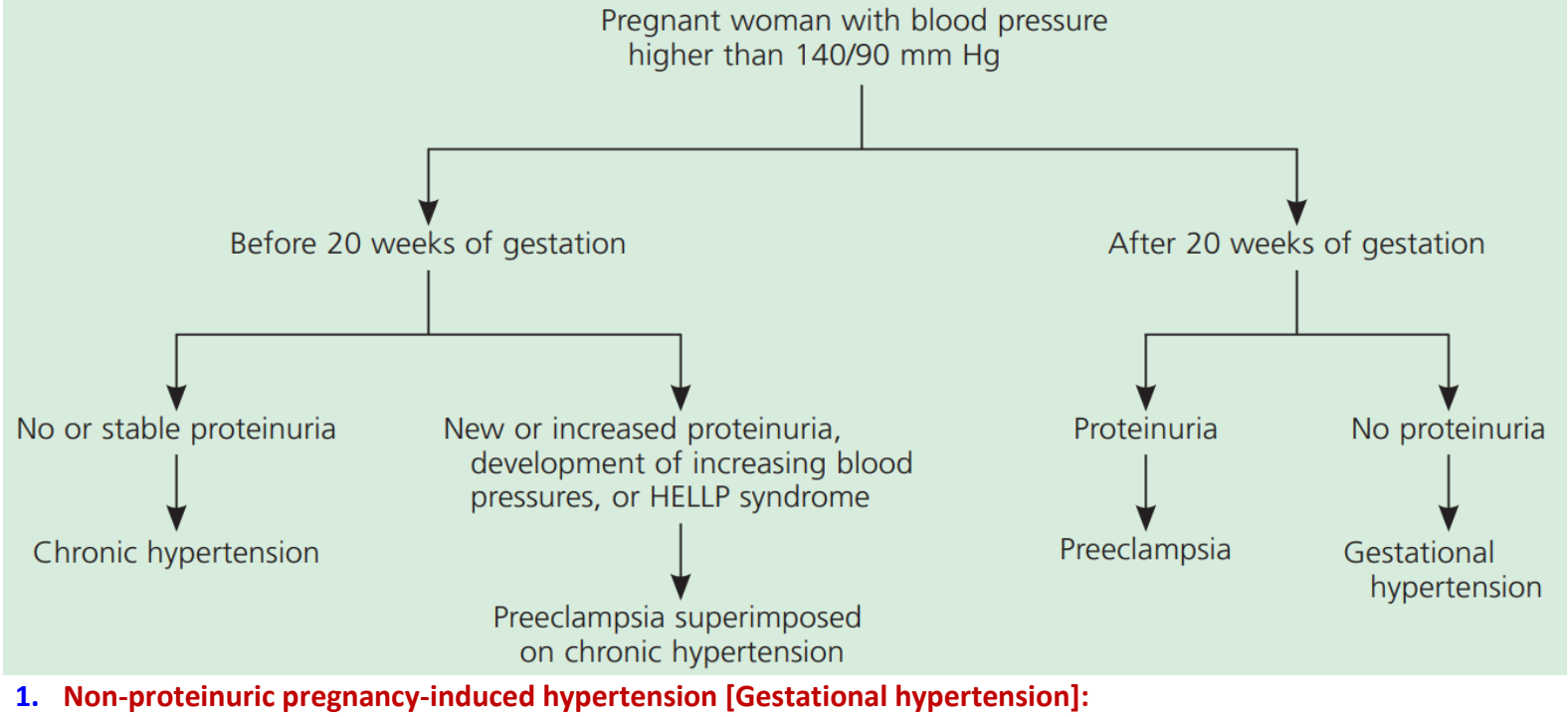
■ 3rd Trimester
1. Mild to Moderate – Parenteral Iron/IV or IM Iron
2. Severe – Packed Cells

- **Ferrous sulfate** 300 mg (60 mg of elemental iron, of which 10% is absorbed) should be given 3 times per day
- Therapeutic results after 3 weeks – **rise in Hb % level of 0.8 gm/dl/week** with good compliance.
- In severe anaemia preferably parenteral therapy [IM or IV]. **Iron dextran** is most widely available parenteral [IV] iron preparation. Dose given I/M or I/V by slow push 100 mg/day or the entire dose given in 500 ml N/S slow I/V infusion over 1-6 hours. Marked increase in reticulocyte count expected in 7-14 day.
- **Blood transfusion** may be required to treat severe anaemia near term or when some other complication such as placenta praevia present.

- Packed red cells transfusion (Under cover of loop diuretic)
- Exchange transfusion (Under cover of loop diuretic)

# Hypertensive Disorders of Pregnancy

- Hypertension is common in pregnancy. 1 in 10 women will have one or more episodes of raised BP prior to delivery.




## 1. Non-proteinuric pregnancy-induced hypertension [Gestational hypertension]:

- Hypertension that arises for the first time in 2nd half of pregnancy and in the **absence of proteinuria**. It is not associated with adverse pregnancy outcome & do not require treatment. BP normalizes 12 weeks postpartum. However, up to 1/3rd of women who present with gestational hypertension will progress to pre-eclampsia.
- **Management:** plan delivery ≥ 37 weeks. Preterm delivery if adverse maternal/fetal condition [after steroid cover]. After delivery continue antihypertensive treatment if required. Stop methyldopa & change to alternative treatment

## 2. Chronic Hypertension:

- Hypertension with onset before pregnancy or before 20th week of gestation or persistence of hypertension beyond 12 weeks postpartum. Chronic hypertension can predispose to the later development of **superimposed pre-eclampsia** [pre-eclampsia or eclampsia that occurs in a woman with pre-existing chronic hypertension].
- **Methyldopa is the first-line antihypertensive agent** in pregnancy for chronic hypertension. Goal: < 135/85 mm Hg.

## 3. Pre-eclampsia:

- Hypertension of at least **140/90 mmHg** recorded on at least **2 separate occasions & at least 4 hours apart** & in the presence of at least **300 mg protein in a 24-hour collection of urine,** arising de novo **after the 20th week of pregnancy** in a previously normotensive woman & **resolving completely by the 6th postpartum week**

### Clinical presentation:

- The classic symptoms of pre-eclampsia include a **frontal headache, visual disturbance and epigastric pain [RUQ pain]**. However, the majority of women merely complain of general vague **'flu-like' symptoms.**
- **Rapidly progressive oedema of face & hands** [first sign].
- **Epigastric tenderness** is a worrying sign and suggests liver involvement.
- **Neurological examination** may reveal **hyperreflexia [at the ankle]** & **clonus in severe cases.** > 3 beats of clonus are pathological.

### Complications related to preeclampsia:

- Preterm birth, FGR, oligohydramnios, placental abruption, maternal pulmonary edema & eclampsia

### Severe Symptoms:

- Systolic BP ≥ 160 or diastolic BP ≥ 110, 2 occasions, 4 hours apart, on bed.
- Thrombocytopenia [platelets < 100,000/ml]

### Risk factors for pre-eclampsia

- First pregnancy.
- Multiparous with a previous history of pre-eclampsia.
- Pre-eclampsia in any previous pregnancy.
- 10 years or more since last baby.
- Age 40 years or more.
- Body mass index (BMI) of 35 or more.
- Family history of pre-eclampsia (in mother or sister).
- Booking diastolic blood pressure of 80 mmHg or more.
- Booking proteinuria ( of ≥1+ on more than one occasion or quantified at ≥0.3 g/24 h).
- Multiple pregnancy.
- Certain underlying medical conditions:
  - pre-existing hypertension;
  - pre-existing renal disease;
  - pre-existing diabetes;
  - antiphospholipid antibodies.

- Elevated LFTS (2 times normal), severe persistent RUQ/epigastric pain unresponsive to medications & no diagnosis
- Progressive renal insufficiency (creatinine > 1.1 mg/dl or doubling of creatinine concentration in absence of renal disease). Reduced urine output < 30 cc/hr may indicate severe disease
- Pulmonary edema
- New onset cerebral or visual disturbance (scotomata, blurry vision, loss of vision)

**Effects of Pre-Eclampsia on Organ:**

- **Cardiovascular system:** marked peripheral vasoconstriction, & generalized edema.
- **Renal system:** proteinuria leads to reduction in plasma oncotic pressure & edema. Acute renal failure may occur.
- **Haematological system:** reduction in platelet, DIC & pulmonary embolism may occur.
- **Liver: HELLP syndrome** (**H**aemolysis, **e**levation of **l**iver enzymes and **l**ow **p**latelets). HELLP syndrome is a severe form of pre-eclampsia**,** associated with high fetal loss rate (60%). Women with HELLP syndrome typically present with **epigastric pain, nausea and vomiting**. Hypertension may be mild or even absent. The hallmark of the disorder is **microangiopathic hemolysis** leading to **elevation of serum lactate dehydrogenase** & **fragmented rbcs on peripheral smear**. **Management involves** stabilizing mother, correcting any coagulation deficits & assessing fetus for delivery. Maternal complications include jaundice, subcapsular/intrahepatic hematoma, & hepatic rupture.
- **Neurological system:** The development of convulsions in a woman with pre-eclampsia is defined as eclampsia. Maternal CNS complications include cerebral hemorrhage & infarction, **hypertensive encephalopathy,** posterior reversible encephalopathy syndrome, status epilepticus, altered mental status, cortical blindness.

## ➢ Management and treatment:

**Investigations:**

- Doppler studies of uterine artery in 1st & early 2nd trimester may be used to predict pregnancies at risk of pre-eclampsia
- **To monitor maternal complications:**
  - FBC (falling platelets & rising haematocrit). If platelet values are normal, additional clotting studies are not indicated
  - Serum renal profile (elevated serum uric acid)
  - Serum liver profile [elevated levels of lactate dehydrogenase & serum transaminases]
- **To monitor fetal complications: Ultrasound assessment of:**
  - Fetal size
  - Amniotic fluid volume
  - Maternal and fetal Dopplers
  - Nonstress test [Biophysical profile]
- **Low dose aspirin (75 mg daily)** reduces risk of pre-eclampsia in high-risk women; initiated early in pregnancy [late 1st trimester] until delivery. **Calcium supplementation** may also reduce risk, but only in women with low dietary intake.

**Women with mild preeclampsia:**

- Women with mild preeclampsia are **hospitalized** for further evaluation and, if indicated, delivery.
- If mild preeclampsia is confirmed & the gestational age is **40 weeks** or greater, delivery is indicated.
- At gestational ages of **37-40 weeks, cervical status is assessed** &, if favorable, induction is initiated.
  - If cervical status is unfavorable, preinduction cervical ripening agents are used as needed.
  - Occasionally, women with very unfavorable cervical examinations may be managed expectantly for a limited time with bed rest, antepartum fetal surveillance & close monitoring of maternal condition, including **BP measurement every 4–6 hours** & **daily assessment of patellar reflexes,** weight gain, proteinuria, & symptoms. A CBC & levels of serum transaminases, lactate dehydrogenase, and uric acid should be checked weekly to twice weekly.
- Women with mild preeclampsia **before 37 weeks' gestation** are managed expectantly with bed rest, twice weekly antepartum testing, and maternal evaluation.
- **Prior to 34 weeks' gestation, steroids should be given IM** to the mother to reduce the chance of neonatal RDS.
- **Delivery before term is often by C-section.** Such patients are at particularly **high risk for thromboembolism** and should be given prophylactic **subcutaneous heparin** & issued with **antithromboembolic stockings.**

**Severe preeclampsia** mandates **hospitalization.**

- **Delivery is indicated** if the gestational age is **34 weeks or greater,** fetal pulmonary maturity is confirmed, or evidence of deteriorating maternal or fetal status is seen. Acute BP control may be achieved with **IV hydralazine, IV labetalol, or oral nifedipine [first line drugs].** The goal of antihypertensive therapy is < 160/105 mm Hg.
- Management of severe preeclampsia **before 34 weeks** is controversial. Delivery is delayed for a limited period of time to permit the **administration of corticosteroids**. **Magnesium sulfate is initiated** [loading dose is 4 g diluted in 100

ml fluid given IV over 20 minutes, maintenance dose is 1 g/hour], fetal status is monitored continuously & antihypertensive agents are used as needed to maintain a systolic BP < 160 mm Hg & diastolic BP < 105 mm Hg.

- **Between 33 & 35 weeks:** If lungs are mature, immediate delivery is indicated.
- **Between 24 & 32 weeks,** antihypertensive therapy is instituted as indicated, corticosteroids are administered.

**Intrapartum Management of Preeclampsia:**

- In women with preeclampsia without contraindications to labor, **vaginal delivery is the preferred approach**.
- If magnesium sulfate is used for seizure prophylaxis, it is administered as an **IV loading dose of 4 g over 20–60 minutes,** followed by a **maintenance dose of 1 g/h.** Urine output and serum creatinine level are monitored, and the magnesium dose is adjusted accordingly to prevent hypermagnesemia. **Patellar reflexes and respiratory rate should be assessed frequently.** In presence of patellar reflexes, serum magnesium levels usually are unnecessary. **Therapeutic magnesium levels range from 4-8 mg/dL. Loss of patellar reflexes** is observed at magnesium levels of ≥ 10 mg/dl, **respiratory paralysis** occur at levels of ≥ 15 mg/dl, & **cardiac arrest** is possible with levels in excess of 25 mg/dL. **Calcium gluconate (10 mL of 10% solution) should be available in the event of hypermagnesemia.**
- To avoid pulmonary edema, total IV fluids should not exceed 100 mL/h.
- Pain control is achieved with **regional anesthesia** or with intramuscular or IV narcotic analgesics.
- If C- section is required, platelets should be available for patients with **platelet counts < 50,000/mm$^3$.**

**Treatment of hypertension:**

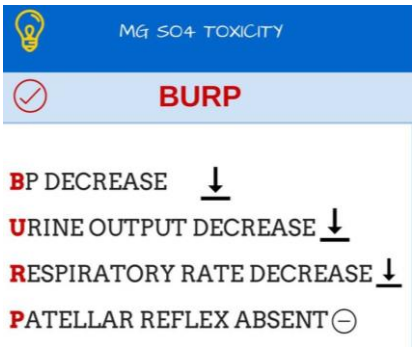
- Commonest cause of death in pre-eclampsia is **cerebral bleeding secondary to uncontrolled systolic BP**.
- **Methyldopa** is a centrally acting antihypertensive agent. It can only be given orally; it takes 24 hrs to take effect
- **Labetalol** is an alpha-blocking and beta-blocking agent. It has a good safety record in pregnancy and can be given orally and intravenously. It is the **first drug of choice** in most national guidelines including the current NICE guideline.
- **Nifedipine,** a calcium channel blocker with rapid onset of action. It causes **severe headache** [mimic worsening disease]
- **In severe fulminating disease,** IV infusion of hydralazine or labetalol can be titrated rapidly against changes in BP.

## ➢ Eclampsia:

- Eclampsia is defined as the presence of one or more **generalized [grand mal] tonic–clonic convulsions** &/or coma in a woman with pre-eclampsia and in the absence of any other identifiable cause.
- In most cases, eclamptic seizures are self-limited, lasting 1–2 minutes.
- **S/s:** persistent occipital or frontal headache, blurred vision, photophobia, epigastric or RUQ pain, altered mental status
- **Cerebral haemorrhage** has been reported to be the **most common cause of death** in patients with eclampsia
- **Risk factors:** uncontrolled hypertension, primigravidity, obesity, black ethnicity, history of diabetes and age < 20 years.
- **Warning signs:** epigastric pain and right upper quadrant tenderness, headache, uncontrolled hypertension, agitation, hyper-reflexia and clonus, facial (especially periorbital) oedema, poor urine output, papilloedema.

**Management:**

- Call senior help and emergency alert team. Initial approach is similar to the collapsed patient with a focus on ABC.
- **The drug of choice for the treatment of eclampsia is IV magnesium sulphate** [reduce further convulsions]
- Magnesium sulphate should also be used in women with severe pre-eclampsia to prevent the onset of convulsions.
- **IV loading dose of 4 g** is given followed by a **maintenance infusion of 1 g/hour** generally **for 24 h** after last seizure
- Magnesium sulphate overdose can cause **respiratory depression** and ultimately **cardiac arrest**.
- The **antidote** is **10 ml 10% calcium gluconate** **given slowly IV**
- Antihypertensive medication to control BP if it is dangerously high
- Once the patient has been stabilized, delivery is indicated.




# Diabetes in Pregnancy

- **Human Placental Lactogen,** which **increases up to 30-fold during pregnancy,** is thought to be the hormone mainly **responsible for insulin resistance and lipolysis.** Maternal **cortisol** levels, which likewise rise during pregnancy, may also contribute to insulin resistance by stimulating endogenous glucose production and glycogen storage and decreasing glucose utilization.
- GDM is defined as any degree of glucose intolerance with onset or first recognition during pregnancy
- The hallmark of GDM is **insulin resistance,** and as such, it is etiologically similar to type 2 diabetes.

**Risk Factors:**

- Age > 35–40 years
- Obesity (nonpregnant body mass index [BMI] >30 kg/m$^2$)
- Prior history of GDM
- Heavy glycosuria (> 2+ on dipstick)
- History of unexplained stillbirth
- Previous macrosomia (≥ 4.5 kg)
- Polycystic ovarian syndrome
- Strong family history of diabetes [first degree relative]
- Women of Asian, black Caribbean or Middle Eastern origin

| | 100-g GTT Plasma/Serum Level (mg/dL) (Carpenter/ Coustan) | 100-g GTT Plasma Level (mg/dL) (National Diabetes Data Group) | 75-g GTT Plasma Level (mg/dL) (IADPSG) |
|---|---|---|---|
| Fasting | 95 | 105 | 92 |
| 1-hour | 180 | 190 | 180 |
| 2-hour | 155 | 165 | 153 |
| 3-hour | 140 | 145 | – |

**Screening:**

- **If risk factors are present,** woman should be offered a **2-hour 75 g oral glucose tolerance test at 24-28 weeks' gestation**. **Women with a previous history of GDM** should have an **oral glucose tolerance test at 16-18 weeks' gestation.** The test should be repeated at 24–28 weeks of pregnancy.
- The **NICE guidelines** recommend a diagnosis of GDM with a **fasting glucose ≥ 5.6 mmol/l** and/or a **2-hour (post-75 g glucose load) of 7.8 mmol/l.** **[for converting mmol/l to mg/dl, multiply mmol/l by 18]**
- The **WHO guidelines** recommend a diagnosis with a **fasting glucose of 5.1 mmol/l** and/or a **1-hour (post 75 g glucose load) of 10.0 mmol/l** or **2-hour of 8.5 mmol/l.**

**Complications:**

- **Maternal:** Preeclampsia, gestational hypertension, subsequent development of type 2 diabetes, Cesarean delivery, vaginal laceration, & postpartum hemorrhage
- **Neonatal:** Neonatal hypoglycemia [Fetal hyperinsulinaemia, with maternal DM], hyperbilirubinemia [Neonatal jaundice], hypocalcemia & RDS [Insulin inhibits cortisol's maturational effects]
- **Fetal:** Stillbirth, **macrosomia** [increase in subcutaneous fat and visceromegaly. Shoulder dystocia with resultant birth injury, in particular Erb's palsy, is the most feared fetal complication] & increased risk of obesity and impaired glucose tolerance later in life.

- **Treatment:**
  - At time of diagnosis, dietary counseling is provided, and patients are prescribed a 1800–2400 kcal/d diabetic diet.
  - Diet should be **40% carbohydrate, 40% fat, and 20% protein** usually divided into 3 meals and 2 or 3 snacks per day.
  - As with pregestational diabetes, treatment of GDM that has failed treatment with dietary modification alone typically starts with **insulin as first-line therapy**. However, a number of studies have demonstrated that oral hypoglycemics such as glyburide & metformin are efficacious at achieving glycemic control with a favorable safety profile for the fetus.
  - **Intrapartum Management:** As with women with pregestational diabetes, the goal of intrapartum management of women with GDM is to **avoid maternal hyperglycemia** and thus **minimize the risk of neonatal hypoglycemia** after delivery. **Glucose infusion** is provided to all patients in labor as **5% dextrose in lactated Ringer's solution** or a similar crystalloid. **Monitor glucose** levels every **2–4 hours in early labor** and **every 1–2 hours in active labor.**
  - If fetal well-being cannot be demonstrated, expeditious delivery, often by caesarean section, is indicated.

# Antepartum Hemorrhage

- Vaginal bleeding from 24 weeks to delivery of the baby is defined as an antepartum haemorrhage (APH).
- **Most common causes of 3rd trimester vaginal bleeding are** abruptio placentae [1/3], placenta previa, vasa previa

## Abruptio Placentae:

MCQ

- Placental abruption is defined as the premature separation of the normally implanted placenta from the uterine wall **after 24 weeks of gestation** but prior to the delivery of infant. It is **more dangerous for the fetus** than the mother.
- **Risk factors: hypertension (preeclampsia),** previous abruption, trauma to the maternal abdomen, smoking, cocaine, polyhydramnios, multiple pregnancy, thrombophilias, advanced maternal age, PPROM, FGR, multigravida [≥ 5]

**Clinical Presentation:**

- **Vaginal bleeding, abdominal pain,** sweating, shock, hypotension, tachycardia, absence or reduced fetal movements & tense, rigid, painful abdomen.
- A pale, tachycardic woman looking anxious with a painful, firm abdomen, underwear soaked in fresh blood and reduced fetal movements needs emergency assessment and management for a possible placental abruption.

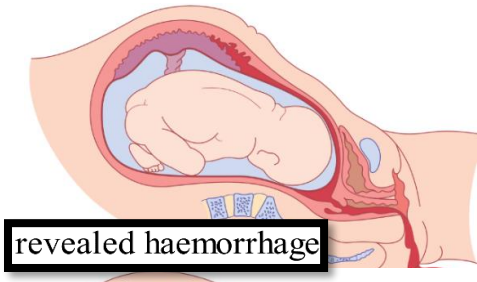
- **Warning signs:** maternal collapse, feeling cold, light-headedness, restlessness, distress and panic, painful abdomen, vaginal bleeding.

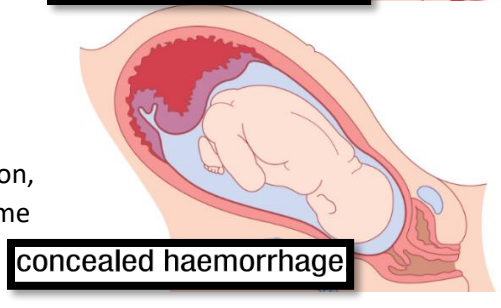
**Investigations:**

- If **ultrasound** is performed during early phases, area of hemorrhage will appear **isoechoic or hyperechoic** compared with the echogenicity of placenta.

**Complications:**

- Hemorrhage [revealed/concealed], hemorrhagic shock, renal failure [oliguria & anuria], PPH, DIC, puerperal sepsis, sheehan's syndrome, fetal deaths are due to prematurity and anoxia due to placental separation



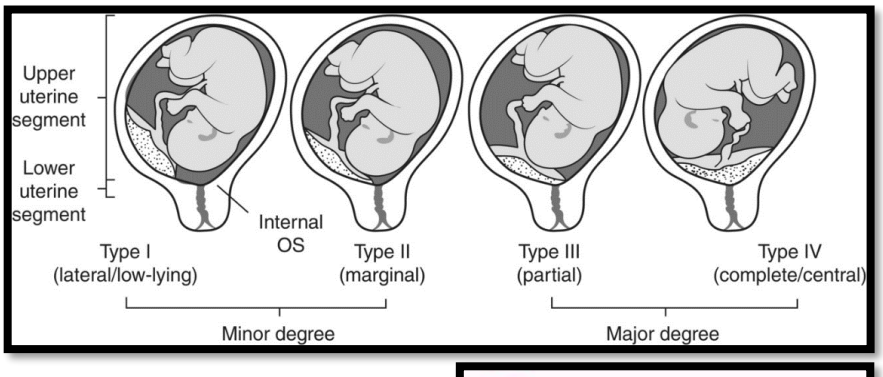




## ➢ Treatment:

- **Emergency measures:** blood is sent for Hb, cross match & hematocrit estimation, coagulation profile (fibrinogen level, FDP, PT, activated partial thromboplastin time & platelets), ABO & Rh grouping & urine for detection of protein
- **Two large-bore intravenous lines** should be placed
- **Crystalloid infusion** should be started **to correct volume deficit**, & **packed rbcs should be given if severe anemia** is evident or if there is continued uterine bleeding. **Urine output** should be maintained **above 30 mL/h**.
- If no transfusion is required immediately, 4 units of packed RBCs should be crossed and held nearby.
- **Fresh frozen plasma** should be administered for a **fibrinogen level < 100 mg/dL**
- **Platelets should be given if platelet count is < 20,000** or < 50,000 for a patient with severe continued hemorrhage or a requirement for emergent C-section.
- If bleeding settles, the woman must be **admitted for 48 hrs,** as the risk of re-bleeding is high within this time frame.
- Rhesus status is important: if the mother is rhesus negative, send a **Kleihauer test** & **administer 300 mcg anti D.**
- When there is substantial vaginal bleeding, (> 500 ml) antenatal **corticosteroids [dexamethasone]** should be considered if gestation is under 35 weeks as the risk of **preterm delivery** is significant.

## Placenta praevia:

- A placenta covering or encroaching on cervical os may be associated with bleeding, either provoked or spontaneous.
- May be defined as placenta situated within 5 cm from internal os. Placenta praevia is most dangerous for the mother.
- **Risk factors:** multiple gestation, **previous caesarean section,** uterine structural anomaly, assisted conception.
- **Warning signs:** low-lying placenta at 20-week anomaly scan, maternal collapse, feeling cold, light-headedness, restlessness, distress and panic, painless vaginal bleeding.
- **Types:** For clinical purpose, the types are graded into **mild degree** (Type-I and II anterior) and **major degree** (Type-II posterior [dangerous placenta previa], III and IV).




**Clinical presentation:**

- **Bright red vaginal bleeding** which is **sudden in onset, painless, apparently causeless & recurrent.**
- The bleeding **may trigger preterm labour** so often patients with bleeding from placenta praevia will have irregular abdominal pain associated with uterine contractions.
- In 1/3rd of cases, there is a **warning hemorrhage** which is usually slight.

**Diagnosis:**

- A placenta praevia is diagnosed using **transvaginal ultrasound,** to allow accurate measurement of the placental edge from the internal os.


### Mode of Delivery in Placenta previa

1. When it is *Type I* and *Type IIA* with cephalic presentation and no fetal distress, the mode of delivery is a vaginal delivery
2. When it is *type IIB* or *III* or *IV*, the mode of delivery is Caesarean section
3. If a patient presents with massive bleeding, the patient should be resuscitated and Caesarean section performed irrespective of the gestational age.

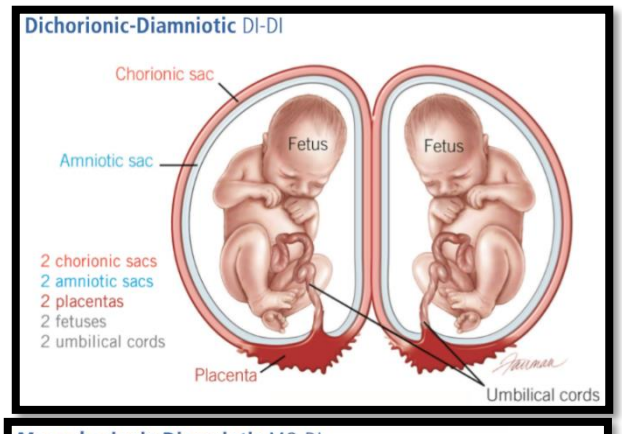
| Clinical Features | Placenta Previa | Placental Abruption |
|---|---|---|
| Nature of Bleeding | 1. Painless, apparently causeless & recurrent<br>2. Bleeding is always revealed | 1. Painfull, often attributed to pre-eclampsia or trauma & continuous<br>2. Revealed, concealed or usually mixed |
| Character of Blood | Bright red | Dark colour |
| General condition & anemia | Proportionate to visible blood loss | Out of proportion to visible blood loss in concealed or mixed variety |
| Features of Pre-eclampsia | Not relevant | Present in 1/3rd of cases |
| **Abdominal Examination** | | |
| Height of uterus | Proportionate height to gestational age | May be disproportionality enlarged in concealed hemorrhage |
| Feel of uterus | Soft & relaxed & elastic with no tenderness | May be tense, tender & rigid [woody] |
| Malpresentation | Common [breech/transverse/unstable lie]<br>The head high floating [head displacement] | Unrelated<br>The head may be engaged |
| FHS | Usually, present | Usually absent especially in concealed type |
| Placentography [USG] | Placenta In lower segment | Placenta in upper segment |
| Vaginal examination | Contraindicated, only done prior to termination of pregnancy | Placenta is not felt in lower segment. Blood clots should not be confused with placenta |
| | | |

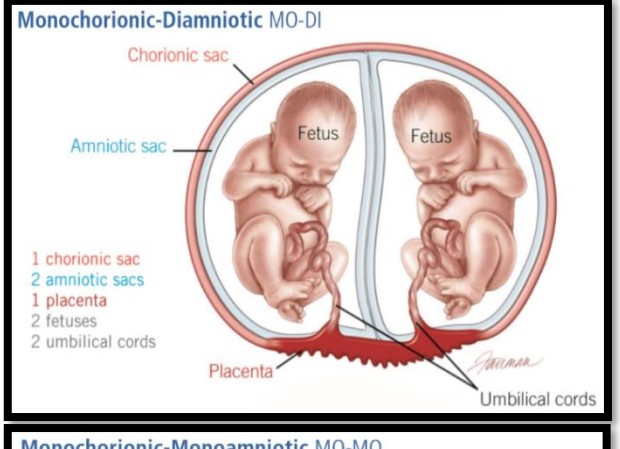
# Multiple Pregnancy

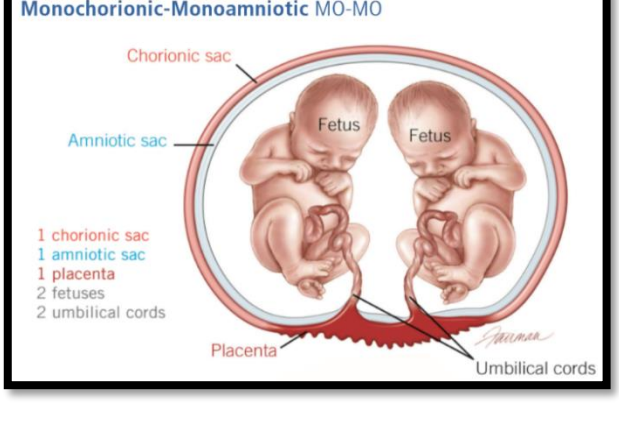
- Rates of multiple pregnancies continue to increase, due to increased use of **fertility drugs** & **in vitro fertilization**
- A history of previous dizygotic twins increases the likelihood of multiple gestation in a future pregnancy 10-fold.

**Aetiology:**

- **Multiple pregnancy may be classified according to:**
  1. Number of fetuses: twins, triplets, quadruplets, etc.
  2. Number of fertilized eggs: zygosity
  3. Number of placentae: chorionicity
  4. Number of amniotic cavities: amnionicity
- **Dizygotic twins (non-identical) [70 %]** occur from ovulation & subsequent **fertilization of 2 oocytes**. This results in **dichorionic diamniotic twins,** where each fetus has its own placenta & amniotic cavity. The fetuses can be either same-sex or different-sex pairings. It is more common among women who become pregnant soon after **cessation of long-term oral contraception.**
- **Monozygotic (identical) [30 %]** pregnancies result from **fertilization of a single ovum** with subsequent division of the zygote. Monozygotic twins are always of the **same sex**. If the zygote splits shortly after fertilization, the twins will each have a separate placenta and thus will be dichorionic diamniotic. **Monochorionic diamniotic** (20 %) pregnancies occur when division of the zygote occurs between days **4 & 8** post-fertilization. **Monochorionic monoamniotic** (1 %) pregnancy occurs when division occurs between days **8 & 12** post- fertilization & finally **conjoined twins** occur when division of the zygote happens **after day 13**.




## ➢ Complications of multiple pregnancy:

- All physiological changes of pregnancy, including increased cardiac output, volume expansion, diaphragmatic splinting, weight gain & lordosis, are exaggerated in multiple gestations.
- **Maternal complications include** maternal hypochromic normocytic anemia [2-3 times], urinary tract infection [2 times], hypertensive [3 times] & thromboembolic disease, antepartum and postpartum haemorrhage. Placenta previa develops more

frequently because of the large size of the placenta or placentas. Placenta previa may be responsible for antepartum bleeding, malpresentation, or unengagement of the first fetus.

- Maternal bleeding in the first trimester can indicate **threatened or spontaneous abortion**
- **Fetal complications include** preterm birth, FGR, cerebral palsy & stillbirth. Intracranial injury is more common in premature infants, even those delivered spontaneously. Fetal malpresentation is also common.
- The **commonest & most serious complications of dichorionic diamniotic pregnancies** is **preterm delivery**.
- **For monochorionic twins, chance of preterm delivery is increased even further**. Perinatal mortality [RDS accounts for 50% of perinatal mortality – 2nd twin] for monochorionic twins is estimated at 30 per 1000. Monochorionic monoamniotic twins have increased risk of congenital anomalies like neural tube defects [anencephaly and holoprosencephaly] & abdominal wall & urinary tract malformations.
- **Monochorionic diamniotic pregnancies** are also at risk of twin-to-twin transfusion syndrome (TTTS) and, more rarely, twin anaemia–polycythaemia sequence (TAPS).
- **Twin-to-twin transfusion syndrome:** If abnormal unbalanced vascular connections [especially arteriovenous] occurs in one direction than the other, alterations in the hydrostatic and osmotic forces occur, resulting in TTTS.
  - **Recipient twin** is plethoric, edematous, & hypertensive. Heart, liver, & kidneys are enlarged. **Hydramnios follows fetal polyuria**. The recipient twin with hypervolemia may die of heart failure during the first 24 hours after birth.
  - **Donor twin** is small, pallid, & dehydrated. **Oligohydramnios** may be present. Severe anemia, due to chronic blood loss to the other twin, may lead to hydrops and heart failure.
- **TAPS** is a rarer chronic form of TTTS in which a large inter-twin haemoglobin difference occurs but the oligohydramnios polyhydramnios sequence is not seen. It is thought to occur from residual small (<1 mm) unidirectional AV anastomoses without accompanying AA anastomoses. The small residual anastomoses lead to the gradual development of **anaemia in one twin and polycythaemia in the other twin**.
- **Fetoscopic laser ablation** is now generally considered the definitive treatment for severe TTTS between 16- and 26-weeks' gestation. Above 26 weeks, delivery may be considered.

### ➢ Diagnosis & Antenatal care:

- Diagnosis of twinning is possible in over **75% of cases by physical examination.**
  1. **Uterus larger than expected** (> 4 cm) for dates
  2. **Excessive maternal weight gain** that is not explained by edema or obesity
  3. **Polyhydramnios,** manifested by uterine size out of proportion to the calculated duration of gestation
  4. Multiplicity of small parts
  5. Simultaneous recording of **different fetal heart rates,** each asynchronous with the mother's pulse and with each other and varying by at least 8 beats/min. (The fetal heart rate may be accelerated by pressure or displacement.)
- **Ultrasonography** is the **preferred imaging modality** for the diagnosis of multiple gestation and is potentially able to differentiate multiple gestation as early as 4–5 weeks (by endovaginal probe).

### ➢ Delivery:

- **Vaginal birth** is usually safely achievable where **presenting twin is in a cephalic vertex presentation**. However, planned **C-section** will usually be performed if **first twin presents by the breech,** and certainly if it is **transverse.**
- **High-order multiples, such as triplets and quadruplets,** are now invariably delivered by **caesarean section**.
  1. For **cephalic–cephalic presentations** in labor [> 40 % of all twins], both twins are delivered vaginally.
  2. If **twin A is vertex & twin B is noncephalic** (almost 40%), each > 32 weeks and weighing > 1500-2000 g, can usually be managed successfully by **vaginal delivery** of both. Twin B is delivered by **total breech extraction.**
  3. When **both twins are noncephalic**, **primary caesarean section** should be performed

# Prenatal Diagnosis

- Procedures undertaken to diagnose genetic abnormalities and structural anomalies often in early embryo and fetus in order to undertake timely prenatal counselling and appropriate interventions.
- It allows timely termination of pregnancy thereby preventing wastage and perinatal mortality

### ➢ Classification:

- Can be divided into noninvasive tests & invasive tests

### ➢ Non-Invasive Tests:

- The main noninvasive test is the use of **ultrasound scanning** to screen for structural fetal abnormalities, like **neural tube defects, gastroschisis, cystic adenomatoid malformation of lung, renal abnormalities.**

- Ultrasound uses high frequency sound waves & developing embryo can be visualized at about 6 weeks of gestation.
- **Maternal blood** can be tested for exposure to viruses (viral serology). If a woman has no immunoglobulin (Ig) G or IgM for a particular virus early in pregnancy, but then develops IgM and IgG later in pregnancy, it suggests that she has had a clinical or subclinical infection with that virus earlier during pregnancy.
- **Triple test:** It measures alpha-fetoprotein [AFP], human chorionic gonadotrophin [hCG] & unconjugated estriol [UE3].

| Disorders | MSAFP | uE3 | Beta hCG | Inhibin A |
|---|---|---|---|---|
| Open NTD | increased | No change | No change | No change |
| Downs syndrome | decreased | decreased | increased | Increased |

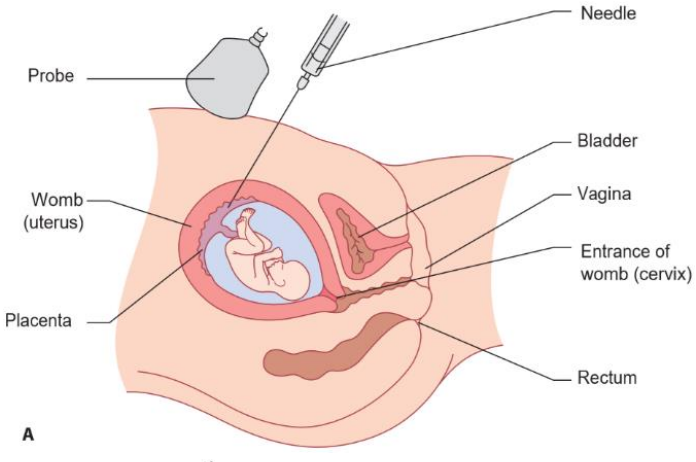
## ➢ Invasive Test:

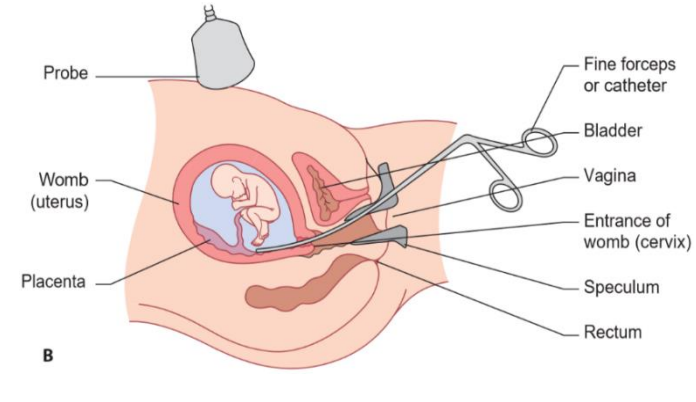
- Invasive tests are most frequently performed to diagnose aneuploidy, for example Down's syndrome or genetic conditions such as cystic fibrosis or thalassemia.

**Amniocentesis & chorion villus sampling** are the 2 most common invasive tests & are used to check the karyotype of fetus or to diagnose single gene disorders.

## ❖ Chorion villus sampling:

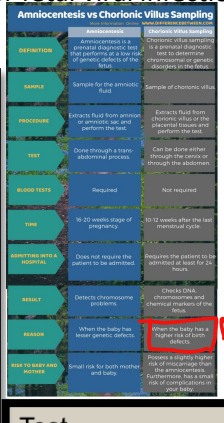
- Fetal trophoblast cells in the mesenchyme of the villi divide rapidly in the first trimester. A CVS procedure aims to take a sample of these rapidly dividing cells from the developing placenta. This is done either by passing a needle under ultrasound guidance through the abdominal wall and myometrium into the placenta **[A],** or by passing a fine catheter (or biopsy forceps) through the cervix into the placenta **[B].**
- **The woman is scanned initially:**
  - To confirm that pregnancy is viable prior to procedure.
  - To ensure that it is a singleton pregnancy (prenatal diagnosis in multiple pregnancy is more complex).
  - To confirm gestational age (CVS should not be performed before 10 weeks' gestation).
  - To localize the placenta & determine whether a transabdominal or transcervical approach is more appropriate.
- Transabdominal procedures are performed more commonly, but they may not be feasible if the uterus is retroverted or the placenta is low on the posterior wall of the uterus.
- For some genetic disorders, for example haemoglobinopathies, CVS may be preferred over amniocentesis because it provides a larger sample of DNA for rapid polymerase chain reaction (PCR) analysis.

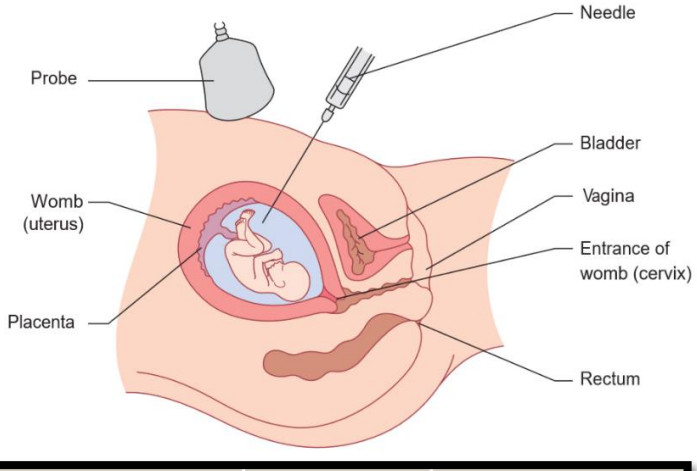



## ❖ Amniocentesis:

- Amniotic fluid contains amniocytes and fibroblasts shed from fetal membranes, skin and the fetal genitourinary tract.
- An amniocentesis procedure takes a sample (15–20 ml) of amniotic fluid that contains these cells. This is done by passing a needle under continuous ultrasound control through the abdominal wall and myometrium into the amniotic cavity and aspirating the fluid.
- Amniotic fluid may be used to check for fetal viral infections, for example cytomegalovirus.



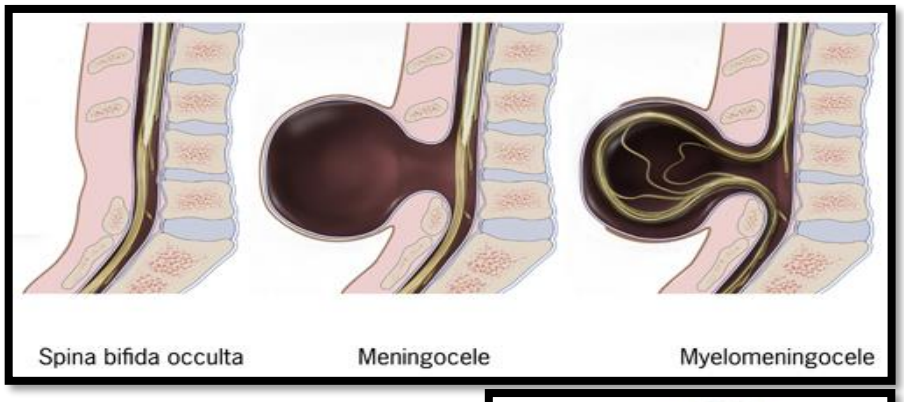




| Diagnostic test | Condition |
|---|---|
| Ultrasound diagnosis | Neural tube defect<br>Gastroschisis<br>Cystic adenomatoid malformation of lung<br>Twin-to-twin transfusion syndrome |
| Invasive test – CVS or amniocentesis | Down's syndrome<br>Cystic fibrosis<br>Thalassaemia |
| Invasive test – cordocentesis | Alloimmune thrombocytopaenia |
| Ultrasound then invasive test | Congenital diaphragmatic hernia<br>Exomphalos<br>Ventriculomegaly<br>Duodenal atresia |

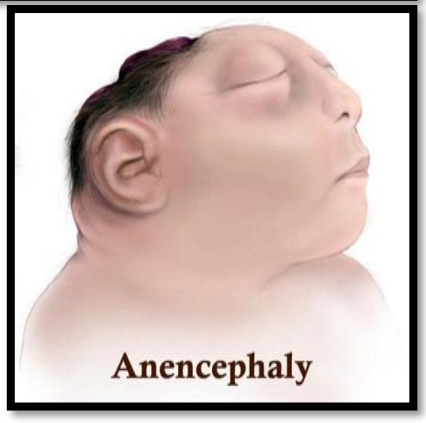
| Test | CVS | Amniocentesis |
|---|---|---|
| Gestation from which test can be performed | 11 weeks | 15 weeks |
| Miscarriage risk | 2 per cent | 1 per cent |

# Neural Tube Defects

- NTDs are relatively common anomalies that **develop when a portion of the neural tube** [the precursor of the central nervous system] **fails to close** as it should during the fourth week of gestation.
- When the posterior neuropore doesn't close well, the baby is born with spina bifida [split spine].
- But when the anterior neuropore doesn't close properly, the forebrain fails to develop, and the baby is born with **anencephaly** or absence of a major portion of the brain and the skull.
- NTDs occurs if mother has diabetes or epilepsy, is taking antiepileptic medication [sodium valproate] & in obese women
- **Spina Bifida:** This means, failure of fusion of vertebral arches & of the development of the posterior dura mater. This leads to **herniation of meninges & spinal cord** through the bony gap & occurs commonly in the lumbo-sacral region.
- **Meningocele:** The **herniation of the pia-arachnoid** may be covered by skin. Surgical closure is required
- **Meningomyelocele/Myelocele:** The cord is displaced as well as the membranes. Skin cover is incomplete and infection likely unless closure is done within 24 hours. Paralysis of legs, bowel & bladder, and hydrocephaly, are normally present.




- **Anencephaly:** Anencephaly is the failure of proper development of the cranium and scalp. The face and base of the skull are present. In anencephaly, the part of the brain that is responsible for neural control of swallowing is absent. As a result, the fetus can't properly swallow amniotic fluid and so excess fluid builds up in the amniotic sac. This is known as polyhydramnios, and it increases the risk of complications such as fetal malposition, premature birth, and placental abruption. Due to the severe nature of the condition, the risk of stillbirth is high and surviving infants only survive hours to days after birth.




- **Folic acid (400 µg) taken preconceptually and for the first trimester reduces the risk of neural tube defects.**
- By taking folic acid for at least 3 months preconceptually, the risk of recurrence can be reduced

# Vertica Transmission of Infections

- A vertically transmitted infection is an infection caused by pathogens (bacteria and viruses) that uses mother-to-child transmission, that is, transmission directly from the mother to an embryo, fetus, or baby during pregnancy or childbirth.
- It can occur when the mother gets an infection as an intercurrent disease in pregnancy.

| Infections causing congenital abnormalities | Other congenital infections associated with pregnancy loss and preterm birth | Infections acquired around the time of delivery with serious neonatal consequences | Perinatal infections causing long-term disease |
|---|---|---|---|
| • Rubella<br>• Cytomegalovirus<br>• Toxoplasmosis<br>• Chickenpox<br>• Syphilis | • Parvovirus<br>• Malaria<br>• Listeria | • Herpes<br>• Group B streptococcus<br>• Chlamydia<br>• Gonorrhoeae | • Hepatitis B<br>• Hepatitis C<br>• Human immunodeficiency virus |

| Infections causing congenital abnormalities | | | |
|---|---|---|---|
| **Pathogens** | **Maternal Effects** | **Fetal Effects** | **Management/Prevention** |
| **Rubella:**<br>• Spread by droplet transmission.<br>• > 100,000 born with congenital | • Febrile rash but is asymptomatic in mother<br>**Congenital Rubella Syndrome:**<br>• Sensorineural deafness | • Rubella defects **occur in 100% of infants infected during the first 11 weeks of pregnancy,** whereas infection between 16 & 20 weeks, carries a minimal risk of deafness. | **Prevention of Rubella:**<br>• MMR vaccine after pregnancy<br>• Vaccination during pregnancy is contraindicated [teratogenic] |

| | | | |
|---|---|---|---|
| rubella Syndrome every year | • Congenital cataract<br>• Blindness | • Rubella infection after 20 weeks' gestation carries no risk to the fetus. | • If infection occurred prior to 16 weeks' gestation, termination of pregnancy. |

| | | | |
|---|---|---|---|
| **Cytomegalovirus:**<br>• DNA herpes virus.<br>• Transmitted by respiratory droplet transmission | • Produces no symptoms or mild non-specific flu-like symptoms in the mother. | • **In fetus:** FGR, microcephaly, **intracranial calcification,** ascites/hydrops & ventriculomegaly.<br>• **At birth [13 %]:** hearing loss & learning difficulties<br>• Affected infants may later be found to have neurological damage such as blindness, deafness or developmental delay. | **Prevention:**<br>• Anomaly scan<br>• PCR analysis of amniotic fluid<br>• Termination of pregnancy |

| | | | |
|---|---|---|---|
| **Toxoplasmosis:**<br>• Protozoan parasite found in cat faeces, soil, uncooked meat<br>• Risk of vertical transmission more as pregnancy advances | • Asymptomatic, or may be a glandular fever-like illness.<br>• Congenital infection occurs if mother acquires the infection during or immediately before pregnancy. | • Severely infected infants may have ventriculomegaly or microcephaly, chorioretinitis and cerebral calcification.<br>• Majority of infected infants are asymptomatic at birth but develop sequelae several years later. | **Diagnosis of maternal primary infection by**<br>• Sabin Feldman dye test<br>• ELISA for IgM antibody<br>• Anomaly scan ⇒ Termination of pregnancy<br>• PCR analysis of amniotic fluid is highly accurate for identification of T. gondii<br>**Spiramycin** [Macrolide] (3-weeks 2-3 g/day) reduces incidence of transplacental infection |

| | | | |
|---|---|---|---|
| **Chicken pox**<br>• Varicella zoster virus (VZV), transmitted by<br>  • Droplet spread<br>  • Direct contact<br>• Individuals are infectious for 48 hours prior to rash and until the vesicles crust over (5 day) | • Non-immune pregnant women are more vulnerable to chickenpox and may develop a serious pneumonia, hepatitis or encephalitis.<br>• Mortality is 5 times higher in pregnant women | • Skin scarring in a dermatomal distribution.<br>• **Eye defects** (microphthalmia, chorioretinitis, cataracts).<br>• Hypoplasia of limbs<br>• Neurological abnormalities (microcephaly, cortical atrophy, mental restriction and dysfunction of bowel & bladder sphincters) | **Prevention of chicken pox:**<br>• Avoid contact with chickenpox<br>• Contact is defined as being in the same room as someone for ≥ 15 minutes, or face-to-face contact. If contact occurs, blood test for VZV immunity [VZV IgG], within 24–48 hours.<br>• Give **Varicella Zoster immunoglobulin (VZIG)** as soon as possible but maybe given up to 10 days after contact<br>**Active infection**<br>• Oral Acyclovir – 800 mg 5 times a day for 7 days if patient presents within 24 hours of the onset of the rash<br>• Delivery should be avoided until 5–7 days after maternal rash for transfer of antibodies from mother to the infant<br>• If delivery occurs within 7 days of maternal rash or if mother develops rash within the 7-day period after birth, VZIG for neonate. Aciclovir treatment for neonatal infection |

| | | | |
|---|---|---|---|
| **Syphilis:**<br>• Sexually acquired infection caused by Treponema pallidum.<br>• The risk of congenital transmission declines with increasing duration of maternal syphilis prior to pregnancy. | • Primary syphilis may present as a painless genital ulcer 3–6 weeks after the infection is acquired<br>• Secondary features [6 weeks to 6 months] present as a maculopapular rash or lesions affecting mucous membranes.<br>• Ultimately, 20% of untreated patients will develop cardiovascular tertiary syphilis and 5–10% will develop neurosyphilis. | • In pregnant women with early, untreated (primary or secondary) syphilis, 70–100% of infants will be infected and approximately 25% will be stillborn.<br>• Mother-to-child transmission leads to FGR, fetal hydrops, congenital syphilis, stillbirth, preterm birth & death | • **Non-treponemal tests** detect non-specific treponemal antibodies and include the<br>1. Venereal Diseases Research Laboratory (VDRL) test<br>2. Rapid plasma reagin (RPR) test<br>• **Treponemal tests** detect specific treponemal antibodies<br>1. Enzyme immunoassays (EIAs)<br>2. T. pallidum haemagglutination assay (TPHA)<br>3. Fluorescent treponemal antibody-absorbed test (FTA-abs)<br>• EIA tests that detect IgG and IgM, are rapidly replacing the VDRL and TPHA combination for syphilis screening<br>**Management:**<br>• **Parenteral penicillin** has a 98% success rate for preventing congenital syphilis. A Jarish–Herxheimer reaction may occur with treatment<br>• If a woman is not treated during pregnancy her baby should be treated after delivery. Untreated babies often develop developmental delay, have seizures or die |

## Infections acquired around time of delivery with serious neonatal consequences

| | | | |
|---|---|---|---|
| **Herpes Simplex**<br>• A double stranded DNA virus<br>• Genital herpes is caused by HSV-2<br>• Most common ulcerative sexually- | • Ulcerative lesions on the vulva, vagina or cervix.<br>• Urinary retention | • Occurs due to contact with infected maternal secretions<br>• Neonatal herpes classified into 3 subgroups<br>1. Disease localized to skin, eye, mouth<br>2. Encephalitis<br>3. Disseminated infection with multiple organ involvement. | • **Greatest risk when a woman acquires a new infection in the third trimester, particularly within 6 weeks of delivery**<br>**Prevention**<br>Following 1st or 2nd trimester acquisition, suppressive acyclovir from 36 wks. of gestation reduces HSV lesions at term |

| | | | |
|---|---|---|---|
| transmitted infection | | | C-section if delivery anticipated within 6 weeks of active herpes |
| **Group B streptococcus**<br>Gram positive coccus<br>Frequently found as a vaginal commensal | Asymptomatic as GPS is a vaginal commensal | • Severe early onset (< 7 days) infection in the new born<br>• Mortality 6 % in term infants and 18 % in preterm infants.<br>• Signs of neonatal sepsis (Sudden collapse, tachypnoea, nasal flaring, poor tone, jaundice) | **Prevention**<br>• Intrapartum antibiotic prophylaxis (penicillin or clindamycin), If risk factors for GBS are present<br>▪ Intrapartum fever (> 38° C)<br>▪ Prolonged rupture of membranes greater than 18 hours.<br>▪ Prematurity less than 37 weeks.<br>▪ Previous infant with GBS<br>▪ GBS bacteriuria<br>• IV penicillin 3 g be given as soon as possible after the onset of labour (or after development of a risk factor) and 1.5 g 4 hourly until delivery |
| **Chlamydia**<br>• An obligate intracellular organism<br>• **Commonest sexually transmitted infection** | ▪ Frequently asymptomatic<br>▪ Preterm rupture of membranes<br>▪ Preterm labour | • Transmission to the fetus occurs at the time of delivery and can cause conjunctivitis and pneumonia.<br>• Prematurity<br>• Low birth weight | **Prevention:**<br>• Treatment with azithromycin or erythromycin |
| **Gonorrhoeae**<br>• A gram-negative diplococcus<br>• **2nd most common bacterial sexually-transmitted disease** | ▪ Frequently asymptomatic. May present with<br>▪ Mucopurulent vaginal discharge or Dysuria<br>▪ Increased risk of co-infection with chlamydia<br>▪ Preterm rupture of membranes, preterm labour | ▪ Transmission to the fetus occurs at the time of delivery and can cause ophthalmia neonatorum. | **Prevention:**<br>Cephalosporins |

## Perinatal infections causing long-term disease

| | | | |
|---|---|---|---|
| **Hepatitis B**<br>• A DNA virus transmitted mainly in blood<br>• Also present in saliva, semen and vaginal fluid.<br>• The HBV has an incubation period of 6 wks. - 6 months | • Mostly asymptomatic<br>• Detection on serological screening<br>• Vertical transmission maximum if mother is HBeAg positive | • Chronic carriers of HBsAg | • In 95 % cases, preventable through administration of **Hepatitis B immunoglobulin (Ig) soon after birth**<br>• To prevent transmission of hepatitis B, a combination of **hepatitis B Ig** & **HBV vaccine** may be given.<br>• Hepatitis B vaccination (3 doses - at birth, at 1 month and at 6 months of age) |
| **Hepatitis C**<br>• RNA virus transmitted predominantly through<br>  • Infected blood products<br>  • Injection of drugs<br>• Mother to child transmission due to contact with infected maternal blood around the time of delivery<br>• Risk is higher in those coinfected with HIV. | • Mostly asymptomatic<br>• Detection on serological screening (anti -HCV antibodies)<br>• One of the major causes of liver cirrhosis, hepatocellular carcinoma & liver failure | | **Prevention**<br>• Post-test counselling, referral to hepatologist<br>• **Interferon and ribavirin contraindicated in pregnancy**<br>• Elective caesarean section if the woman is also HIV positive |

# Labour

## ➢ Maternal and fetal anatomy:

1. **Pelvic inlet:** Fetal head enters the pelvis in a **transverse position [13.5 cm]** as it is the widest diameter
2. **Midpelvis** is almost round, as the transverse and anterior diameters are similar at 12 cm.
   - **Station 0** is at the level of the ischial spines, **–1 is 1 cm above the spines** & **+1 is 1 cm below the spines**.
3. **Pelvic outlet:** AP diameter of the pelvic outlet is 13.5 cm and the transverse diameter is 11 cm.

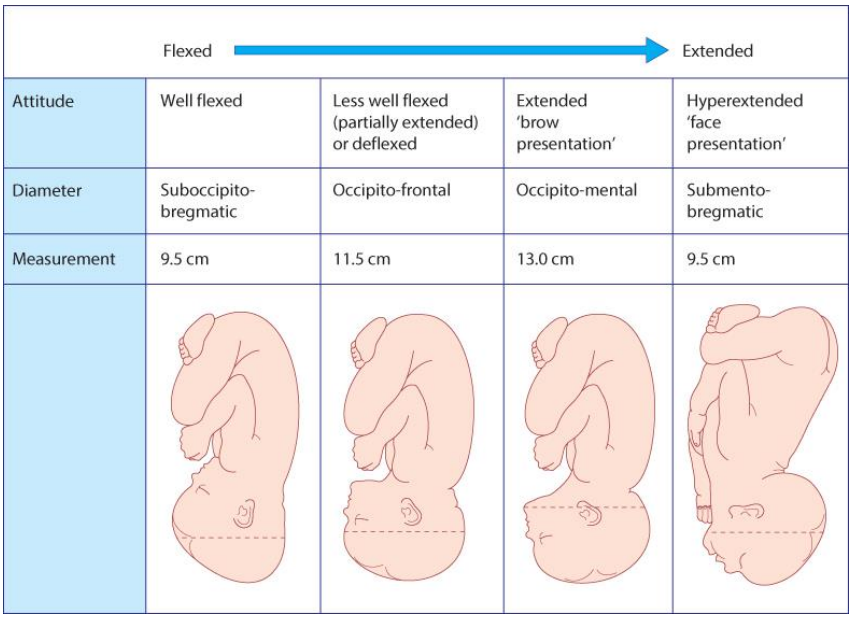
- The **gynaecoid pelvis is the most favourable for labour, and also the most common.**
- **The perineum** is taut and resistant in the nulliparous woman, and pushing can be prolonged.
- **Fetal skull:** skull sutures are not fixed & **allows the bones to move together** & **even to overlap.** Furthermore, **bones themselves are compressible**. Together, these characteristics of the fetal skull allow a process called **'moulding** to occur, which **reduces diameters of the fetal head**, while still protecting the underlying brain.
- The **occipito-anterior (OA) position is the most favourable for a spontaneous vaginal birth**.

## ➢ Labour definition:

- Uterine contractions resulting in progressive dilation and effacement of the cervix and accompanied by descent and expulsion of the fetus.

- **Labour [parturition] is divided into 3 stages:**
- **First stage** begins with diagnosis of the onset of labour & is complete when full cervical dilatation [10 cm] has been reached. Longest stage of labor.
- The **second stage** begins with full cervical dilatation and ends with birth of the baby
- The **third stage** begins with birth of the baby and ends with complete delivery of the placenta and membranes. Shortest stage of labor.

## The diameters of the fetal skull.




## ➢ Diagnosis of labour:

- Correct diagnosis of labor is considered to be the **single most important determination** in the management of labor
- The diagnosis is suspected when a woman presents with contraction-like pains, and is confirmed when the midwife performs a vaginal examination that reveals **effacement and dilatation of the cervix.**
- With cervical effacement, mucus plug within the cervical canal may be released. When this occurs, the onset of labor is sometimes marked by the passage of a small amount of blood-tinged mucus from the vagina known as **bloody show**

| True Labour | False Labour [Braxton Hicks Contractions] |
|---|---|
| Contractions occur at regular intervals | Contractions occur at irregular intervals |
| Contractions increase in frequency, duration & intensity | Do not |
| Interval between contractions gradually shorten | Intervals remain long/irregular |
| Contractions get stronger by ambulation | Contractions frequently stop with ambulation or position change |
| Cervix softens, effaces & dilates progressively | Cervix may soften, but little or no change in effacement/dilatation |
| Fetus continuous to decent into pelvis | No significant change in fetal position |
| Membranes are bulging during contractions | No bulging of membranes |
| Mucous discharge with small to moderate amount of blood | Brown vaginal discharge instead of blood tinged |
| Pain is felt in abdomen & radiating to back | Pain is felt mainly in the abdomen |
| Pain not relieved by antispasmodics or sedatives | Pain can be relieved by antispasmodics or sedatives |

## ➢ First stage:

- Time from the diagnosis of labour to full dilatation of the cervix **(10 cm).** First stage can be divided into **2 phases.**
- In this stage, regular & stronger contractions which are increasing in frequency cause cervical dilatation & effacement
- **The 'latent phase'** is the time between the onset of regular painful contractions and 3–4 cm cervical dilatation. During this time, the cervix becomes 'fully effaced'. **Effacement is a process by which the cervix shortens in length as it becomes incorporated into the lower segment of the uterus**. The process of effacement may begin during the weeks preceding the onset of labour, but will be complete by the end of the latent phase. Latent phase usually lasts **8 hours in nulliparous, 3 hours in multiparous.** Cervical dilation is latent phase is **< 1 cm/hour.**
- The **'active phase'** describes the time between the end of the latent phase (3–4 cm dilatation) and full cervical dilatation (10 cm). It usually lasting between **2 & 6 hours, shorter in multiparous women**. Cervical dilatation during the active phase occurs typically at **1 cm/hour** or more in a normal labour **[abnormal if it occurs at < 1 cm in 2 hours].**

## ➢ Second stage:

- This describes the time from full dilatation of the cervix to delivery of the fetus or fetuses. Also subdivided into 2 phases
- **The 'passive phase'** describes the time between full dilatation & the onset of **involuntary expulsive contractions.** There is **no maternal urge to push** and the fetal head is still relatively high in the pelvis.
- The second phase is called the **'active second stage'**. There is a **maternal urge to push** because the fetal head is low (often visible), causing a reflex need to 'bear down'.
- Conventionally, a normal active second stage should last no longer than 2 hours in a nulliparous woman and 1 hour in women who delivered vaginally before.

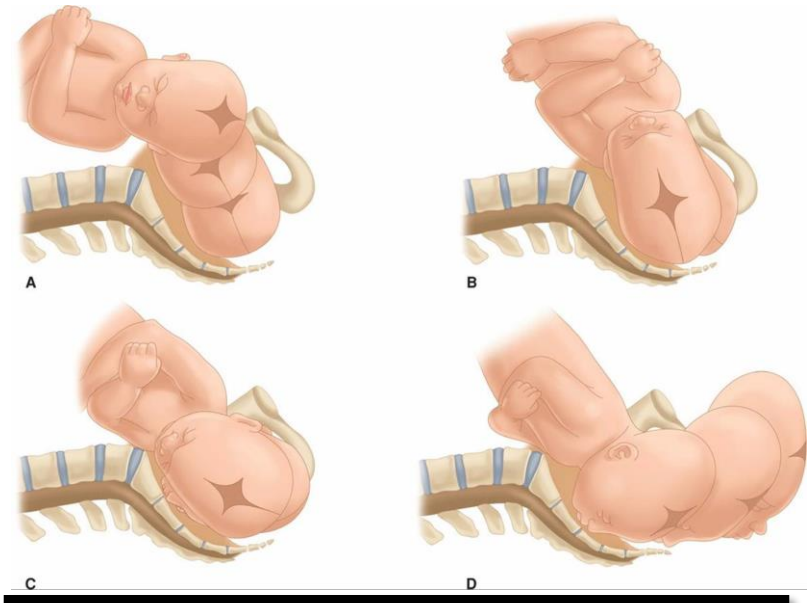
## ➢ Third stage:

- This is the time from delivery of the fetus or fetuses until complete **delivery of the placenta(e) and membranes.**
- The placenta is usually delivered within a few minutes [5-20 minutes (if actively managed)] of the birth of the baby.

- A third stage **lasting > 30 minutes is defined as abnormal,** unless the woman has opted for 'physiological management', in which case it is reasonable to extend this definition to 60 minutes. **Blood loss:** 150-250 ml (average)

## ➢ The mechanism of labour:

- This refers to the series of changes in position and attitude that the fetus undergoes during its passage through the birth canal. It is described here for the vertex presentation and the gynaecoid pelvis.

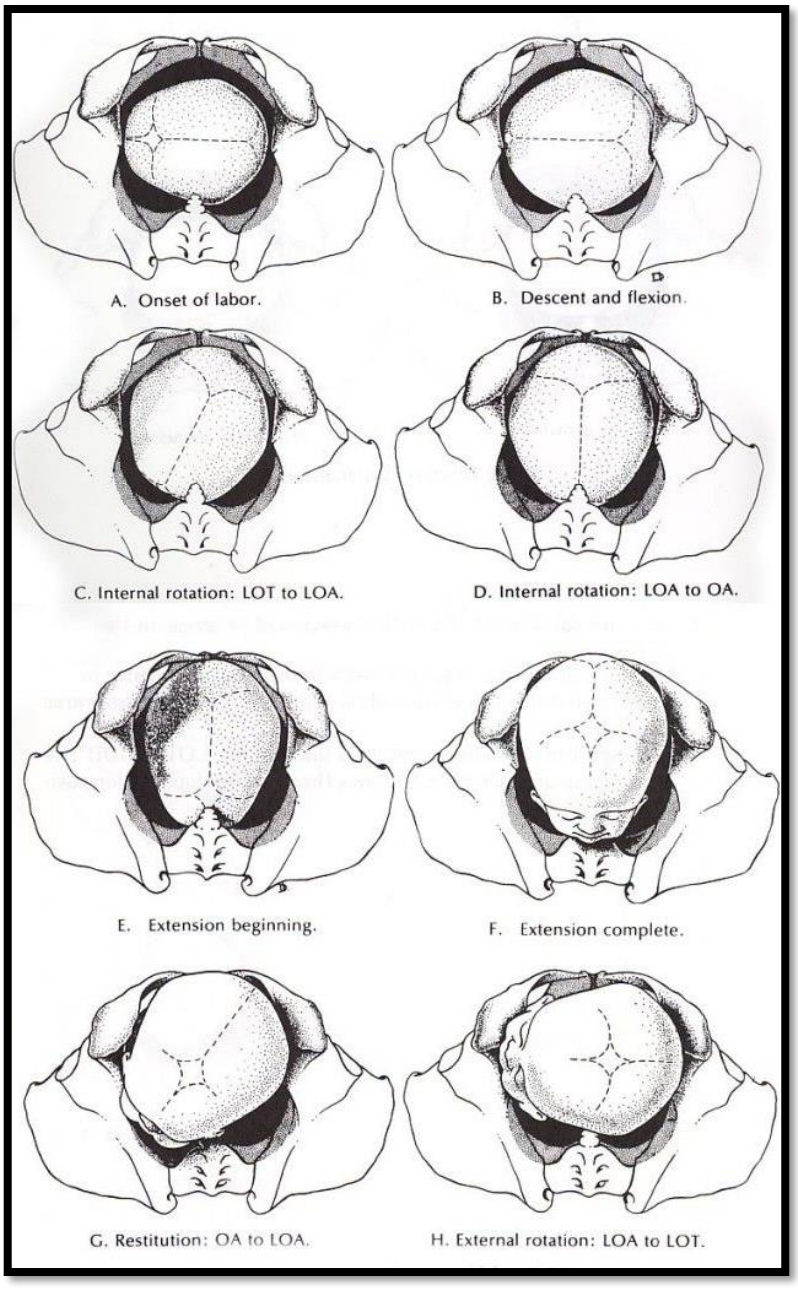



### Engagement:

- Fetal head normally enters the pelvis in transverse position [widest]. **Engagement occurs at 0 station**
- Engagement is said to have occurred when widest part of the presenting part has passed successfully through the inlet.
- If > 2/5$^{th}$ of the fetal head is palpable abdominally, the head is not yet engaged.

### Descent:

- During the first stage and passive phase of the second stage of labour, descent of the fetus occurs as a result of uterine contractions. In the active phase of the second stage of labour, descent of the fetus is assisted by voluntary efforts of the mother using her abdominal muscles and the Valsalva manoeuvre ('pushing').




### Flexion:

- As the head descends into the narrower midpelvis, flexion occurs. This passive movement occurs, in part, due to the surrounding structures and is important in reducing the presenting diameter of the fetal head.

### Internal rotation:

- If the head is well flexed, occiput will be the leading point, & on reaching the sloping gutter of the levator ani muscles it will be encouraged to **rotate anteriorly** so that **sagittal suture now lies in the AP diameter** of pelvic outlet (widest)
- In cases of occipitoanterior vertex, the head has to rotate **45 degrees,** & in occipitoposterior vertex, **135 degrees,** to pass beneath the pubic arch

### Extension:

- The well-flexed head now extends and the occiput escapes from underneath the symphysis pubis and distends the vulva. This is known as **'crowning' of the head**. Crowning occurs when largest diameter of the fetal head is encircled by the vulvar ring.

### Restitution:

- When the head is delivering, the occiput is directly anterior. As soon as it crosses the perineum, the head aligns itself with the shoulders, which have entered the pelvis in the oblique position. This slight rotation of the occiput through 1/8th of the circle is called 'restitution'.

### External rotation:

- In order to be delivered, the shoulders have to rotate into the direct AP plane (widest diameter at outlet). The anterior shoulder rotates internally approximately 45 degrees to come under the pubic arch for delivery. When this occurs, occiput rotates through a further 1/8th of a circle to the transverse position. This is called external rotation.

**Delivery of the shoulders and fetal body:**

- When restitution and external rotation have occurred, the shoulders will be in the AP position. The anterior shoulder is under the symphysis pubis and delivers first, and the posterior shoulder delivers subsequently.

## ➢ Management of normal labour:

- **History:** Past obstetric history, history of current pregnancy, relevant medical history & events leading up to hospital

**General examination:**

- BMI, temperature, pulse and blood pressure must be recorded. Skin colour, edema, previous C-section scar
- Take **sample of urine** for protein, blood, ketones, glucose and nitrates.

**Abdominal examination:**

- Initial **inspection** for scars indicating previous surgery
- Determine the **lie** (longitudinal, transverse or oblique) and **nature of the presenting part** (cephalic or breech). If it is a cephalic presentation, degree of engagement must be determined in terms of 5ths palpable abdominally.

**Vaginal examination:**

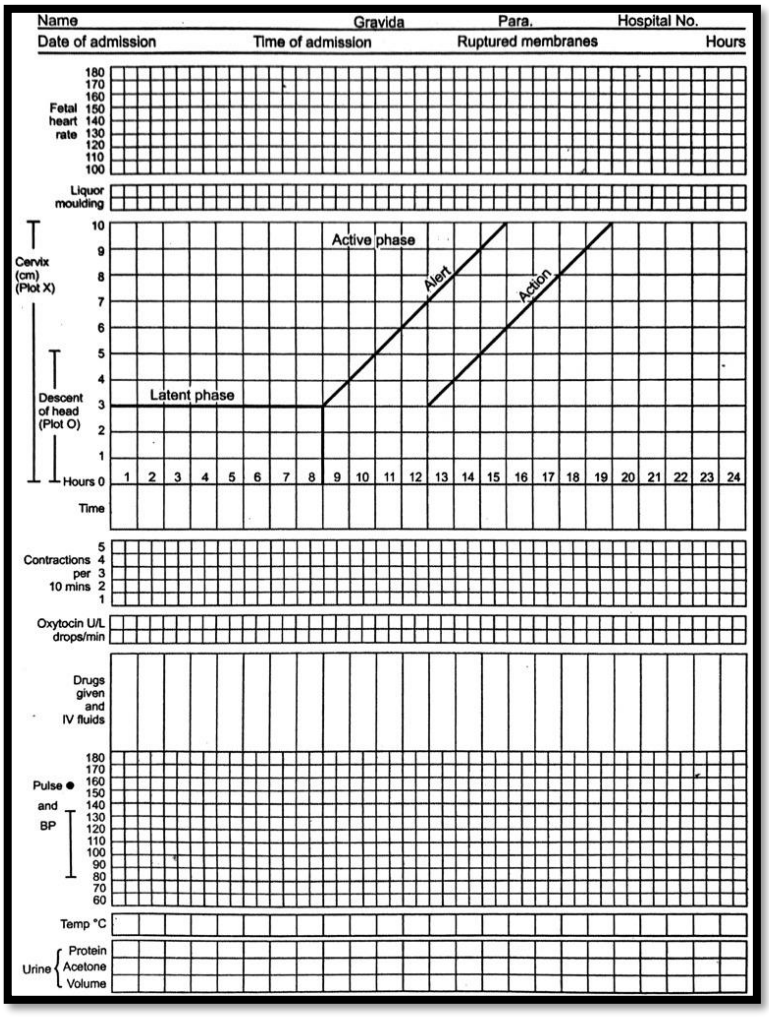
- The index and middle fingers are passed to the top of the vagina and the cervix.
- The **cervix is examined** for position, length, effacement, consistency, dilatation & application to the presenting part.
- Assessment of the **fetal head position, station, attitude and the presence of caput or moulding**.
- The condition of the membranes should also be noted. If they have ruptured, **colour and amount of amniotic fluid** draining should be noted. A generous amount of clear fluid is a good prognostic feature; **scanty, heavily blood-stained or meconium-stained fluid is a warning sign of possible fetal compromise.**
- Women in labour should have their **pulse measured hourly** & their **temperature & BP every 4 hours. Frequency of contractions should be recorded every 30 minutes** & a **vaginal examination performed every 4 hours**
- **Once 2nd stage is reached, BP & pulse should be performed hourly, & vaginal exam offered every hour also**

## ➢ Fetal assessment in labour:

1. **Inspection of amniotic fluid** – fresh meconium staining, absence of fluid, and heavy blood-stained fluid
2. **Intermittent auscultation of the fetal heart** using a Pinard stethoscope or a hand-held Doppler ultrasound
3. **CTG**. **In brief, features of a normal FHR pattern include** a baseline heart rate of between 110 and 160 bpm, variability of between 5 and 25 bpm (variation in the FHR above and below the baseline), accelerations (a transient increase in FHR of at least 15 bpm lasting at least 15 seconds) and the absence of decelerations (transient decrease in the FHR of 15 bpm or more). If all 4 features are reassuring, then the CTG is classified as **'normal'**.
4. **Continuous internal electronic fetal monitoring using a fetal scalp electrode (FSE) and CTG**.
5. **Fetal scalp blood sampling (FBS)** to measure fetal pH and base excess directly.

## ➢ The partogram:

- 1st stage of Labour can be represented with the help of graph, which is Known as Partogram. Partograph is a composite graphical record of cervical dilatation and descent of head against duration of labor in hours.
- This record allows an instant **visual assessment of the progress of labour** based on the rate of cervical dilatation compared with an expected norm, according to the parity of the woman.
- Other key observations include frequency & strength of contractions, descent of the head in fifths palpable & station, amount & colour of amniotic fluid draining & observations of maternal wellbeing, such as BP, heart rate & temperature.
- **The alert line** drawn from 3 cm of cervical dilatation at the end of the latent phase and continued to the point of full dilatation (10 cm) at the rate of slowest progress



of labour [1 cm/h] starting at zero time **i.e.,** time of admission. Moving to the right side of alert line referral to the hospital for extra care. If progress is satisfactory the plotting will remain on or to the left of the alert line

- **Action line** is drawn 4 hours to the right of the alert line & parallel to it. If the progress crossed the action line, appropriate action should be taken within 4 hours
- Progress can also be considered slow if the cervix dilates at less than 1 cm every 2 hours.

## ➢ Management of first stage of labour:

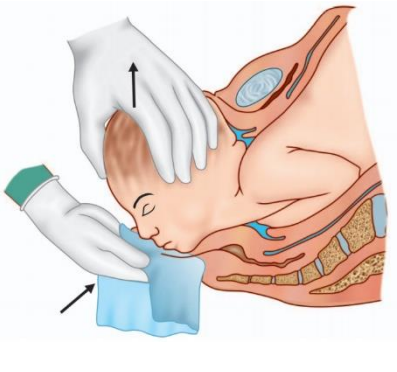
- Maternal & fetal wellbeing should be monitored. Evaluate frequency, duration & intensity of uterine contractions every 30 minutes (by hand or by CTG). Maternal pulse & BP should be recorded every **2-4 hours** & frequently if indicated.
- Vaginal examinations are performed **4 hourly** or as indicated to determine when active phase has been reached
- In the active phase, the **cervix should be assessed approximately every 2 hours.** The cervical effacement and dilatation and the station and position of the fetal head should be recorded
- Progress of labour is monitored using a partogram with timely intervention if abnormal.
- Women in latent phase should be **encouraged to mobilize** & it is likely that standing upright encourages progress.
- During first stage, membranes may be intact, may have ruptured spontaneously or may be ruptured artificially. Generally speaking, if membranes are intact, it is not necessary to rupture them if the progress of labour is satisfactory
- **Active management of labour** was a collection of interventions that was routinely recommended to nulliparous women to maximize chances of a normal birth. It included **one-to-one midwifery care, 2-hourly vaginal examinations, early artificial rupture of membranes [amniotomy]** and **use of oxytocin augmentation if progress fell > 2 hours behind the schedule of 1 cm dilatation per hour.**

## ➢ Management during second stage:

- If the labour has been normal, the first sign of the second stage is likely to be an **urge to push** experienced by mother.
- The second stage generally takes from 30 minutes to 3 hours [50 min average] in primigravid women and from 5–30 minutes [20 minutes average] in multigravida women.
- Lying in the **left lateral position, squatting and 'all fours'** are particularly effective options.

### Descent and delivery of the head:

- At first, there is a slight general bulge in perineum as the woman bears down. When the head stretches the perineum, the anus will begin to open and soon after this the baby's head will be seen at the vulva
- Slow delivery of the head in between the contractions is to be regulated. This is done when the suboccipitofrontal diameter emerges out. This is accomplished by pushing the chin with a sterile towel covered fingers of the right hand placed over the anococcygeal region while the left hand exerts pressure on the occiput **(Ritgen's maneuver)**
- An **episiotomy** is a surgical cut, performed with scissors, which extends from vaginal fourchette in a mediolateral direction, usually to the **right,** through perineum & incorporating the lower vaginal wall. It is performed during most instrumental births (ventouse/forceps) or to hasten delivery if there is suspected fetal bradycardia.



### Delivery of the shoulders & rest of the body:

- Once fetal head is born, a **check is made to see whether the cord is wound tightly around neck**
- **Delivery of the anterior shoulder** is aided by **gentle downward & forward traction** on the externally rotated head. The **posterior shoulder** is then delivered by **gentle upward traction** on the head. After these maneuvers, the body, legs, and feet are delivered with gentle traction on the shoulders. **If the infant is large and traction is necessary to deliver the body, it should be applied to the shoulders** only, and not to the head.

## ➢ Management of third stage:

- Third stage **normally takes 5-10 minutes** & is considered **prolonged after 30 minutes,** unless a physiological approach is preferred.
- **Signs of placental separation:**
  - Apparent lengthening of the cord
  - A small gush of blood from the placental bed
  - Rising of the uterine fundus to above the umbilicus
  - Uterine contraction resulting in **firm globular** feel on palpation

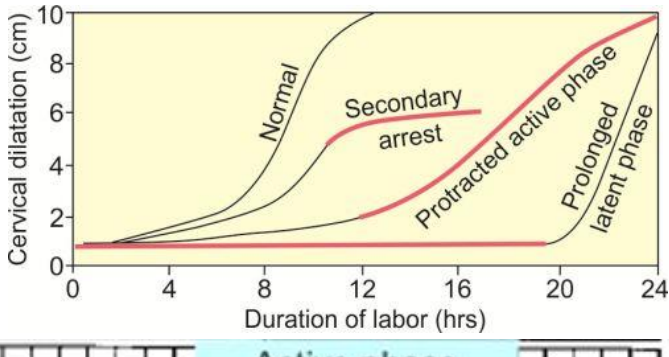
## ➢ Active management:

- Active management of the third stage should be recommended to all women because it reduces the incidence of postpartum haemorrhage (PPH) from 15% to 5%.

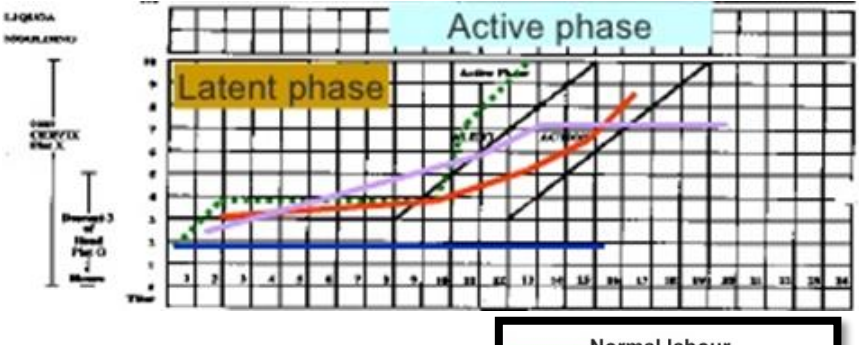
- **IM injection of 10 IU oxytocin**, given as the **anterior shoulder of the baby is delivered**, or **immediately after delivery of the baby**
- When signs of placental separation are recognized, **controlled cord traction [Brandt' s Andrew method]** is used to expedite delivery of the placenta. When a contraction is felt, **left hand should be moved suprapubically** & fundus elevated with the palm facing towards mother. At the same time, the **right hand should grasp the cord** and **exert steady traction** so that the placenta separates and is delivered gently, care being taken to peel off all the membranes, usually with a twisting motion. Traction on the umbilical cord must not be used to pull the placenta out of the uterus
- In 2% of cases, the placenta will not be expelled by this method. If no bleeding occurs, a further attempt at controlled cord traction should be made after 10 minutes. If this fails, the placenta is 'retained' and will require **manual removal** under general or regional anaesthesia in the operating theatre.
- It is now recognized that a **modified approach to active management** of the third stage may be preferable with **delayed cord clamping for between 1 and 3 minutes**. This approach allows autotransfusion of placental blood to the neonate while maintaining the benefit of a **reduced risk of PPH**. It is of particular importance in preterm birth.

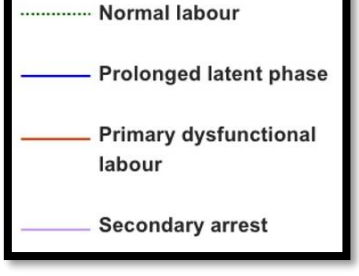
# Abnormal Labour

## ➢ Patterns of abnormal progress in labour:




1. **Prolonged latent phase: > 20 hours in the nulliparous & > 14 hours in the multipara.** More common in **primiparous women**
   - Probably results from a delay in the chemical processes that occur within the cervix that soften it and allow effacement.
   - It is best managed away from the labour suite with simple analgesics, mobilization and reassurance. Amniotomy is usually avoided. Prolonged latent phase is not an indication for C-delivery.
2. **Primary arrest [primary dysfunctional labour]** is the term used to describe poor progress in the active first stage of labour (< 2 cm cervical dilatation/4 hours) and is also more common in **primiparous women**.
   - It is most commonly **caused by inefficient uterine contractions**, but can also result from cephalopelvic disproportion (CPD), malposition and malpresentation of the fetus. 5




3. **Secondary arrest** occurs when progress in the active first stage is initially good but then slows or stops altogether, typically after 7 cm dilatation.
   - **Fetal malposition, malpresentation and CPD** are common causes.

## ➢ Poor progress in the first stage of labour:

- Defined as **cervical dilatation of < 2 cm in 4 hours,** usually associated with failure of descent and rotation of the fetal head. It may relate to the powers, passages or passenger.

### 1. Dysfunctional uterine activity ('powers'):

- This is the **most common cause of poor progress in labour**. It is **more common in primigravidae [**less likely in multiparous women**] and in older women** and is characterized by **weak, irregular and infrequent contractions.**
- The **assessment of uterine contractions** is most commonly carried out by **clinical examination** and by using **external uterine tocography. A frequency of 4-5 contractions per 10 minutes is usually considered ideal.**
- When poor progress in labour is suspected, it is usual to recommend **repeat vaginal examination at 2 hours** rather than 4 hours after the last. **If delay is confirmed, the woman should be offered ARM** and, if there is still poor progress in a further 2 hours, advice should be sought from an obstetrician regarding the use of an **oxytocin infusion**
- Continuous EFM is necessary as **excessively frequent strong contractions may cause fetal compromise**.
- **Extreme caution must be exercised when making this diagnosis in a multiparous woman** where an alternative explanation, such as malposition or malpresentation or obstructed labour due to CPD, is more likely. **Excessive uterine contractions in a truly obstructed labour may result in uterine rupture in a multiparous woman,** a complication that is extremely rare in primiparous women.
- If progress fails to occur despite 4-6 hours of augmentation with oxytocin, a **C-section** will usually be recommended.

## 2. Cephalopelvic disproportion (passages and passenger):

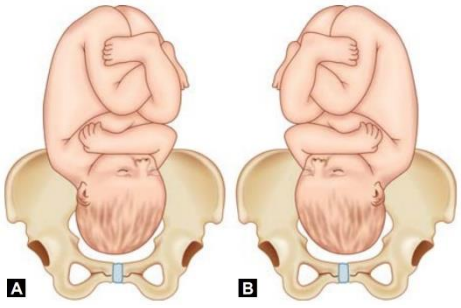
- CPD implies **anatomical disproportion b/w fetal head & maternal pelvis**
- **Causes: large head, small pelvis** [due to fracture or metabolic bone disease] or **combination of two** relative to each other. Women of short stature with a large baby in first pregnancy are potential candidates.
- **Oxytocin** can be given carefully to a **primigravida** with mild to moderate CPD as long as the CTG is normal. **Oxytocin must never be used in a multiparous woman where CPD is suspected.**

**Findings suggestive of CPD**

- Fetal head is not engaged.
- Progress is slow or arrests despite efficient uterine contractions.
- Vaginal examination shows severe moulding and caput formation.
- Head is poorly applied to the cervix.
- Haematuria.

## 3. Malposition:

- **Any position of the vertex other than flexed occipitoanterior one.**
- **In a vertex presentation** where the occiput is placed posteriorly over the sacroiliac joint or directly over the sacrum, it is called an occiput-posterior position. When the occiput is placed over the right sacroiliac joint, position is called **right occipitoposterior (A),** & when placed over the left sacroiliac joint, is called **left occipitoposterior (B)**




**Causes:**

- **Shape of pelvic inlet:** In > 50%, occipitoposterior position is associated with either an **anthropoid or android pelvis**
- **Fetal factors:** Marked deflection of the fetal head, too often favors posterior position of the vertex.
- **Uterine factor:** Abnormal uterine contraction, leads to persistent deflexion and occipitoposterior position.

**Mechanism of labor:**

- **In Favorable Circumstances (90%):** Good uterine contractions result in good flexion of the head. As occiput is the leading part, it rotates 3/8th of a circle (135°) anteriorly to lie behind the symphysis pubis.
- **In unfavorable circumstances [10%]:** In certain circumstances, the occiput fails to rotate. The causes are deflexion of the head, weak uterine contraction, faulty shape of pelvis [flat sacrum, prominent ischial spines], weak pelvic floor muscles, big baby and immobility of the fetal trunk

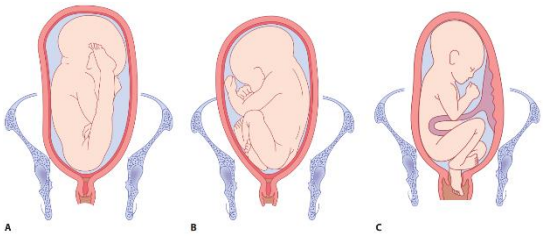
## 4. Malpresentation (the 'passenger'):

- Malpresentation is a **presentation that is not cephalic.**
- Malpresentations are more common in women of **high parity** and **carry a risk of uterine rupture**

### ➢ Breech presentation:

- **Most common malpresentation** and occurs in 3–4% of term pregnancies, but is more common at earlier gestations.
- There are **3 types of breech presentation:**

1. **Commonest is extended (frank) breech – A [Vaginal breech delivery]**
2. Less common is **flexed (complete) breech – B [Vaginal breech delivery]**
3. Least common is **footling breech – C [Caesarean section]. Cord and foot prolapse are risks in this situation.**




**Predisposing factors for breech presentation:**

- **Maternal:** Fibroids, congenital uterine abnormalities (e.g., bicornuate uterus), uterine surgery
- **Fetal/placental:** Multiple gestation, prematurity **[most common cause],** placenta praevia, abnormality (e.g., anencephaly, trisomies or hydrocephalus), fetal neuromuscular condition, IUGR, oligohydramnios & polyhydramnios

**Antenatal management of breech presentation:**

- If a breech presentation is clinically suspected at or after 36 weeks, this should be **confirmed by ultrasound scan**.
- The **3 management options** available are external cephalic version, vaginal breech delivery & elective C-section.
- Majority of breech presentations recognized at term (≥37 weeks) are **delivered by caesarean section [best method]**

### ➢ Face presentation:

- Face presentation occurs **due to complete extension of the fetal head**. Face presentation apply poorly to cervix
- The presenting diameter is the **submento-bregmatic,** which measures **9.5 cm**
- It is diagnosed in labour by **palpating the nose, mouth and eyes on vaginal examination**
- If progress in labour is good and the **chin remains mento-anterior, vaginal delivery** is possible, the head being delivered by flexion. If the **chin is posterior (mento-posterior position),** delivery is impossible, as extension over the perineum cannot occur. In this circumstance, **caesarean section** is performed.
- **Forceps delivery is acceptable for low mento-anterior face presentations** but **ventouse is contraindicated.**

## ➢ Brow presentation:

- Brow presentation arises when there is **less extreme extension of the fetal neck** than that with a face presentation.
- The presenting diameter is the **mento-vertical (measuring 13.5 cm)**. It is least common presentation
- It is **diagnosed in labour by palpating anterior fontanelle, supraorbital ridges** & **nose on vaginal examination**
- If this presentation persists, delivery can only be **achieved by caesarean section.**

## ➢ Shoulder presentation:

- Shoulder presentation occurs **as the result of a transverse or oblique lie of the fetus** and the causes of this abnormal presentation include **placenta praevia, high parity, pelvic tumour and uterine anomaly**.
- Delivery should be by **caesarean section**. Delay in making the diagnosis risks **cord prolapse and uterine rupture.**

## • Poor progress in the second stage of labour:

- Birth of the baby is expected to take place **within 3 hours of the start of the active second stage (pushing) in nulliparous women** and **2 hours in parous women. Delay** is diagnosed **if delivery is not imminent after 2 hours of pushing in nulliparous labour** & **1 hour for parous woman**

### 1. Secondary dysfunctional uterine activity ('powers'):

- **Common cause of second stage delay**, may be **exacerbated by epidural analgesia**. Having achieved full dilatation, the uterine contractions may become weak & this is **sometimes associated with maternal dehydration** & **ketosis.**
- If no mechanical problem is anticipated and the woman is primiparous, treatment is with **rehydration & IV oxytocin.**

### 2. Android pelvis:

- Delay in second stage can occur because of a **narrow midpelvis** (android pelvis), which **prevents internal rotation of the fetal head**. This may result in arrest of descent of the fetal head at the level of ischial spines in the transverse position, condition called **deep transverse arrest.** It may also occur due to a resistant perineum [nulliparous woman]

### 3. Persistent OP position of Fetal head [passenger]:

- In this situation, the head will either have to undergo a **long rotation to OA** or be **delivered in the OP position**.

1. By the time delay in the second stage of labour has been diagnosed, NICE guidelines recommend that oxytocin should not be started. Inefficient uterine activity therefore needs to be corrected proactively at the beginning of second stage.
2. **Instrumental vaginal birth** should be considered for prolonged second stage if the safety criteria have been fulfilled.
3. If the safety criteria for instrumental vaginal birth are not met, then delivery will be by **caesarean section.**
4. A resistant perineum resulting in significant delay may be an indication for an **episiotomy.**

# Postpartum haemorrhage

- Postpartum hemorrhage [PPH] is the most common cause of excessive blood loss in pregnancy
- PPH defined as **blood loss ≥ 500 ml after normal delivery and > 1000 ml after caesarean section**
- **Primary PPH:** Loss of > 500 mL blood from the genital tract **within 24 hours of delivery**
- **Secondary PPH:** Loss of > 500 mL blood from the genital tract **between 24 hours and 6 weeks post-delivery**.
- **Common causes of secondary PPH:** genital tract infection & retained products of conception.
- **Major obstetric haemorrhage:** Blood loss ≥ 2,500 ml, or requiring blood transfusion ≥ 5 units rbc or Tx for coagulopathy
- **The causes of PPH can be remembered as the four 'Ts':**

1. **Tone: Uterine atony** (commonest cause)
2. **Tissue:** Retained placenta and/or membranes occurs in placenta accreta.
3. **Trauma:** Injury to vagina, perineum [instrumental vaginal deliveries or episiotomy] & uterine tears at C-section
4. **Thrombin:** Clotting disorders [Von Willebrand's disease]

- **There are three main areas from which haemorrhage occurs:** uterus, placenta and cervix/vagina.
- Uterine causes of haemorrhage include atony, uterine inversion & rupture. Remember, haemorrhage may be concealed
- **Risk factors for uterine atony (commonest cause of haemorrhage):** macrosomia, multiple pregnancy, prolonged labour, oxytocin use, induction of labour, grand multiparity, polyhydramnios, APH, placental abruption.
- **Other risk factors for obstetric haemorrhage:** placenta praevia and accreata, previous multiple caesarean sections (risk of placenta accreata is > 60% for women who have had 3 or more previous caesarean sections), perineal trauma, full bladder, underlying haematological disorder (e.g., factor VIII deficiency), disseminated intravascular coagulation.
- **Prevention:** haemoglobin levels below the normal range for pregnancy should be investigated & iron supplementation considered if indicated to optimize Hb prior to delivery. Prophylactic use of oxytocin agents for high-risk patients
- **Warning signs:** failure of uterus to contract following delivery of the placenta, maternal collapse.

- **Symptoms:** anxiety, thirst, nausea, cold, pain, dizziness.
- **Signs:** rising fundus, peritonism, reduced urine output, tachypnoea, tachycardia, hypotension, narrow pulse pressure.
- In traumatic hemorrhage, the uterus is found well contracted.
- In atonic hemorrhage, the uterus is found flabby and becomes hard on massaging.
- **Complications:** anemia, puerperal infection, partial or total necrosis of the anterior pituitary gland [Sheehan's syndrome], which is characterized by failure to lactate, amenorrhea, decreased breast size, loss of pubic and axillary hair, hypothyroidism, and adrenal insufficiency. Hypotension also can lead to acute renal failure. In extreme hemorrhage, sterility will result from hysterectomy performed to control intractable postpartum hemorrhage.

## ➢ Management:

- **Call for help** [skilled obstetric team, anesthesiologist, clinical hematologist, supporting staff (nurse]]
- **Resuscitation:**

1. **A: Airway** [oropharyngeal airway]
2. **B: Breathing** [Administer oxygen by mask (10-15 liters/min)]
3. **C: Circulation** Assess circulatory compromise (Cap refill, HR, BP, ECG)
   - Secure 2 wide bore IV lines: 14-16 gauge
   - Draw 20 ml blood sample for grouping & cross matching, CBC, LFT [HELLP], RFT [renal failure], serum electrolytes & coagulation profile [fibrinogen]
   - Arrange 4-6 units of blood

- Keep patient flat and warm
- Catheterize the patient for emptying bladder & monitoring urinary output every hour
- **Crystalloids** (Normal saline or Ringer's solution)**: Fluids of choice** until compatible blood is arranged
  - **1 ml of blood loss = 3 ml of crystalloids**
  - **1 ml of blood loss = 1 ml of colloid – like Haemaccel**
  - If hemorrhage is torrential & fully cross-matched blood still not available: Uncross matched O ive blood may be given
  - **Fresh frozen plasma:** 4 Units for every 6 Units of red cells **or** PT/ APTT > 1.5 X normal
- Monitor adequacy of replacement with **urine output** (0.5 ml/kg/hr)
- **Establish etiology simultaneously [4 T's]**
  - Tone (abnormalities of uterine contraction): 70 – 80 % } **Uterus not contracted [Relaxed]**
  - Trauma (of the genital tract): 20 %
  - Tissue (retained products of conception): 10 % } **Uterus Contracted**
  - Thrombin (abnormalities of coagulation): 1 %

## ➢ If uterus is relaxed [uterine atony]:

- Massaging the uterus **[Bimanual compression]** will expel any retained bits & stimulate uterine contractions

**First line is Oxytocin:**

- Start with 5-10 units slow IV or IM
- Infusion of 40 units in **500**/**1000** ml at **30**/**60** drops/min [over 4 hours]
- Continue same dose at 40 drops/min until bleeding stops.

**Second line:**

- **Ergometrine/methyl ergometrine:** Dose is 0.5 mg IM or slow IV. Repeat ergometrine (0.5 mg) IM or slow IV push

**Uterine Tamponade:**

- Tamponade using various types of hydrostatic balloon catheter has mostly replaced uterine packing. Mechanism of action is similar to uterine packing. Balloon is inflated with normal saline (200–500 mL). It is kept for 4–6 hours.

**B-Lynch compression suture:**

- Placement of a brace suture to compress the uterus. Success rate is about 80 % and it can avoid hysterectomy.

**Hysterectomy:**

- Rarely uterus fails to contract and bleeding continues in spite of the above measures.

# Preterm Labour, PROM & PPROM

## Preterm Labour [PTL]:

- Preterm labour (PTL) is the onset of labour before 37 weeks' gestation.
- Worldwide, **preterm delivery is the most important cause of infant (< 5 years) mortality.**

- The **risk of PTD** is greater in **teenagers**, **women with advanced maternal age** & in 1st pregnancies. Socioeconomic factors, marital status, environmental stress, **cigarette smoking**, illegal substance (i.e., cocaine) abuse, alcohol & poor nutrition, African or Afro-Caribbean women have all been linked to an increased risk of preterm birth.

## ➢ Causes of preterm labour:

- 85 % of PTD occurs due to **PTL and PPROM**

1. **Cervical weakness** is associated with **painless second trimester pregnancy loss**.
2. Infection of the fetal membranes, **chorioamnionitis,** is a **major cause of preterm birth.** Mostly, infection **ascends from vagina**. **Cervical weakness, resulting in early shortening,** can predispose to **ascending bacterial infection**
3. **Bacterial vaginosis (BV),** affects 16% of pregnant women & is **associated with PPROM** & **PTL**
4. **Multiple pregnancy [2 %] & uterine distension**
5. Polyhydramnios
6. Haemorrhage Antepartum haemorrhage and placental abruption may lead to spontaneous PTL.

## ➢ Management of preterm labour:

**Laboratory Studies:**

- CBC with differential, urine culture & sensitivity, ultrasound examination for fetal size, position, and placental location
- Speculum examination should be performed. Cervical cultures should be sent for gonorrhea & chlamydia. A wet mount should be performed to look for signs of BV. GBS cultures should be taken from the vaginal & rectal mucosa.
- Deciding who is and who is not in PTL has been helped by testing the **cervicovaginal fluid levels of fetal fibronectin (fFN),** a glycoprotein found in cervicovaginal fluid, amniotic fluid, placental tissue and in the interface between the chorion and decidua. It acts like 'glue' at the maternal–fetal interface and its presence in cervicovaginal fluid between 22- and 36-weeks' gestation has been shown to be a predictor of PTD. Negative fFN testing has a very high negative predictive value, enabling most women with threatened PTL and a negative fFN test to be sent home.
- Those with a **positive fFN test can be admitted for tocolysis and steroids for fetal lung maturation.**
- **Tocolytics** are used to delay delivery long enough for **corticosteroid administration** to improve neonatal lung function
- First choice for tocolytics should be a **calcium channel blocker (nifedipine) or an OTR antagonist (atosiban).**

## ➢ Prevention of preterm delivery:

1. **Progesterone promotes uterine inactivity** & inhibit the production of proinflammatory cytokines and PGs within the uterus. In women with previous preterm birth, **intramuscular hydroxyprogesterone caproate** is effective in reducing the risk of recurrence. In women with short cervix, vaginal progesterone may prevent preterm birth.
2. **Cervical cerclage:** Cervical cerclage should be considered in a small group of carefully selected patients [prior history of ≥ 3 late miscarriages or PTD]. It is **best performed after 12–14 weeks** to avoid the problems of early pregnancy loss. The most common suture material is a **Mercilene tape,** which is non-absorbable

## ➢ Delivery:

- Premature infants **younger than 34 weeks** should be delivered in a hospital equipped for neonatal intensive care.
- If C-section is indicated, decision to operate is based on maturity of fetus and prognosis for survival. In borderline cases **(23-24 weeks' gestation & 500–600 g EFW),** wishes of parents with regard to intervention assume an important place

# Premature rupture of the membranes (PROM):

- defined as rupture of membranes before the onset of active labor. Mostly, this occurs near term, but when membrane rupture occurs before 37 weeks gestation, it is known as preterm premature rupture of membranes [PPROM]
- **Risk Factors:** smoking, previous PROM/PTD, polyhydramnios, multiple pregnancy, cervical insufficiency.
- **Complications:** delivery within 1 week, RDS, cord compression, chorioamnionitis, placental abruption, oligohydramnios, neonatal sepsis, IVH and NEC.

## ➢ Management:

- Patients often report a **sudden gush of fluid with continued leakage.**
- Physician should perform a **speculum examination** to evaluate if any **cervical dilation, effacement** & **cord prolapse** are present. During the speculum examination **cervical culture for chlamydia and gonorrhea** should be performed, because women with these infections are 7 times more likely to have PROM.
- Examiner should look for **3 hallmark confirmatory findings in speculum examination associated with PROM:**
  1. **Pooling**—the collection of amniotic fluid in the posterior fornix.
  2. **Nitrazine test –** a sterile cotton-tipped swab should be used to collect fluid from the posterior fornix & apply it to Nitrazine paper. In presence of amniotic fluid, **Nitrazine paper turns blue,** demonstrating an alkaline pH (7-7.25)

3. **Fern test** – Fluid from posterior fornix is placed on a slide and allowed to air-dry. Once fluid has dried on the slide, physician can check for ferning (arborization) under low-power microscope. Presence of **ferning indicates PROM**

- **On ultrasonography,** there is Oligohydramnios [Amniotic fluid index < 5 cm, Deepest vertical pool < 2 cm]

## ➢ Treatment:

**Corticosteroids:**

- Corticosteroids should be given between **24-32 weeks** to **reduce the risk of RDS, intraventricular hemorrhage & necrotizing enterocolitis**. Most widely used regimen include **IM dexamethasone (12 mg/12 hourly/2 doses)**

**Antibiotics:**

- An intravenous combination of **2 g of ampicillin and 250 mg of erythromycin every 6 hours for 48 hours**, **followed by 250 mg of amoxicillin and 333 mg of erythromycin every 8 hours for 5 days.**
- Women given this combination were more likely to stay pregnant for 3 weeks despite discontinuation of the antibiotics after 7 days. It is advisable to administer appropriate antibiotics for intrapartum group B streptococcus prophylaxis
- **Tocolysis is contraindicated** due to the increased risk of maternal and fetal infection in patients with PPROM
- **Magnesium sulfate** (neuroprotector) to reduce neonatal cerebral palsy between 24 & 32 weeks of gestation

## ➢ Management Based on Gestational Age:

**34 to 36 weeks:**

- Labor induction [vaginal delivery] clearly is beneficial at or after 34 weeks' gestation.
- Antibiotics for group B streptococcus prophylaxis [Penicillin G]

**32 to 33 weeks:**

- Documented **pulmonary maturity** ⇒ induction of labor
- Administer a course of **corticosteroids and antibiotics** to patients without documented fetal lung maturity
- All patients should receive appropriate **intrapartum group B streptococcus prophylaxis,** if indicated.

**24 to 31 weeks:**

- Expectant management in tertiary care hospital
- Physicians should administer a **course of corticosteroids and antibiotics** & do fetal monitoring or ultrasonography.

# Menstrual Irregularities

## ➢ Abnormal Uterine Bleeding:

- Any variation from the normal menstrual cycle, which includes changes in regularity & frequency of menses, duration of flow, or amount of blood loss is known as abnormal uterine bleeding [AUB].
- **Types of AUB:** Heavy menstrual bleeding [HMB], intermenstrual bleeding (IMB), postcoital bleeding (PCB) & postmenopausal bleeding (PMB).

**Causes of Anovulation:**

- Hyperandrogenic anovulation (e.g, PCOS, CAH, or androgen producing tumors)
- Hypothalamic dysfunction
- Hyperprolactinemia
- Thyroid disease
- Pituitary disease
- Premature ovarian failure
- Iatrogenic (Chemotherapy)
- Medications

| FIGO classification of abnormal uterine bleeding[3] |
|---|
| Structural causes |
| Polyps |
| Adenomyosis |
| Leiomyoma[a] |
| Malignancy and hyperplasia |
| Nonstructural causes |
| Coagulopathy |
| Ovulatory dysfunction |
| Endometrial |
| Iatrogenic |
| Not yet classified |

| Patterns of AUB | Interval | Frequency | Amount | Description |
|---|---|---|---|---|
| Amenorrhea | Absent | Absent | Absent | Absence of bleeding for > 6 months **[No cycles]** |
| Oligomenorrhea | Regular/Irregular | **Decrease** | Normal | >35 days **[Infrequent cycles]** |
| Menorrhagia | **Regular** | Normal | **Excessive** | >80 ml/period **or** > 7 days |
| Polymenorrhea | **Regular** | **Increase** | Normal | < 21 days **[Frequent cycles]** |
| Metrorrhagia | **Irregular** | Normal | Normal/Variable | >7 days |
| Menometrorrhagia | **Irregular** | Normal | **Excessive** | >80 ml/period **or** > 7 days |

# Heavy menstrual bleeding [HMB]:

- **HMB** is the **most common type** of menstrual bleeding disorder. Replaced older term **menorrhagia [hypermenorrhea]**

- HMB is defined as a **blood loss of > 80 ml per period** or **> 7 days.**
- **The aetiology of HBM may be hormonal or structural, with common causes listed below:**
  - **Fibroids: 30% of HMB is associated with fibroids**
  - **Adenomyosis: 70% of women will have AUB/HMB**
  - Endometrial polyps
  - Coagulation disorders (e.g., von Willebrand disease)
  - Pelvic inflammatory disease (PID)
  - Thyroid disease
  - Drug therapy (e.g., warfarin)
  - Intrauterine devices (IUDs)
  - Endometrial/cervical carcinoma

| The Normal Menstrual Period | |
|---|---|
| Blood loss < 80 ml | (average 30–35 ml) |
| Duration of flow 2–7 days | (average 4 days) |
| Cycle length 21– 35 days | (average 28 days) |

- Often no pathology can be identified. **Bleeding of endometrial origin [BEO]** is diagnosis of exclusion. BEO has replaced the term dysfunctional uterine bleeding (DUB). Abnormal uterine bleeding in absence of pelvic organ disease or a systemic disorder is called dysfunctional uterine bleeding. Disordered endometrial PGs production cause BEO.

| Associated symptoms of HMB | Suggestive of |
|---|---|
| **Irregular bleeding**<br>Intermenstrual bleeding [IMB]<br>Postcoital bleeding [PCB] | Endometrial or cervical polyp OR other cervical abnormality |
| Excessive bruising/bleeding from other sites [petechiae]<br>History of postpartum haemorrhage (PPH)<br>Excessive postoperative bleeding<br>Excessive bleeding with dental extractions<br>Family history of bleeding problems | Coagulation disorder (Coagulation disorders will be present in 20% of those presenting with 'unexplained' heavy menstrual bleeding.) |
| Unusual vaginal discharge | Pelvic inflammatory disease |
| Urinary symptoms, abdominal mass or abdominal fullness | Pressure from fibroids |
| Weight change, skin changes [dry], fatigue, proptosis | Thyroid disease |
| Obesity, hirsutism, acne | PCOS |

## ➢ Management:

### Investigations:

- **Urine pregnancy test** is a **very important investigation**, may indicate miscarriage or ectopic pregnancy
- **FBC** should be performed in all women. **Coagulation screen** if HMB since menarche or history of coagulation defects
- **Pelvic ultrasound scan [First line imaging-TVUSS]** if history suggests structural or histological abnormality such as **PCB, IMB, pain/pressure symptoms, or enlarged uterus or vaginal mass** is palpable on pelvic examination
- **Pipelle endometrial Biopsy or outpatient hysteroscopy** is **indicated** if there is:
  - PMB and endometrial thickness on TVUSS > 4 mm
  - HMB after 45 years
  - HMB associated with IMB
  - Treatment failure
  - Prior to ablative techniques

- **Thyroid function tests** should only be carried out when the history is suggestive of a thyroid disorder.
- **Hysteroscopy** [Diagnostic & therapeutic] is the **gold standard evaluation of pathology in the uterine cavity.**

## ➢ Treatment:

### Medical Treatment:

- **Indications:**
  - No structural or histological abnormality
  - Fibroids < 3 cm
  - No distortion of the uterine cavity
- **Levonorgestrel intrauterine system (LNG-IUS, Mirena):** Mean reductions in mean blood loss (MBL) of around 95% **[Most effective treatment]** are achieved by 1 year after LNG-IUS insertion. It provides a highly effective alternative to surgical treatment, with few side-effects. It is obviously not suitable for women wishing to conceive.

**Management of acute HMB**

- Admit.
- Pelvic examination.
- FBC, coagulopathy screen, biochemistry.
- Intravenous access and resuscitation or transfusion as required.
- Tranexamic acid oral or IV.
- TVUSS.
- High-dose progestogens to arrest bleeding.
- Consider suppression with GnRH or ulipristol acetate in the medium term.
- Longer-term plan when a diagnosis has been made.

- **Tranexamic acid,** an antifibrinolytic that reduces blood loss by 50% and is taken during menstruation, or **mefenamic acid,** which **inhibits prostaglandin synthesis** & reduces blood loss by 30%, or **COCP** will induce slightly lighter periods
- Oral progestogens **[Norethisterone]**: 15 mg daily in a cyclical pattern from day 6 to day 26 of the menstrual cycle
- **Gonadotrophin-releasing hormone (GnRH) agonists:** act on pituitary to stop the production of estrogen, which results in amenorrhoea. Used for short term as they cause hypo-estrogenic state that predisposes to osteoporosis. They are used preoperatively to shrink fibroids or cause endometrial suppression to enhance visualization at hysteroscopy.

**Surgical treatment:**

- Indicated in women where medical treatments have failed or there are pressure symptoms from fibroids or prolapse.
- Women contemplating surgical treatment for HMB must be certain that their family is complete [hysterectomy].
- **Endometrial ablation:** ablation of endometrial lining of uterus to sufficient depth which **prevents regeneration of endometrium**. Suitable for women with a **uterus no bigger than 10 weeks'** size & with **fibroids < 3 cm**
- After treatment, 40% - amenorrhoeic, 40% - markedly reduced menstrual loss & 20% - no difference in their bleeding.
- Endometrial ablation is so successful that all women should be encouraged to consider it before hysterectomy
- **Uterine artery embolization:** UAE is treatment useful for **HMB associated with large fibroids.**
- **Myomectomy:** for women with HMB secondary to large fibroids with pressure symptoms who wish to conceive.
- **Transcervical resection of large submucosal fibroid** reduce HMB & is appropriate in women wishing to conceive.
- **Hysterectomy:** First-line treatment in women with large fibroids, & associated uterine prolapse.

# Amenorrhoea and oligomenorrhoea:

- **Amenorrhoea** is **absence of menstruation for > 6 months** in the absence of pregnancy in a woman of fertile age.
  - **Primary amenorrhea** is the failure to start menstruation by age of 16 in a girl with normal secondary sexual characteristics **or** by the age of 14 where there is a failure to develop secondary sexual characteristics
  - **Secondary amenorrhoea** is absence of menstruation for > 6 months in a normal female of reproductive age with regular periods that is not due to pregnancy, lactation or the menopause, **or** for 12 months in a woman who had irregular periods without any physiological reasons.
- **Oligomenorrhoea** is defined as **irregular periods at intervals of > 35 days,** with only **4–9 periods a year**.

**Aetiology:**

- **Physiological causes:** pre-puberty, pregnancy related, during lactation, after menopause
- **Pathological causes:** Primary & secondary causes:

**Causes of Primary Amenorrhea:**

MCQ **Turner syndrome** [Gonadal dysgenesis]: short stature, webbed neck, increased carrying angle & sexual infantilism

- **Kallman's syndrome** (X-linked recessive, resulting in deficiency in GnRH causing underdeveloped genitalia).
- Androgen insensitivity [testicular feminization]
- **Müllerian defects** [absent uterus, outflow tract abnormalities, leading to a haematocolpos (retention of menstrual blood within vagina, due to **imperforate hymen**)]

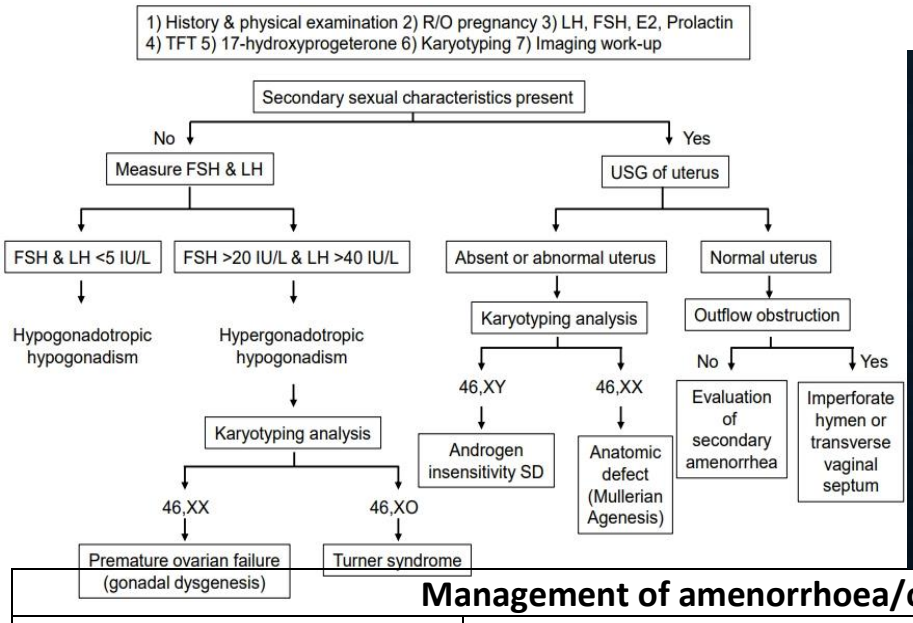
**Causes of secondary amenorrhea:**

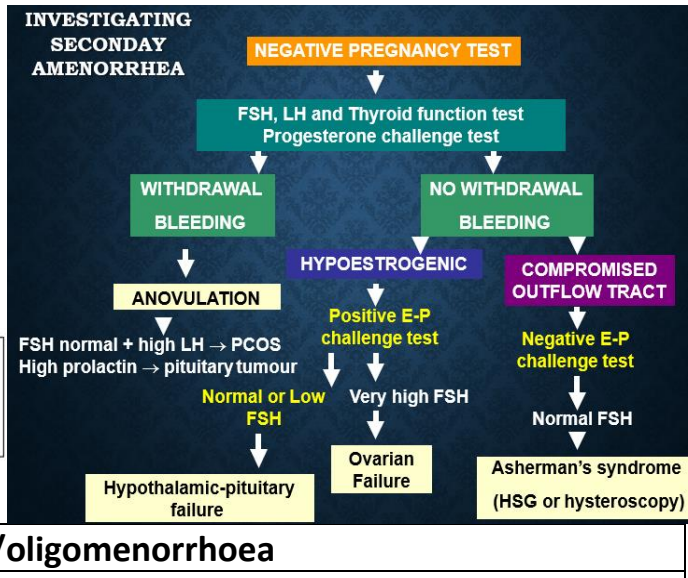
- The **most common cause of secondary amenorrhea** in reproductive age women is **pregnancy** and this should always be excluded by physical exam and laboratory testing for the pregnancy hormone – B-hCG.
- Hypothyroidism & hyperthyroidism [High level of thyroxine inhibit FSH release]
- Cushing syndrome
- **Pituitary failure** as a result of trauma, or infarction after massive blood loss in PPH (Sheehan's syndrome)
- Pituitary adenomas, of which **prolactinoma** is most common [Prolactin inhibits GnRH release from the hypothalamus]
- **Hypothalamic dysfunction** [30%]: due to stress, excessive exercise, weight loss & eating disorder [switch off hypothalamic stimulation of the pituitary]. It may be due to tumour, infarction, thrombosis or inflammation.
- Ovarian tumour (androgen secreting) & adrenal tumour
- **Premature ovarian failure (POF)** is defined as cessation of periods before 40 years of age. May be due to chemotherapy, radiotherapy, autoimmune disease or chromosomal disorders (e.g., **Turner's syndrome**)
- **PCOS** [characterized by obesity, amenorrhea/oligomenorrhoea in 75% patients, subinfertility & hirsutism]
- Surgical removal [Hysterectomy]
- **Asherman's syndrome** (damage to the endometrium with adhesion formation, due to vigorous uterine curettage)
- **Drugs:** progestogens, HRT or dopamine antagonists [phenothiazines], methyldopa, cimetidine, antihistamines

| History and examination of patient with amenorrhoea/oligomenorrhoea | | |
|---|---|---|
| **Information required** | **Relevant factors** | **Possible diagnoses** |
| Developmental history [menarche] | Delayed/incomplete puberty | Congenital malformation/chromosomal abnormality |
| Menstrual history | Oligomenorrhoea, Hirsutism, infertility | PCOS |
| | Secondary amenorrhoea | POF |
| | Hot flushes, decreased libido | Premature menopause |
| Obstetrical history | Severe PPH | Sheehan syndrome |
| Cyclical symptoms | Cyclical pain without menstruation | Congenital malformation, Imperforate hymen |
| | Elevated blood pressure | Cushing and PCOS |
| Weight | Dramatic weight loss | Hypothalamic malfunction, anorexia nervosa |
| | Difficulty losing weight | PCOS |
| Weight gain, moon face, thin limbs, buffalo hump | | Cushing syndrome |
| Weight gain, cold intolerance, dry skin, fatigue, puffy face | | Hypothyroidism |
| Lifestyle | Exercise, stress | Hypothalamic malfunction |
| Past surgical history | Evacuation of uterus | Asherman syndrome |
| Drug history | Dopamine agonists, HRT | Hypothalamic malfunction |
| Headache, visual disturbance | | Pituitary adenoma |
| Breast examination | Galactorrhoea | Prolactinoma |

## ➢ Investigation of amenorrhoea/oligomenorrhoea:

- A **pregnancy test [B-hCG]** should be carried out if the patient is sexually active.
- Blood can be taken for **LH, FSH and testosterone**
  - **Raised LH or raised testosterone** could be suggestive of **PCOS**
  - **Raised FSH** may be suggestive of **Premature Ovarian Failure [POF]**
  - A **raised prolactin** level may indicate a **prolactinoma**
- **Thyroid function** if clinically indicated.
- An **ultrasound scan** can be useful in detecting **polycystic ovaries**
- **MRI of the brain** if symptoms are consistent with a **pituitary adenoma.**
- **Hysteroscopy** is suitable where **Asherman or cervical stenosis** is suspected.
- **Karyotyping** is diagnostic of **Turner's and other sex chromosome abnormalities.**




| Management of amenorrhoea/oligomenorrhoea | |
|---|---|
| **Cause** | **Management** |
| Low BMI | Dietary advice and support |
| Imperforate Hymen | Surgical incision |
| Testicular feminization | Remove gonad + HRT |
| Turner's syndrome | HRT |
| Hypothalamic lesions, e.g., glioma | Surgery [craniotomy] |
| Hyperprolactinaemia/prolactinoma | Dopamine agonist (e.g., cabergoline or bromocriptine) or transsphenoidal surgery |
| POF | HRT or COCP |
| Asherman syndrome | Adhesiolysis and IUD insertion at time of hysteroscopy (to prevent recurrence of adhesions) |
| Cervical stenosis | Hysteroscopy and cervical dilatation |

# Polycystic Ovarian Syndrome

- Polycystic ovary syndrome [PCOS] is a syndrome of ovarian dysfunction along with the cardinal features of hyperandrogenism and polycystic ovary morphology. Also, be known as **Stein – Leventhal Syndrome.**
- 50 % of first degree relative have PCOS, which suggests an **autosomal dominant inheritance.**

❖ **Clinical Features:**

- **Oligomenorrhoea**/amenorrhoea [75%], related to **chronic anovulation**. ⬆ **risk of endometrial carcinoma**
- **Subfertility in upto 75% of women [most common cause]**. PCOS is the **most common cause of anovulation.**
- Signs of androgen excess (e.g., **hirsutism and acne**) and obesity [40 % - BMI > 30]
- **Elevated serum LH levels**
- Associated with an increased risk of type 2 diabetes [raised insulin resistance] & CVS events [High Triglycerides, low HDL]
- Anxiety, depression & poor self-esteem
- Acanthosis nigricans (areas of increased velvety skin pigmentation occur in the axillae and other flexures).
- ⬆ risk of Gestational Hypertension, Diabetes & Miscarriages
- **May be asymptomatic.**

**Diagnosis:**

- **Patients have 2 out of 3 features [Rotterderm's criteria]:**
- Amenorrhoea/oligomenorrhoea.
- Clinical or biochemical hyperandrogenism.
- Polycystic ovaries on ultrasound. The ultrasound criteria for the diagnosis of a polycystic ovary are eight or more subcapsular follicular cysts < 10 mm in diameter [Usually peripheral in location] and increased ovarian stroma. While these findings support a diagnosis of PCOS, they are not by themselves sufficient to identify the syndrome.

➢ **Management:**

- **Combined oral contraceptive pill (COCP)** to regulate menstruation. This also increases sex hormone binding globulin, which will help reduce androgenic symptoms **[First line medical Treatment]**
- **Cyclical oral progesterone:** used to regulate a withdrawal bleed.
- **Clomiphene:** Used to induce ovulation where subfertility is a factor
- **Lifestyle advice:** Dietary modification and exercise [diabetes and cardiovascular disease]
- **Weight reduction**
- **Ovarian drilling,** a laparoscopic procedure to destroy some of the ovarian stroma that may prompt ovulatory cycles.
- **Treatment of hirsutism/androgenic symptoms:**
  - **Eflornithine cream** (Vaniqua) applied topically
  - **Cyproterone acetate** (an antiandrogen contained in the contraceptive pill, sometimes used alone)
  - **Metformin:** For patients with hyperinsulinaemia and cardiovascular risk factors. It improves parameters of insulin resistance, hyperandrogenaemia, anovulation and acne in PCOS, and may aid weight loss. It is less effective than clomiphene for ovulation induction and does not improve pregnancy outcome
- **GnRH analogues with low-dose HRT:** Reserved for women intolerant of other therapies
- Surgical treatments (e.g., laser or electrolysis).

# Chronic Pelvic Pain & Dysmenorrhea

- **Chronic pelvic pain:** Intermittent or constant pain in lower abdomen or pelvis of a woman of **atleast 6 months in duration,** not occurring exclusively with menstruation (dysmenorrhoea) or intercourse & not associated with pregnancy

**Causes of Chronic Pelvic Pain**

| Gynaecological | CNS & PNS | GIT | Urological | MSK | Nerve | Psychological |
|---|---|---|---|---|---|---|
| Endometriosis<br>Adenomyosis<br>Chronic PID [with adhesions]<br>Uterine Fibroids<br>Ovarian cysts | Visceral hyperalgesia<br>Neuropathic Pain | Irritable bowel syndrome<br>Constipation<br>Celiac disease<br>Inflammatory bowel disease | Bladder pain syndrome<br>Recurrent UTI<br>Urinary tract calculi | Degenerative joint disease in pelvis<br>spondylolisthesis | Nerve entrapment in scar tissue, fascia or a narrow foramen | Depression<br>Anxiety<br>Sleep disorders<br>Physical & sexual abuse |

## Endometriosis:

- Endometriosis is a common **benign** condition that is defined as **endometrial tissue lying outside the uterine cavity.**
- It is usually found within pelvis [peritoneum lining pelvic side walls, pouch of Douglas, uterosacral ligament & bladder]

- When endometrial tissue is **implanted into the ovary an endometrioma [ground glass echogenicity] forms**. This cyst may be large and contains old, altered blood that has a thick brown appearance, & referred to as a **chocolate cyst.**
- Endometriotic tissue responds to cyclical hormonal changes & undergoes cyclical bleeding & inflammatory reactions. These regularly repeated episodes of bleeding & healing lead to fibrosis & adhesion formation between pelvic organs.
- **In adenomyosis** [seen with endometriosis], **endometrial tissue is found deep within underlying myometrium**

## ❖ Clinical features:

- **Severe cyclical non-colicky pelvic pain restricted to around the time of menstruation,** sometimes with heavy menstrual loss. **Symptoms may begin a few days before menses starts** until end of menses
- Deep pain with intercourse (deep dyspareunia) and on defaecation (dyschezia) ➡ endometriosis in pouch of Douglas.
- 30% to 40% of patients with endometriosis complain of difficulty in conceiving [infertility]

**Physical Examination:**

- Thickening/nodularity of uterosacral ligament, tenderness in pouch of Douglas, adnexal mass or fixed retroverted uterus

**Investigations:**

- **TVUSS** can detect endometriosis involving ovaries (chocolate cysts) but its use in diagnosing smaller lesions is limited, although findings such as ovaries fixed together or to the back of uterus **(kissing ovaries)** add strength to the diagnosis.
- **MRI** can detect lesions > 5 mm in size, particularly in deep tissues, for example the rectovaginal septum.
- **Laparoscopy [Best approach for diagnosis]:** Lesions can be red, puckered, black or appear white and fibrous on laparoscopy. **Diagnosis is confirmed by Biopsy.** Laparoscopy allows lesions to be biopsied for histology.

## ➢ Management:

**Medical therapy:**

- **NSAIDs** are potent analgesics and are helpful in reducing the severity of dysmenorrhoea and pelvic pain
- **Combined oral contraceptives:** reduce endometriosis associated dyspareunia, dysmenorrhoea. If symptoms persist, diagnosis should be reviewed and common coexisting conditions such as IBS & constipation treated
- **Progestogens:** In those where there are risk factors for COCP, progestogens should be used to induce amenorrhoea
- **Levonorgestrel intrauterine system** is particularly useful in providing a long-term effect particularly after surgery.
- **Gonadotrophin-releasing hormone agonists:** Effective in relieving the severity and symptoms of endometriosis.

**Surgical treatment:**

- Most surgery for endometriosis can be achieved laparoscopically. Symptomatic endometriotic chocolate cysts should not just be drained but the **inner cyst lining should be excised to reduce the risk of recurrence**
- Deposits of superficial peritoneal endometriosis can be excised during laparoscopy using diathermy or laser energy
- **Hysterectomy and oophorectomy:** Considered only in women who have completed their family.
- Oestrogen-only hormone replacement therapy can be started immediately following surgery once patient is mobile.

# Dysmenorrhoea:

- Dysmenorrhoea is painful menstruation
- **Dys** means difficult, painful or abnormal. **Meno** means month. **Rrhea m**eans flow
- **Primary dysmenorrhoea**: painful periods since onset of menarche and is unlikely to be associated with pathology. Primary dysmenorrhoea **improves after childbirth,** and it also appears to decline with increasing age.
- Primary dysmenorrhea increases with smoking
- **Secondary dysmenorrhoea**: Painful periods that have developed over time and usually have a secondary cause

| PRIMARY DYSMENORRHEA | SECONDARY DYSMENORRHEA |
|---|---|
| Pain which comes from having a period, due to natural chemicals called *Prostaglandins* which are produced in the lining of the uterus. There is no underlying disorder. | The pain occurs as a consequence of an underlying disorder like *Endometriosis, Adenomyosis, Fibroids, or Pelvic Inflammatory Disease* (PID). |
| Often happens when a girl starts getting her periods, and may improves later in life. | Occurs or starts later in life, than primary dysmenorrhea. |
| Pain occurs right before menstruation starts, as the *Prostaglandin* level rises and eases out as the period progresses. | Pain often starts earlier in the cycle, than in primary dysmenorrhea, continues through the period and may last even beyond the period. |
| Can be treated with medicines for pain and other remedies . | Underlying condition needs to be diagnosed and treated. |

**Aetiology of secondary dysmenorrhoea:**

- Endometriosis and adenomyosis
- Pelvic inflammatory disease
- Cervical stenosis and haematometra (rarely).

## ➢ Investigations:

- **TVUSS** to detect **endometriomas**, **adenomyosis** (enlarged uterus with heterogeneous texture).
- **Diagnostic laparoscopy** is performed if history is suggestive of endometriosis, swabs and ultrasound scan are normal, yet symptoms persist & patient wants a definite diagnosis or wants reassurance that their pelvis is normal

## ➢ Management:

- **NSAIDs:** Naproxen, ibuprofen and mefenamic acid
- **Hormonal contraceptives:** Progestogens [oral or parenteral] may be useful to cause anovulation and amenorrhoea.
- **LNG-IUS:** Beneficial for dysmenorrhoea and indeed can be an effective treatment for endometriosis & adenomyosis. It is often **used as a first-line treatment** before laparoscopy.
- **Lifestyle changes:** Low fat, vegetarian diet may improve dysmenorrhoea. Exercise may improve symptoms [blood flow]
- **GnRH analogues:** Best used to manage symptoms if awaiting hysterectomy
- **Surgical laparoscopy** to perform adhesiolysis or treatment of endometriosis/drainage of endometriomas.

# Menopause & Its Problems

- The menopause is defined as the woman's final menstrual period and the accepted **confirmation of this is made retrospectively after 1 year of amenorrhoea.** The cause of the menopause is cessation of regular ovarian function.
- Median age of menopause is between 51 & 52 years, with 95% of women attaining menopause b/w age of **45-55 years**

### Etiology of Menopause:

- Ovary has a finite collection of germ cells with a maximum number of 7 million ovarian follicles at 20 weeks of fetal life
- From mid-gestation onwards, there is a logarithmic reduction in germ cells until the oocyte store becomes exhausted on overage at the age of 51. Complete failure of follicular development occurs and estradiol production is no longer sufficient to stimulate the endometrium, amenorrhea follows and FSH and LH levels become persistently elevated.

### Diagnosis:

- **FSH level > 30 IU/L** considered in postmenopausal range.

## ➢ Effects of the menopause by time of onset:

### Immediate (0–5 years):

- Vasomotor symptoms, (e.g., hot flushes, night sweats [hot flush occurs at night], insomnia)
- Psychological symptoms (e.g., labile mood, anxiety, tearfulness)
- Loss of concentration, poor memory
- Joint aches and pains
- Dry, wrinkled and itchy skin
- Hair changes
- Decreased sexual desire

### Intermediate (3–10 years):

- Vaginal dryness, soreness
- Dyspareunia
- Urgency of urine
- Recurrent urinary tract infections
- Urogenital prolapse

### Long term (> 10 years)

- Osteoporosis [Fracture of wrist (Colle's fracture) & Fractures of hip & vertebrae]
- Cardiovascular disease [chances of myocardial infarction & stroke increases]
- Dementia

### Premature ovarian insufficiency:

- If menopause occurs before the age of 40 years it is defined as premature ovarian insufficiency (POI), also sometimes called premature ovarian failure (POF). It occurs in 1% of women under 40 years and 0.1% under 30 years.

### Iatrogenic menopause:

- If GnRH **is given in a constant high dose**, it desensitizes the GnRH receptor and reduces LH and FSH release. This will induce a temporary menopause with a relatively rapid onset, which can be managed with the introduction of hormone therapies and other drugs to relieve some of the unwanted menopausal symptoms – known as add-back therapy.
- Bilateral oophorectomy or surgical menopause.
- Hysterectomy without oophorectomy, **menopause occurs sooner** than the time of natural menopause.

## ➢ Management:

- **Diet and lifestyle:** improved longevity with regular exercise, stopping smoking and reducing alcohol consumption.
- **Hormonal replacement therapy [HRT]: mainstay of the treatment of menopausal symptoms** for decades.

- **Key benefits of HRT:** they improve vasomotor symptoms; sleep patterns; performance during the day. They prevent osteoporosis, increased bone mineral density; & reduce incidence of fractures. They reduce vaginal dryness, soreness & dyspareunia. They also prevent CVS diseases.
  - If estrogen is given without progestogenic opposition, endometrial hyperplasia/cancer may develop
  - Progestogen [LNG-IUS] is normally given cyclically in preparations over a 28-day cycle, of which 16–18 days will provide oestrogen alone and 10–12 days will provide oestrogen and progesterone combined (cyclical HRT).
  - Testosterone is given for disorders of sexual desire and energy levels for women who have failed to respond to HRT.

**Duration of Treatment:**

- Hot flushes & night sweats improve within 4 weeks of starting therapy. Maximum response achieved within 3 months
- Treatment should be continued for at least 1 year**,** as otherwise vasomotor symptoms will often recur
- The bone protection of HRT lasts as long as the regimen is taken and stops on cessation of treatment. Therefore, HRT to be effective in preventing hip fracture it needs to be taken life long and continuously.

**Risks of hormone therapy:**

- **CA endometrium:** If estrogen alone prescribed to patient with intact uterus.
- **CA ovary:** Risk increased in patients taking estrogen alone for more than 5 years.
- **CA Breast:** Estrogen is said to be associated with increased risk of breast cancer.
- HRT doubles the incidence of venous thromboembolism
- There is also small increase in incidence of ischemic stroke due to HRT.

**Bisphosphonates:**

- Alendronate is used in prevention and treatment of osteoporosis.

**Selective estrogen receptor modulators (SERMs):**

- Act as an **estrogen antagonist to breast & endometrial tissue** & **estrogen agonists on bone and lipids**
- **Raloxifene** is the first SERM to be licensed for the prevention and treatment of osteoporosis-related vertebral fracture.

# Contraception

- A method or a system, which allows intercourse and yet prevents conception, is called a contraceptive method.
- **The most effective methods of contraception are the long-acting reversible methods of contraception (LARC)** such as **copper intrauterine device, levonorgestrel intrauterine system & progestogen-only implant.**

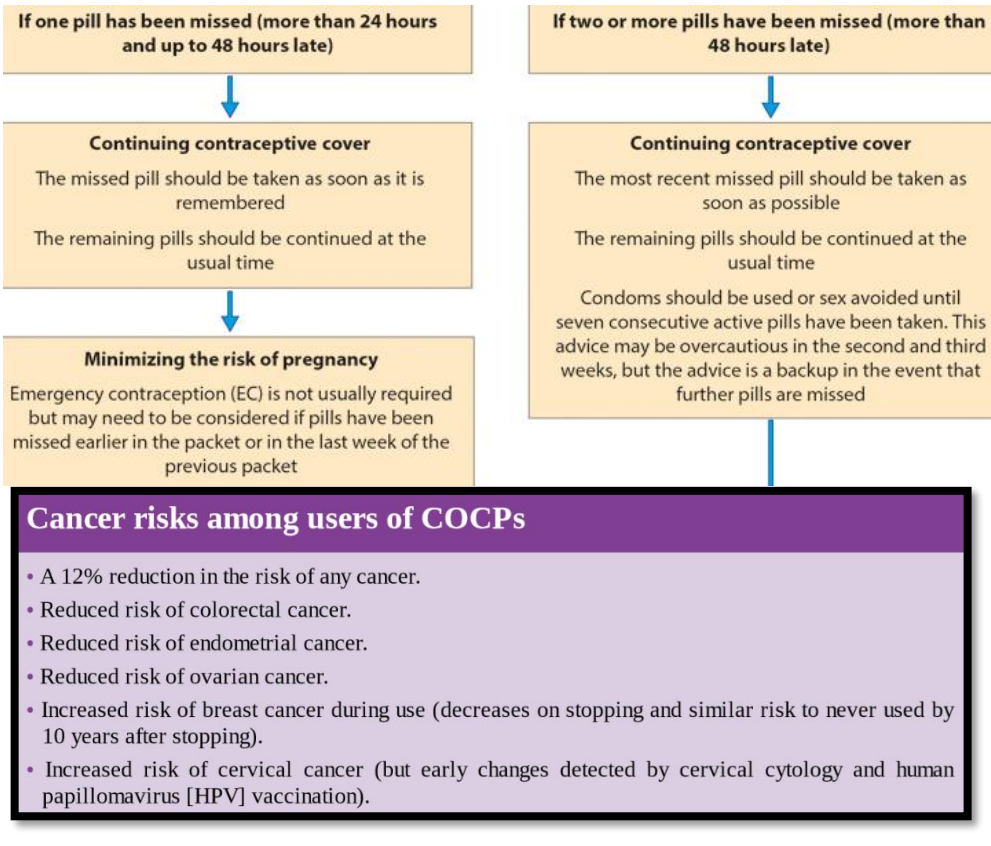
**The current available methods of contraception work in the following ways:**

- **Prevent ovulation:** this is the mechanism of action of the following methods:
  - Combined hormonal methods (pill, patch and vaginal ring)
  - Progestogen-only injectables
  - Progestogen-only implant (Nexplanon)
  - Oral emergency contraception
  - Lactational amenorrhoea
- **Prevent sperm reaching the oocyte:** Female sterilization and male sterilization (vasectomy)
- **Prevent an embryo implanting in the uterus:** this is a mechanism of action of the Cu-IUD and LNG-IUS.
- **Allow sperm into the vagina but poison them:** mechanism of action of spermicides.
- **Allow sperm into the vagina but block further passage:** mechanism of action of diaphragm and cap.
- **Prevent sperm entering the vagina:**
  - Male and female condoms
  - Avoid sex during the fertile time of the cycle
  - Fertility awareness-based methods (FAB)

## ➢ Combined hormonal contraception:

- CHC methods contain two hormones: an oestrogen and a progestogen. They are available as oral pills, a transdermal patch and as a vaginal ring. These methods all work by **inhibition of ovulation** via negative feedback of oestrogen and progestogen on the pituitary, with suppression of FSH & LH.
- They cause **thinning of endometrial lining** & **thickening of cervical mucus**
- **Pills:** Most traditional preparations contain 21 pills followed by a 7-day pill-free interval (or 7 placebo tablets)
- **Patch and ring:** It is applied to the skin of the lower abdomen, buttock [except breast]. The regimen usually involves application of patches for a total of 21 days followed by a 7-day hormone-free interval. The ring is self-inserted and worn in the vagina for 21 days, followed by a 7-day hormone-free interval, during which a withdrawal bleeding occurs.

- **Absolute contraindications of HRT:**
  - Suspected pregnancy
  - Breast cancer
  - Endometrial cancer
  - Active liver disease
  - Uncontrolled hypertension
  - Current venous thromboembolism
  - Known thrombophilia (Factor V leiden)
  - Otosclerosis
- **Relative contraindications of HRT:**
  - Uninvestigated abnormal bleeding
  - Large uterine fibroids
  - Past history of benign breast disease
  - Unconfirmed personal history or a strong family history of VTE
  - Chronic stable liver disease
  - Migraine with aura
- **Common side-effects of all hormonal methods:** unexpected bleeding, **weight gain** [greatest perceived disadvantages], **headaches** [If during use of hormonal method, then change the method of contraception], mood swings & loss of libido. Unexpected bleeding is common (15%) when women start a COCP and may settle with time.







## ➢ Progestogen-only contraceptive methods:

- Injectable, implant and desogestrel-containing POP **inhibit ovulation.**
- All progestogen-only contraceptive methods **thicken cervical mucus** so reducing sperm penetrability and transport.
- **Progesterone only pill** needs to be taken continuously. If a POP is missed then the woman should continue taking the POP and use extra precautions (condoms) for the next 48 hours until the progestogen effect on the mucus is built up.
- **Implant:** A single rod (**Nexplanon**) containing the progestogen etonorgestrel is the currently available method
- **Progestogen-only injectable:** The most commonly used injection is **medroxyprogesterone acetate,** which can be administered IM (buttock, upper arm, lower abdomen) as the formulation **Depoprovera** or subcutaneously.
- **Progestogen-releasing intrauterine system:** it releases the progestogen **levonorgestrel into uterus [LNG-IUS].** The LNG-IUS works by exerting a potent hormonal effect on the endometrium, which prevents endometrial proliferation and implantation. The LNG-IUS does not prevent ovulation.

## ➢ Intrauterine contraception:

- Intrauterine contraception methods include copper intrauterine device Cu-IUD [Non-hormonal] & LNG-IUS [Hormonal]
- In addition to routine contraception, the Cu-IUD can **also be used for emergency contraception.**
- IUDs stimulate an inflammatory reaction in the uterus. The concentration of macrophages & leucocytes, prostaglandins in both uterine & tubal fluid increase. These effects are toxic to both sperm & egg & interfere with sperm transport.
- Women with the LNG-IUS tend to experience lighter, less painful menses, while women using the Cu-IUD may experience more painful or heavier menses.

## ➢ Barrier contraception:

- **Male condoms** are cheap. They **protect against STIs including HIV**. They are the only reversible male method.
- **Female condom** is a lubricated polyurethane condom that is inserted into the vagina. It **also protects against STIs.**
- **Diaphragm & cap** are latex or non-latex devices that are inserted into vagina to prevent passage of sperm to the cervix
- Spermicides are recommended for women who are at high risk of HIV infection.

## ➢ Female sterilization:

- Permanent method, that prevents sperm reaching the oocyte in the Fallopian tube.
- **Laparoscopic sterilization** most commonly occludes the Fallopian tube with filshie clips

## ➢ Vasectomy:

- The so-called 'no scalpel' vasectomy involves a puncture wound in the skin of scrotum under local anaesthesia to access and then divide and occlude the vas using cautery.

- Postvasectomy semen analysis should be conducted at 12 weeks to confirm the absence of spermatozoa in the ejaculate. Alternative contraception should be used until azoospermia is confirmed.

## ➢ Fertility awareness-based methods (FAB)

- Formerly known as 'natural family planning', FAB rely on the signs and symptoms that reflect the physiological changes that occur during the menstrual cycle that define the fertile period, with avoidance of intercourse at that time.
- **Calendar or rhythm method:** Fertile days are calculated based upon the cycle length recorded over at least 6 cycles.
  First fertile day = shortest cycle minus 20
  Last fertile day = longest cycle minus 10
- For women with a 28-day cycle this equates to abstinence for 10 days in each cycle (i.e., day 8–18).

## ➢ Lactational amenorrhoea:

- If a mother is within the first 6 months postpartum, is amenorrhoeic and is fully or nearly fully breastfeeding, then the risk of pregnancy is about 2%.
- After 6 months, or if menses occur or breastfeeding reduced, then another method of contraception must be used.

### Emergency contraception

- The most effective method of EC is an IUD (about 99% effective).
- An IUD can be inserted up to 5 days after ovulation for EC.
- Ulipristal acetate (UPA) or levonorgestrel (LNG) are available as oral methods of EC.
- UPA can be given within 120 hours of unprotected intercourse.
- LNG can be used within 96 hours of unprotected intercourse.
- Effective ongoing contraception should be started after EC.

# Subfertility

- Failure to conceive after 12 months of regular unprotected intercourse is known as subfertility.
- The most important factor affecting fertility is **female age,** which is related to a decline in the quality and quantity of eggs. Female fertility tends to fall sharply **over the age of 36,** with a further dip after the age of 40.
- Male age is also important; semen quality tends to fall after 50, while frequency of intercourse tends to fall after 40.
- Both **frequency and timing of sexual intercourse** influence strongly on the chance of conceiving naturally. Couples having intercourse **3 times a week** are 3 times more likely to conceive
- Eggs are thought to be **fertilizable for about 12–24 hours postovulation**, while sperm can survive in the female reproductive tract for upto **72 hours**. Ovulation usually occurs about 14 days prior to menstruation.
- For a woman with a 28-day menstrual cycle, her optimal fertile window will be between days 12 and 15
- There is now strong evidence that **smoking can decrease the quality and quantity of eggs and sperm.**
- **Excessive alcohol** is harmful to the fetus, and can also affect sperm quality.
- Women with a body mass index (BMI) of >29 or <19 will have difficulty conceiving.
- **Stress** can have a direct influence on hypothalamic–pituitary–ovarian (HPO) axis, interfering with regular ovulation, and may indirectly reduce conception by **reducing libido and frequency of intercourse.**
- **Drugs:** NSAIDs (inhibit ovulation); chemotherapy (destroys rapidly dividing cells e.g., gametes); cimetidine, sulphasalazine, androgen injections (affects sperm quality).

## ➢ Causes of subfertility:

**Female subfertility: Most common causes**

- **Ovulatory disorders [Most common is PCOS]**
  - Hypothalamic disorders (e.g., hypothalamic hypogonadism), pituitary disease (e.g., hyperprolactinaemia) and endocrine abnormalities (thyroid disease) are fewer common causes due to anovulation.
- **Tubal damage:**
  - **Pelvic inflammatory disease (PID)**
  - **Endometriosis** [If Fallopian tubes are involved, then this may result in partial or complete blockage of the tubes]
  - **Chlamydial infections** can produce significant degrees of tubal damage, often resulting in a hydrosalpinx]
- **Uterine disorders**:
  - **Submucosal fibroids** have a direct impact on embryo implantation
  - Endometrial scarring **(Asherman's syndrome)** from surgery [D&C] or infection
- Conditions such as diabetes, epilepsy, thyroid disorders & bowel disease can also reduce the chance of conception.
- **Decreased ovarian reserve and age** are major factors in reduced female fertility.

**Male factor:**

- Spermatogonial cells that produce the sperm can be damaged by **inflammation (orchitis)**
- Certain **iatrogenic influences** [pelvic radiotherapy or surgery for undescended or torted testes] reduce sperm production

- Occasionally, sperm production is normal but there are **erectile difficulties or problems with ejaculation.**
- Medical conditions such as **diabetes** and certain occupations involving contact with chemicals or radiation
- Aneuploidy of sex chromosomes (**Klinefelter** XXY most commonly)

## ➢ Female investigations:

- **Blood hormone profile:** this should include early follicular phase **FSH, oestradiol & LH.**
- **Anti-Müllerian hormone (AMH)**: helpful in assessment of **ovarian reserve** & is independent of the menstrual cycle
- **Measurement of ovarian reserve:**
  - Female reproductive potential is directly proportionate to number of oocytes in ovaries, it is called **ovarian reserve.**
  - Ovarian reserve **declines after the age of 35** in an average healthy woman
  - The ovarian reserve can help to predict the response to ovarian stimulation in assisted reproductive technology [ART]
  - **Antral follicle count [AFC]** on TVUSS is a good indicator of ovarian reserve (< 4 – low response, >16 – high response)
  - AMH is produced in **granulosa cells of ovarian follicles** & does not change in response to gonadotrophins during menstrual cycle. As a result, it can be measured & compared from any point in cycle &, is **most successful marker**
  - AMH levels can be measured in blood and are shown to be proportional to the number of small antral follicles.
  - **AMH & AFC,** both are utilized **to assess ovarian reserve.**
- A **midluteal progesterone measurement** should be taken to confirm ovulation.
- In women with an irregular menstrual cycle, thyroid function, prolactin and testosterone can also prove useful.
- **Transvaginal ultrasound (TVUSS)** provides an accurate assessment of pelvic anatomy, including uterine size and shape, the presence of any fibroids, ovarian size, position and morphology, with **antral follicle count (AFC)** an important parameter of ovarian reserve. Pathology such as hydrosalpinges and endometriotic cysts can be detected, and access to the ovaries for assisted reproductive technology [ART] can be assessed.
- **Tubal patency and an assessment of the uterine cavity** are traditionally investigated by
  1- Hysterosalpingography (HSG) using X-ray
  2- Hysterocontrast synography (HyCoSy) using ultrasound
  3- 3D hysterocontrast synography [Recently]

## ➢ Male investigations:

- The only routine investigation on the male side is a **semen fluid analysis (SFA)**
- There should be 2–4-day abstinence from ejaculation before providing the semen sample [2 samples 1 week apart]
- If initial SFA is abnormal it should be repeated 3 months later, because an abnormal SFA will result from viral infections.
- For men with a very low sperm count or azoospermia, it is important to check their testosterone levels (low levels suggest a production impairment **or** testicular failure may be associated with symptomatic low testosterone) and LH/FSH (Hypogonadotrophic hypogonadism is rare and can be treated with FSH and hCG injections.)
- Karyotyping for Y chromosome deletion defects.
- **Azoospermia:** No sperm in semen
- **Aspermia:** No ejaculate
- **Oligospermia:** Reduced sperm count
- **Asthenozoospermia:** Reduced sperm motility

| Parameter | Lower & Reference limit |
|---|---|
| Semen volume [ml] | 1.5 [1.4-1.7] |
| Sperm concentration [million/ml] | 15 [12-16] |
| Total sperm Number [million/ejaculate] | 39 [33-46] |
| Progressive motility [%] | 32 [31-34] |
| Morphology normal forms [%] | 4 [3-4] |
| Vitality – live sperms [%] | 58 [55-63] |
| Ph | >7.2 |

## ➢ Management:

- **Ovulation induction:** For patients with PCOS/ovulatory problems, **ovulation induction (OI) is usually the first line of management. The most common ovulation induction agent used is the antioestrogen clomiphene citrate.**
- Clomiphene binds to oestrogen receptors in the hypothalamus and pituitary. This blocks the normal feedback loops of oestrogen and results in a surge of gonadotrophin release, stimulating the ovary to recruit more follicles for maturation.
- Approx**. 70 % of women on clomiphene will ovulate** & one-half of these will be pregnant within 6 months of trying.
- There is a risk of multiple pregnancies (12 %) and therefore women on clomiphene should be monitored by ultrasound
- **In clomiphene-resistant women,** alternatives include **augmentation with metformin, use of aromatase inhibitors [Letrozole]** & **injectable gonadotrophin.**
- OI can also be induced by laparoscopic ovarian drilling (LOD) in PCOS. For unknown reasons, passing electrical energy through polycystic ovaries can result in the induction of ovulation.
- In women with anovulation of hypothalamic origin, OI using injectable gonadotrophins is more effective.
- Open laparotomy myomectomy for very large uterine fibroids
- Submucosal fibroids, endometrial polyps, Asherman syndrome and some congenital uterine anomalies, such as a septum, are usually managed hysteroscopically.

# Sexually Transmitted Diseases

- STIs are group of communicable diseases that are transmitted predominantly or entirely by sexual contact or close bodily contact with infected individual.
- Some of the Sexually Transmitted Infections are also transmitted through birth, intravenous needles or breastfeeding.

**Bacterial Agents:**

- Gardnerella vaginalis **[Bacterial Vaginosis-Not an STD]**
- Neisseria gonorrhoeae **[Gonorrhea, urethritis, cervicitis, salpingitis, PID, neonatal conjunctivitis]**
- Chlamydia trachomatis **[Lymphogranuloma venereum, urethritis, cervicitis, proctitis, epididymitis, PID]**
- Treponema pallidum **[Syphilis]**
- Haemophilus ducreyi **[Chancroid]**
- Group B streptococcus

**Viral Agents:**

- Herpes simplex virus 1 & 2 **[Oral & Genital herpes]**
- Hepatitis B virus **[Acute & Chronic hepatitis]**
- Human Papilloma Virus **[Genital & anal warts]**
- Molluscum contagiosum virus **[Genital Molluscum contagiosum (Wart like nodules)]**
- Human Immunodeficiency virus **[AIDS]**

**Protozoal Agents:**

- Trichomonas vaginalis **[Trichomoniasis]**

**Fungal agents:**

- Candida albicans **[Vulvovaginal candidiasis]**

**Ectoparasites:**

- Phthirus pubis
- Sarcoptes scabiei

## ➢ Risk Factors:

- **Age:** Highest rate are prevalent in **20-24 years old**
- **Gender:** Morbidity is higher in **men.**
- **Marital Status:** Higher among single, divorced and separated persons than among married couples
- **Socio Economic Status:** Individuals from the lowest socio-economic groups have the highest morbidity rates

## ➢ Gonococcal Infection:

- Caused by Neisseria gonorrhoeae [Gram - ve diplococcus]
- Causes inflammation of the genital tract involving **urethra in men & women and rectum among homosexuals.**

**Clinical Features:**

- Asymptomatic in 50 % of cases, **altered vaginal discharge** [most common symptom] & lower abdominal pain in 25 %.
- Dysuria with urethral discharge
- Proctitis with rectal bleeding, discharge and pain
- Cervicitis – with or without mucopurulent discharge
- Ascending infection may result in PID and, rarely, haematogenous spread can cause disseminated gonococcal infection with a **purpuric non-blanching rash** and/or arthralgia or **arthritis** that is **monoarticular** in a **weight-bearing joint**
- Ophthalmic infection occurs due to inoculation from infected genital secretions, and neonatal infection occurs when the mother has endocervical infection at the time of delivery.

**Diagnosis:**

- NAAT tests **[Nucleic acid amplification tests]** are highly sensitive and specific

**Treatment:**

- Parenteral 3rd generation cephalosporin + Azithromycin [an attempt to delay the emergence of further drug resistance]
- Simultaneous treatment of sexual partner

## ➢ Chlamydial Infection:

- Chlamydial infection is the **most common bacterial STI,** with women under 25 years of age most frequently affected.

**Clinical Features:**

- Altered vaginal discharge, intermenstrual or postcoital bleeding & abdominal pain
- Cervicitis with mucopurulent discharge may be present

- Neonates born to mothers with cervical infection may develop **conjunctivitis.**
- A reactive arthritis that is typically monoarticular affecting weight-bearing joints may occur, but is more common in men
- **Fitz–Hugh–Curtis syndrome** [liver capsule inflammation leading to the creation of adhesions]

**Diagnosis:**

- NAAT test from vulvovaginal swab

**Treatment:**

- Azithromycin or Doxycycline
- Simultaneous treatment of current or recent sexual partner


Violin-string" adhesions of chronic Fitz-Hugh-Curtis

## ➢ Genital Herpes:

- There are 2 types of herpes virus; herpes simplex virus (HSV) type 1 & type 2.
- **HSV-1 causes orolabial herpes** also & occur in childhood, it is also a common cause of genital herpes alongside HSV-2.

**Clinical Features:**

- The majority of initial infections are asymptomatic
- Symptoms include genital pain and dysuria
- On examination, there are typically multiple superficial tender ulcers with regional lymphadenopathy.
- **Vertical transmission:** Neonatal herpes leading to mortality rate upto 30%
- **Diagnosis** is by detection of the virus from the genital lesions by gently taking a swab. The test of choice is PCR
- **Treatment:** Acyclovir-very safe and effective including in pregnancy

## ➢ Genital Warts:

- These are benign epithelial tumours caused by HPV infection. **HPV types 6 and 11 cause over 90% of genital warts.**
- HVP 16 and 18 can cause anogenital dysplasia and cancer [Not warts]

**Clinical Features:**

- Soft, flesh-colored protuberances which may become exuberant (cauliflower like) to papular flat warts on drier areas.
- **Associated Complications:**
- Warts may become very large and obstruct the birth canal, necessitating caesarean delivery
- Neonatal respiratory papillomatosis
- **Diagnosis** is based on clinical examination
- **Treatment:**
- Ablative therapies [In pregnancy] such as application of **liquid nitrogen** or surgical techniques or patient-applied topical therapies, including podophyllotoxin containing preparations or the local immune modulator imiquimod.
- Screening for other STIs and cervical screening

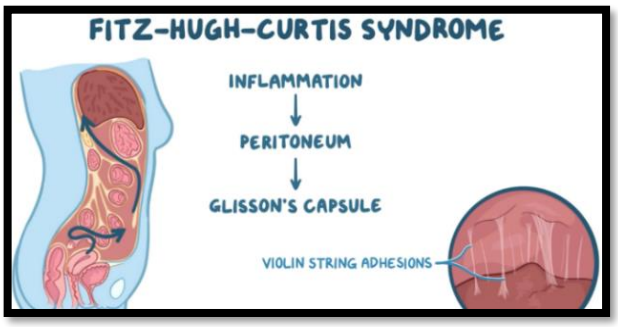
| INFECTION | SYMPTOMS | DIAGNOSIS | TREATMENT |
|---|---|---|---|
| NEISSERIA GONORRHOEAE | CERVICITIS URETHRITIS | NAAT | 250 mg IM CEFTRIAXONE 1 g ORAL AZITHROMYCIN |
| CHLAMYDIA TRACHOMATIS | CERVICITIS URETHRITIS | NAAT | 1 g ORAL AZITHROMYCIN or DOXYCYCLINE for 7 days |
| MYCOPLASMA GENITALIUM | CERVICITIS URETHRITIS | NAAT | 1 g AZITHROMYCIN |
| TRICHOMONAS VAGINALIS | VAGINAL/URETHRAL DISCHARGE | NAAT | 2 g ORAL TINIDAZOLE or METRONIDAZOLE |
| PEDICULOSIS PUBIS | PRURITIS LICE & NITS | CLINICAL EXAM | TOPICAL PERMETHRIN |
| SARCOPTES SCABIEI | PRURITIS | SKIN SAMPLE | TOPICAL PERMETHRIN |
| HSV | PUSTULAR ULCERS | VIRAL CULTURE or HSV PCR | ACYCLOVIR, FAMCICLOVIR & VALACYCLOVIR |
| HPV SEROTYPES 6 & 11 | CONDYLOMATA ACCUMINATA (anogenital warts) | CLINICALLY or by BIOPSY | IMIQUIMOD or SINECATECHINS; if lesions persist: surgical excision, electrosurgery, cryotherapy, or trichloroacetic acid |

# Pelvic Inflammatory Disease

- PID is a spectrum of infection and inflammation of the upper genital tract organs typically involving the uterus (endometrium), fallopian tubes, ovaries, and pelvic peritoneum and surrounding structures.
- Ascending spread of microorganisms from the cervicovaginal canal to the contiguous pelvic structures causing endometritis, salpingitis [infection of fallopian tube], pelvic peritonitis or tubo-ovarian abscess.
- **Risk factors:** young age, low socioeconomic status, multiple sexual partners, absence of contraceptive pill use, previous history of acute PID, IUCD users & area with high prevalence of sexually transmitted diseases
- Usually, a polymicrobial infection caused by organisms ascending upwards
- **The primary organisms (sexually transmitted)**
  - N. gonorrhoeae in 30% cases
  - Chlamydia trachomatis in 30% cases
  - Mycoplasma hominis in 10% cases

**Symptoms:**

- Bilateral Lower abdominal or pelvic pain
- Cervical motion tenderness and cervicitis



- Fever [beyond 38.3°C], nausea, vomiting, diarrhea, tenesmus
- Abnormal uterine bleeding [IMB or PCB]
- Dyspareunia – deep
- Right upper quadrant pain due to perihepatitis **(Fitz-Hugh-Curtis syndrome)** may occur in 5–10% of acute salpingitis

**Signs:**

- Lower abdominal & liver tenderness.
- Purulent vaginal discharge
- Congested external urethral meatus or openings of Bartholin's ducts
- Congested cervix with purulent discharge
- Cervical motion tenderness [Mobilizing the cervix during vaginal examination causes pain & discomfort]
- Adenexal tenderness/mass
- Fullness in POD

## ➢ Investigations:

- **Pregnancy test** [Exclude important d/d of ectopic pregnancy]
- **NAAT: High vaginal** for trichomonas, candida & bacterial vaginosis & **endocervical swabs** for gonorrhoea, Chlamydia)
- **Midstream specimen of urine** for microscopy and culture.
- **Laparoscopy** [gold standard] indicated if the diagnosis is unclear or there is no response to treatment after 48 hours.
- Acute appendicitis & ruptured ectopic pregnancy must be ruled out, because both conditions require urgent laparotomy

## ➢ Complications:

- Dyspareunia
- Infertility - due to tubal damage or tubo-ovarian mass
- Chronic pelvic inflammation [recurrent pyogenic infection]
- Formation of adhesions/hydrosalpinx/pyosalpinx & **tubo-ovarian abscess**
- Chronic pelvic pain
- Increased risk of ectopic pregnancy (6-10-fold).

## ➢ Treatment:

- **Indications of surgery:**
- Generalized peritonitis
- Pelvic abscess
- Tubo-ovarian abscess, which does not respond (48-72 hrs) to antimicrobial therapy

**TABLE 10.4 AMBULATORY MANAGEMENT OF ACUTE PID (CDC-2006)**

- **Patient should have oral therapy for 14 days**
- **Regimen A**
  - Levofloxacin 500 mg (or, ofloxacin 400 mg) PO once daily with or without
  - Metronidazole 500 PO bid
- **Regimen B**
  - Ceftriaxone 250 mg IM single dose PLUS
  - Doxycycline 100 mg PO bid with or without
  - Metronidazole 500 mg PO bid for 14 days

Broad spectrum antibiotic coverage (cefotaxime/cefoxitin) is indicated as most PIDs are polymicrobial (gram-negative and positive aerobes as well as anaerobic rods and cocci)

**TABLE 10.6 INPATIENT ANTIBIOTIC THERAPY (CDC–2006)**

- **Regimen A**
  - Cefoxitin 2 gm IV every 6 hours for 2-4 days
    PLUS
  - Doxycycline 100 mg PO for 14 days

  Metronidazole 400mg BD
- **Regimen B**
  - Clindamycin 900 mg IV every 8 hours
    PLUS
  - Gentamicin 2 mg/kg IV (loading dose), followed by 1.5 mg/kg IV (maintenance dose) every 8 hours

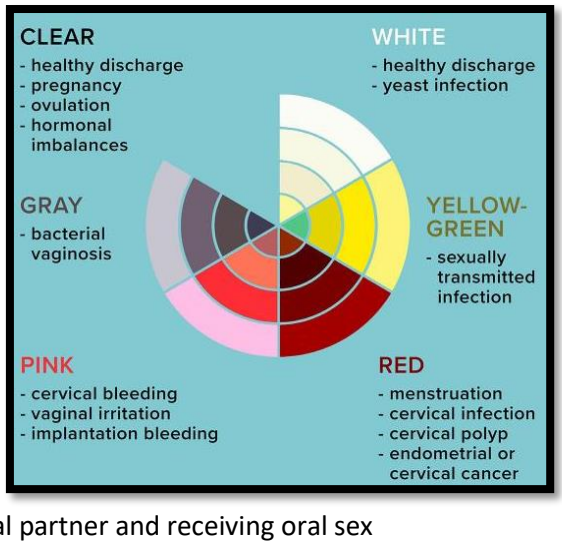
  Metronidazole 400mg BD
- **Alterntive Regimen**
  - Levofloxacin 500 mg IV once daily with or without
  - Metronidazole 500 mg IV every 8 hours

Regimen B is preferred for cases with pelvic abscess as it has anaerobic coverage. **Alternative regimen** is dosed once a day

# Vaginal Discharges

**Organisms responsible for lower genital infection:**

- Gardnerella vaginalis [Bacterial vaginosis 40-50 %]
- Candida Albicans [20-25 %]
- Trichomonas Vaginalis [15-20 %]




**Normal Vaginal Discharge: Leucorrhoea**

- Due to normal increase in cervical mucous production mid-cycle, OCP use
- Can be malodorous and accompanied by irritative symptoms
- Requires no treatment

## ➢ Bacterial Vaginosis:

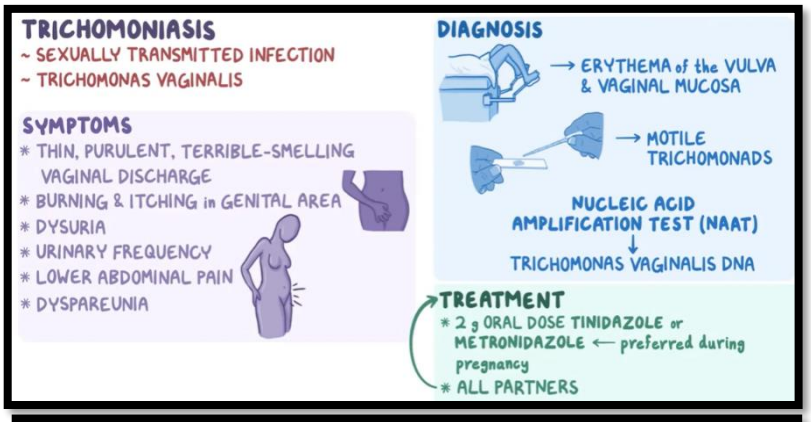
- **Commonest cause of abnormal vaginal discharge**
- Depletion of lactobacilli & overgrowth of gardnerella vaginalis & other species
- **Rise in vaginal pH (> 4.5)**
- **Other risk factors** include douching, black race, smoking, having a new sexual partner and receiving oral sex

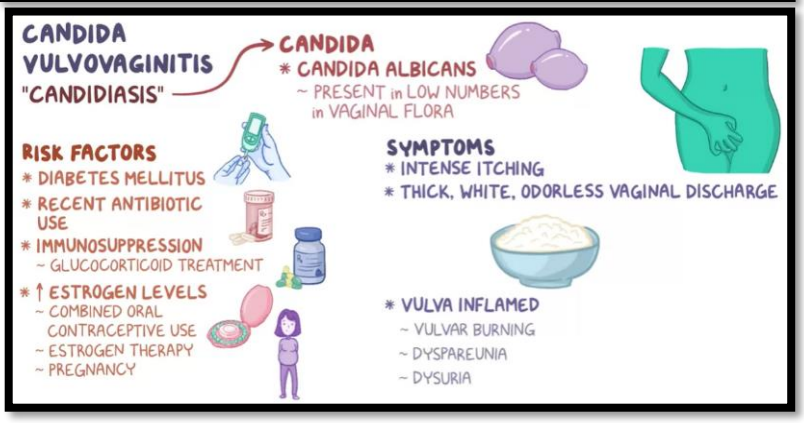
**Clinical Features:**

- Offensive, **off-white vaginal discharge** [commonly adherent to the wall of vagina] with fishy malodour
- More prominent during and following menstruation

**Diagnosis:**

- **Gram stain of the vaginal discharge** using a validated method, such as the Hay-Ison or Nugent criteria or, less frequently in modern practice, by using **Amsels criteria** (3 of 4 are required)
  1. Homogenous discharge
  2. High pH
  3. **Clue cells** on microscopy
  4. **Fishy odor** on adding 10 % KOH to a sample of vaginal discharge
- **Treatment:**
- Oral or intravaginal **metronidazole** or clindamycin




## ➢ Vulvovaginal candidiasis:

- Most frequently C. albicans, cause vulval and vaginal inflammation.
- When symptoms occur, they include itching, irritation & a typically **white, curdy vaginal discharge**.
- On examination, signs of inflammation, including erythema, oedema and fissuring of the vulva and vagina, together with the discharge may be observed.
- Symptoms may be more frequent and persistent when woman is **diabetic, immunocompromised & in pregnancy.**
- The **diagnosis** is made by taking a swab for microscopy and culture
- Topical vulval antifungals and the use of aqueous cream as an emollient and cleansing agent provide symptomatic relief. This is not an STI and partners without symptoms do not require treatment.
- **Treatment** with **topical, intravaginal pessaries or oral imidazoles** are effective.

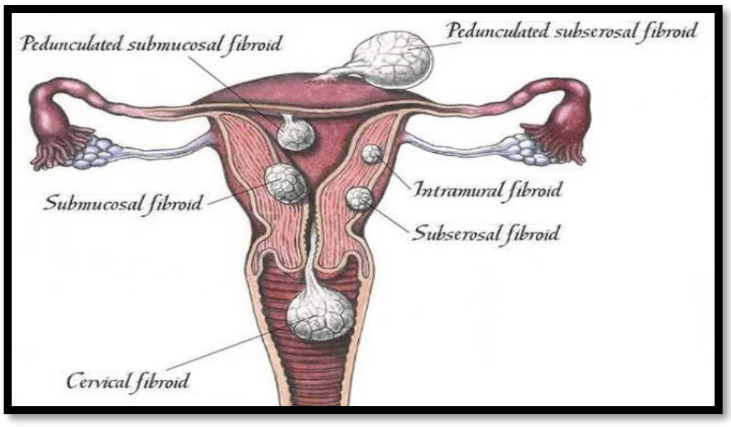
| Symptoms and signs | Candidiasis | Bacterial vaginosis | Trichomoniasis |
|---|---|---|---|
| Itching or soreness | ++ | – | +++ |
| Smell | May be 'yeasty' | Offensive, fishy | May be offensive |
| Colour | White | White or yellow | Yellow or green |
| Consistency | Curdy | Thin, homogeneous | Thin, homogenous |
| pH | < 4.5 | 4.5–7.0 | 4.5–7.0 |
| Method of confirmation | Microscopy and culture | Microscopy | Microscopy and culture |

# Fibroid uterus

- A fibroid is a **benign** tumour of uterine smooth muscle termed a **'leiomyoma'**. Most common type of tumor in females
- The gross appearance is of a **well-demarcated, firm, grayish-white, whorled tumour.**
- They are highly prevalent, being found in approximately 40% of women overall, and are **more common in**
  - Nulliparous
  - Obese women
  - In those with a family history [Genetic mutation MED12]
  - African descent
- They are usually multiple & can increase the size of uterus


| Decreased risk | Increased risk |
|---|---|
| Increased parity[7] | African descent[8] |
| Late menarche (older than 16 years)[8] | Age greater than 40 years[8] |
| Smoking[8] | Early menarche (younger than 10 years)[8] |
| Use of oral contraceptives[9] | Family history of uterine fibroids[8] |
| | Nulliparity[7] |
| | Obesity[7] |

### Classification




- Submucosal Fibroids [Located adjacent to and bulging into the endometrial cavity
- Intramural Fibroids – **Most common type** [Centrally located within the myometrium]
- Subserosal Fibroids [located at outer border of myometrium
- Pedunculated Fibroids [Attached to the uterus by a narrow pedicle containing blood vessels]
- Cervical fibroids arise from the cervix

### Natural history:

- Fibroids are benign, **oestrogen-dependent tumours** that can **enlarge during pregnancy** and **shrink after the menopause** when ovarian oestrogen production ceases. They can undergo **degenerative change** usually in response to outgrowing their blood supply. **3 forms are recognized:**
  - **Red** – **haemorrhage & necrosis** occurs in fibroid, presents in the midsecond trimester pregnancy with acute pain.
  - **Hyaline** – asymptomatic softening and liquefaction of the fibroid.
  - **Cystic** – asymptomatic central necrosis leaving cystic spaces at the centre.
- Degenerative changes can initiate calcium deposition leading to calcification.

### Clinical features:

- Vast majority of fibroids are asymptomatic.
- AUB [HMB & IMB]
- Pain is unusual, except in acute red degeneration or torsion of a pedunculated fibroid
- Bladder & bowel dysfunction. Abdominal distension

### Diagnosis:

- Often clinical diagnosis from history and examination
- A **full blood count** should be taken in women with HMB; severe anaemia associated with HMB indicates fibroids.
- **Abdominopelvic ultrasound (TAUSS & TVUSS)** is **mainstay of diagnosis** (distinguish b/w fibroid & ovarian tumour)
- **Hysteroscopy:** Good for detecting submucosal fibroids & for planning subsequent hysteroscopic surgical treatment
- **MRI** describe morphology & location of fibroids. Indicated prior to uterine artery embolization & monitor treatment

## ➢ Treatment of fibroids:

### Medical treatment:

- Conservative management is appropriate where asymptomatic fibroids are detected incidentally.
- Only effective treatment is **injectable gonadotrophin-releasing hormone agonists,** which induce a menopausal state by **shutting down ovarian oestradiol production**. Not tolerated because of severe menopausal symptoms

### Surgical treatment:

- For bulky fibroid uterus, which causes pressure symptoms or where HMB is refractory to medical interventions, **myomectomy** will be the preferred option where preservation of fertility is required.
- **Hysterectomy:** indicated for women with no future fertility desires.
- Before hysterectomy & myomectomy, GnRH agonist can be given for 3 months to reduce bulk & vascularity of fibroids.
- **Uterine artery embolization (UAE):** It involves embolization of both uterine arteries with a small incision in femoral artery performed under LA. It leads to 50 % shrinkage of fibroids & reduction in menstrual blood loss

### Complications:

- Problems during pregnancy
  1. Premature labour
  2. Fetal malpresentation
  3. Post-partum hemorrhage
  4. Caesarean section [Large fibroids block vagina]
  5. Recurrent pregnancy loss
- Subfertility may result from mechanical distortion or occlusion of the Fallopian tubes, and an endometrial cavity grossly distorted by **submucous fibroids** may prevent implantation of a fertilized ovum.
- Anemia due to HMB
- Torsion of subserous pedunculated fibroids
- Infection, hemorrhage & sarcomatous change
- Degenerative changes [Red, hyaline & cystic]

# Malignant Tumors of Uterus

**Incidence of Malignant Gynecological Lesions**
endometrium > ovary > cervix > vulva > vagina > fallopian tube

- Uterine cancer arises from the endometrial lining of uterine corpus (body)
- **Most common gynaecological malignancy in postmenopausal women.**
- 4th most common malignancy in women (following breast, bowel, & lungs)
- Majority is **adenocarcinoma.**
- The mean age of diagnosis is 62 years.

| Factors that increase endometrial cancer risk | Factors that protect against endometrial cancer |
|---|---|
| Obesity | Hysterectomy |
| Diabetes | Combined oral contraceptive pill |
| Nulliparity | Progestin-based contraceptives, including injectables |
| Late menopause >52 years | Intrauterine device, including Cu-IUD and LNG-IUS |
| Unopposed oestrogen therapy | Pregnancy |
| Tamoxifen therapy | Smoking |
| Family history of colorectal and endometrial cancer | |

## ❖ Classification:

- Endometrial cancer usually arises from the glandular component of the endometrium. Endometrial cancers are classified as type 1 or type 2, depending on their histological subtype and are graded 1–3.
- **Type 1 tumors** [75-80%] are endometrioid adenocarcinomas that are **estrogen driven** and **arise from a background of endometrial hyperplasia.**
- **Type 2 tumours**: high-grade serous and clear cell histological subtypes & arise from an atrophic endometrium. More aggressive & carry a worse prognosis.

## ➢ Aetiology:

- Estrogen causes endometrial cells to proliferate when it is unopposed by progesterone. Thus, **hyperoestrogenic states increase endometrial cancer risk,** while cyclical or continuous progestin-containing hormone treatments reduce risk.
- Aromatization of androgens to estrogen by adipose tissue [obesity] provides postmenopausal supply of estrogen
- **Insulin & insulin-like growth factor stimulate endometrial proliferation [more common in diabetic women].**
- **Tamoxifen** [SERM] to prevent breast cancer, which is antiestrogenic in breast but stimulatory in endometrium
- The **most common hereditary association of endometrial cancer is with Lynch syndrome**
- Other tumour associations include colorectal, ovarian and urothelial tumours, depending on the mutation responsible.
- **Primary infertility due to polycystic ovary syndrome is a risk factor for premenopausal endometrial cancer.**

### Clinical Features:

- **Abnormal bleeding** is the most common presenting complaint [heavy, irregular or intermenstrual bleeding (IMB)].
- At more advanced stages, present with abdominal pain, urinary dysfunction, bowel disturbances or respiratory symptom
- Signs include bleeding from the cervical os on speculum examination and a bulky uterus on bimanual pelvic examination.

## ➢ Diagnosis:

- The mainstays of diagnosis are **TVUSS, hysteroscopy and endometrial biopsy.**
- **TVUSS** allows a quick and accurate assessment of endometrial thickness. If the **endometrium measures < 4 mm,** cancer is very unlikely and further investigation is not needed. **Hysteroscopy + endometrial biopsy (Gold standard)**
- **Findings suggestive of endometrial carcinoma:**
  - Endometrial thickness > 4 mm
  - Hyper-echogenic endometrium with irregular outline
  - Increased vascularity with low vascular resistance
  - Intrauterine fluid
- **Hysteroscopy** is performed in the outpatient setting under local anaesthetic where possible and directed biopsy of any abnormal areas.
- Stage is determined by **MRI scan** and **FIGO staging** uses this information
- Patients with high-grade tumours undergo a **CT scan** of the chest, abdomen & pelvis to exclude metastases

**Indications for Endometrial Biopsy**

- Abnormal uterine bleeding
- Postmenopausal bleeding
- Cancer screening (e.g., hereditary nonpolyposis colorectal cancer)
- Detection of precancerous hyperplasia and atypia
- Endometrial dating
- Follow-up of previously diagnosed endometrial hyperplasia
- Evaluation of uterine response to hormone therapy
- Evaluation of patient with one year of amenorrhea
- Evaluation of infertility
- Abnormal Papanicolaou smear with atypical cells favoring endometrial origin

## ➢ Management:

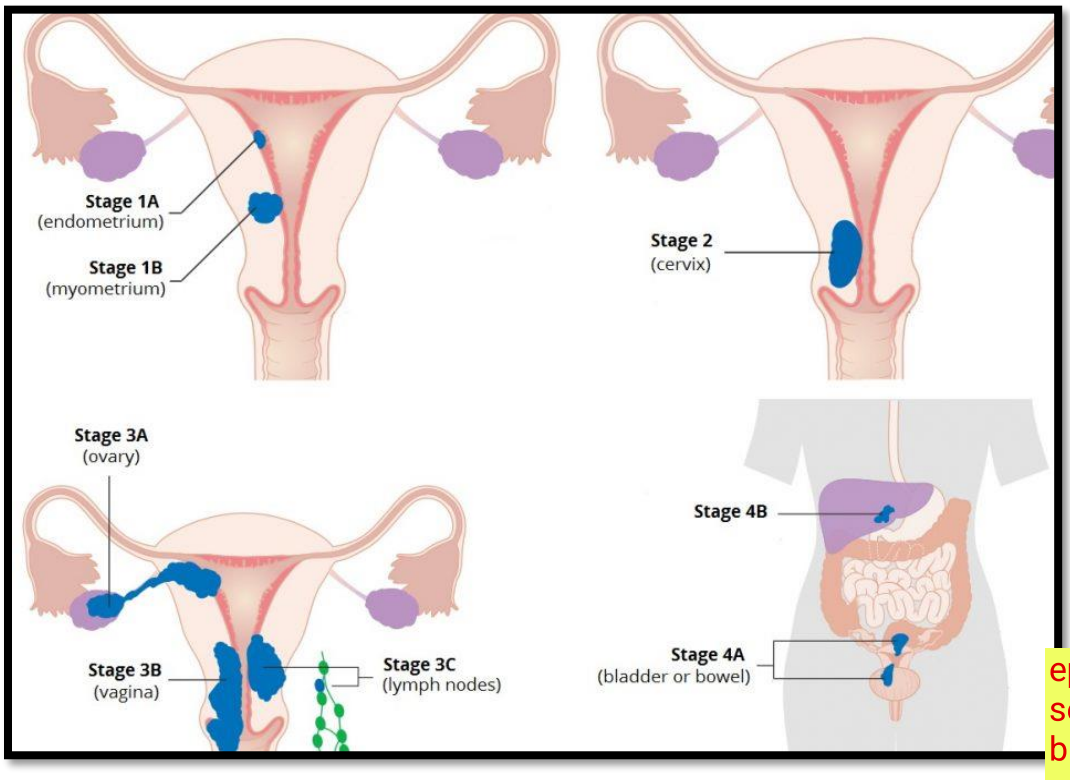
- Standard surgery is **total hysterectomy** and removal of both Fallopian tubes and ovaries (bilateral salpingo-oophorectomy, BSO).
- If the MRI suggests cervical involvement, a **modified radical hysterectomy** is performed, which also removes a cuff of vagina, paracervical & parametrial tissue to ensure adequate excision margins.
- If the tumour is high grade (grade 3) or of type 2 histology, also perform pelvic and para-aortic node dissection
- **Adjuvant treatment:**
- Postoperative radiotherapy reduces local recurrence

➢ **Stage 1**: TAH+BSO and washings.
  - Grade 3/ type 2 histology – node dissection

➢ **Stages 2&3**: Modified radical hysterectomy and washings and node dissection ± omentectomy

➢ **Stage 4**: No surgical option.

- Chemotherapy is given for advanced or metastatic disease.




## Prognostic Factors

Histologic grade (single most important).
Depth of myometrial invasion (Second).
Histologic type.
Original tumor volume.
Pelvic lymph nodes involvement.
Extension to the cervix, adnexal metastasis, positive peritoneal washings.

| Stage | 5-year survival (%) |
|---|---|
| I | 88 |
| II | 75 |
| III | 55 |
| IV | 16 |

epithelial lining with sebaceous glands in the wall
b. Atypical columnar ciliated epithelial lining.
Closely packed endometrial like glands.
d. Sheets of clear cells with lymphocytes in stroma

# Pre-Invasive & Malignant Dise

- **Cervical cancer is the second commonest cancer in women**

## ➢ Etiology:

- Cervical cancer is caused by **persistent high-risk HPV infection.**
- Low-risk types HPV 6 and 11 cause benign warts, while high-risk types **HPV 16, 18,** 31, 33 and 45 cause cervical cancer.
- **Smoking** reduces the efficiency with which virus is cleared by immune system & increases risk of persistent infection
- Women who are immunocompromised [HIV and transplant recipients on long-term immunosuppressive therapy]

## ➢ Pathophysiology:

- Cervix is composed of stromal tissue, which is lined by **squamous epithelium in the vagina (ectocervix)** and **columnar epithelium within the cervical canal (endocervix).** The meeting of the 2 types of epithelial is called the **squamocolumnar junction (SCJ) and this is usually at the ectocervix.**
- The position of the SCJ varies throughout the reproductive years. In children, it lies at the ectocervix, at puberty it extends outwards as the cervix enlarges and in adult life it returns to the ectocervix through the process of metaplasia, which is a physiological change from columnar epithelium to squamous epithelium.
- The transformation zone is defined as the area where the original SCJ was to the current SCJ and it includes areas of metaplasia. The **transformation zone (TZ) is the site where premalignancy and malignancy develop.**
- Integration of the viral DNA into the basal cells of the cervical epithelium in the TZ can lead to immortalization of the basal cells and rapid turnover of the basal cells within the epithelium. This disordered immaturity within the epithelium is called **'cervical intraepithelial neoplasia'** and is truly an intraepithelial condition.
- CIN is classified as either low-grade (CIN 1) or high-grade disease (CIN 2 and 3)
- Spontaneous regression of low-grade disease is common & it occur through the patient's own cell-mediated immunity.
- High-grade disease is less likely to regress spontaneously and requires treatment as there is a risk of progression to cancer. If left untreated, around 20 per cent of patients with high-grade abnormalities may develop cancer of the cervix.

## ➢ Cytology: cervical smears

- Cells exfoliated from the cervix can be cytologically examined and act as a good screening test.
- The 'Pap' smear has been superseded by **liquid-based cytology** where a small brush is used to sample cells from the transformation zone and the brush head placed in fixative.
- Most cytological smears are normal and normal squamous cells are seen within the smear test. An abnormal smear can show cells in different degrees of maturity (dyskaryosis). Like CIN, cells can be classified as **low grade (mild dyskaryosis and borderline change) or high grade (moderate and severe dyskaryosis).**
- Cervical screening should be carried out **every 3-5 years in all sexually active women from 25-65 years of age.**

- Patients with **high-grade smears (2 %) are referred urgently to colposcopy** and patients with low-grade smear (4 per cent) have the smear repeated as minor changes may revert to normal.

## ➢ Colposcopy:

- Colposcopy is the **outpatient examination of the magnified cervix using a light source.** It is used for both diagnosis and treatment. A speculum is passed & cervix examined with the light source under magnification (5 to 20 X).
- Usually, **5 per cent acetic acid and iodine** are applied to the cervix and biopsies taken when necessary. Acetic acid causes nucleoproteins within cells to coagulate temporarily, therefore areas of increased cell turnover, for example in **CIN will appear white at colposcopy.** Areas of CIN lack the presence of intracellular glycogen and therefore stain yellow as opposed to the **normal squamous epithelium, which will stain brown when iodine is applied**

## ➢ Treatment of premalignant disease of the cervix:

- **High-grade CIN** requires treatment usually with **excision or ablation.** The favored method of treatment for high-grade CIN is **loop diathermy** (large loop excision of transformation zone, LLETZ).
- **Low-grade CIN (CIN 1)** may regress spontaneously in up to 60 % of cases, therefore **close follow up with colposcopy and cytology 6 months** after initial diagnosis is favored as this avoids over treating lesions.
- **Cryotherapy,** where the cervix is frozen with liquid nitrogen as an outpatient, is sufficient treatment for low-grade CIN.
- **Cold coagulation** involves placing a hot probe on cervix under LA, **effective for both high & low-grade CIN**
- **Prophylactic HPV vaccination** can prevent infection with high-risk HPV types that cause cancers of the cervix

## ➢ Malignant disease of cervix:

- Most cervical cancers, are **friable, vascular masses on the cervix** and patients present with **abnormal bleeding, typically postcoital (PCB), prolonged, intermenstrual (IMB) or postmenopausal (PMB) bleeding.**
- In advanced disease (stages III–IV), patients may experience **pain** (malignant infiltration of spinal cord), **incontinence** (vesicovaginal fistulae), **anaemia** (chronic vaginal bleeding) & **renal failure** (ureteric blockage).
- A pelvic and speculum examination usually clinches the diagnosis as there is often a cervical mass which bleeds on contact and if advanced disease, a hardness and fixity of the tissues. A biopsy in the outpatient should be taken.
- Majority (70%) of cervical cancers are **squamous cell carcinomas**
- The tumours are locally infiltrative in pelvic area, but also spread via lymphatics and in the late stages via blood vessels. Tumour can grow through the cervix to reach the parametria (area lateral to cervix), bladder, vagina & rectum
- Metastases can occur therefore in pelvic (iliac and obturator) and para-aortic nodes and, in the later stages, liver & lungs

### ❖ Investigation and the importance of staging:

- A **biopsy is crucial to confirm malignancy** and assess the tumour type.
- A **chest x-ray** is vital to exclude lung metastases.
- An **MR scan of abdomen & pelvis** will assess the local spread in cervix & will detect enlarged lymph nodes in pelvis
- Doing **rectovaginal examination** under anaesthetic can give crucial information on the tumour including size of disease, fixity and vaginal involvement, and a cystoscopy can help eliminate bladder involvement.
- Small mobile tumours favour a surgical approach, whereas **larger fixed tumours favour the use of radiotherapy.**

## ➢ Treatment:

- **Stage IA:** Small lesions need to have a **clear margin of excision.** CIN that invariably coexists must also be completely excised
- When disease is confined to cervix **(stage 1b),** then radical hysterectomy and pelvic node dissection **(Wertheim's**

### International Federation of Gynecology and Obstetrics Staging of Cervical Cancer

| Stage (five-year survival) | Characteristics |
|---|---|
| I | Carcinoma strictly confined to the cervix (extension to the uterine corpus should be disregarded) |
| IA (93%) | Invasive cancer identified only micro-scopically; all gross lesions, even with superficial invasion, are stage IB cancers; invasion is limited to measured invasion of stroma ≤ 5 mm in depth and ≤ 7 mm in horizontal spread |
| IA1 | Measured invasion of stroma ≤ 3 mm in depth and ≤ 7 mm in horizontal spread |
| IA2 | Measured invasion of stroma > 3 mm to ≤ 5 mm in depth, and ≤ 7 mm in horizontal spread |
| IB (80%) | Clinical lesions confined to the cervix or microscopic lesions greater than IA2 |
| IB1 | Clinical lesion ≤ 4 cm in size |
| IB2 | Clinical lesion > 4 cm in size |
| II | Carcinoma extends beyond uterus but not to pelvic wall or to lower one-third of the vagina |
| IIA (63%) | No parametrial invasion |
| IIA1 | Clinical lesion ≤ 4 cm in size |
| IIA2 | Clinical lesion > 4 cm in size |
| IIB (58%) | Parametrial invasion |
| III | Carcinoma extends to pelvic wall and/or involves the lower one-third of the vagina, and/or causes hydronephrosis or non-functioning kidney |
| IIIA (35%) | Involves lower one-third of the vagina, no extension to the pelvic wall |
| IIIB (32%) | Extends to pelvic wall and/or causes hydronephrosis or nonfunctioning kidney |
| IV | Carcinoma extends beyond the true pelvis or has clinically involved the mucosa of the bladder or rectum |
| IVA (16%) | Spread to adjacent organs |
| IVB (15%) | Spread to distant organs |

**hysterectomy)** should be considered in pre-menopausal patients **OR** pelvic radiotherapy [similar success rates as surgery] in pre-menopausal patients who are too overweight for radical surgery or who are anesthetically unfit

- **Radical hysterectomy involves** removal of cervix, upper third of the vagina, uterus & the parametrial tissue. Pelvic lymph node removal includes the obturator, internal and external iliac nodes. The **ovaries in premenopausal women can be spared.**
- **Radiotherapy** is the treatment of choice in post-menopausal patients with **early stage 1b** disease as urological complication rates following radical surgery are higher due to tissue fragility.
- **Radical Trachelectomy:** Patients with small volume cancers that are just outside the stage of 1a2 but fall into stage 1b1 on measurement may be suitable for **fertility sparing treatment.** The radical trachelectomy operation involves **removing 80 % of the cervix and parametrial tissues together with resection of the pelvic lymph nodes**.
- When the **disease is beyond the cervix (stages 2–4 disease) then radiotherapy (with or without chemotherapy)** becomes the optimal treatment.

# Benign & Malignant Tumors of Ovary

- Ovarian cancer accounts for 3-4% of cancer in women & is 4th most frequent cause of cancer-related death in females
- Ovarian cancer is the **second most common gynecologic malignancy** [endometrial cancer being the most common] but is the most common cause of death among women who develop a gynecologic malignancy.
- In general, ovarian cancer is a **disease of the postmenopausal woman.** Mean age of presentation is 64 years.

## ➢ Aetiology & risk factors:

- Epithelial ovarian cancer is due to malignant transformation of the ovarian epithelium
- Gene mutations resulting in **suppression of tumour suppressor genes [p16 and p53],** along with **overexpression of oncogenes [HER2],** have been associated with sporadic epithelial ovarian cancer (EOC).
- Women with mutations in **BRCA1, BRCA2** & **Lynch syndrome** have an increased risk of epithelial ovarian cancer.
- The most common hereditary cancer is the **breast ovarian cancer syndrome (BRCA),** accounting for 90%
- A woman with a single 1st-degree relative with ovarian Ca has a relative risk of approx. 3.6 for developing ovarian cancer
- **Preventing ovarian cancer:** Women who test positive for a BRCA mutation are offered risk-reducing prophylactic BSO when they have completed their families. Prophylactic surgery reduces the risk of ovarian cancer by 90 %.

| Decreased risk of ovarian cancer | Increased risk of ovarian cancer |
|---|---|
| Multiparity | Nuliparity |
| Oral contraceptive pill (RR reduced by 20% per 5 years use) | Intrauterine device (RR 1.76) |
| Tubal ligation | Endometriosis |
| Hysterectomy | Cigarette smoking (mucinous tumours only) |
| | Obesity |

Bilateral salpingo-oophorectomy (BSO) is a surgical procedure involving the removal of both fallopian tubes and ovaries. This procedure is typically performed to treat or prevent certain medical conditions, such as ovarian cancer, endometriosis, or severe pelvic inflammatory disease

## ➢ Classification of ovarian cancer:

- Primary ovarian cancers are epithelial (80%), sex cord stromal [10 %] or germ cell [10 %].
- **Epithelial tumors include:** High grade serous, low grade serous [borderline], endometroid, clear cell, mucinous cancers
- **Sex cord stromal tumors include:** granulosa cell, Sertoli-leydig cell tumors
- **Germ cell tumors include:** dysgerminoma, yolk sac [endodermal sinus], teratoma & choriocarcinoma
- Ovary is also a common site for metastatic tumors [Krukenberg tumors]; common sites include colon, stomach & breast.
- **Epithelial tumours** of the ovary can be benign, malignant or borderline

## ➢ Clinical Features:

- **The most common symptoms are:**
  - Persistent pelvic and abdominal pain
  - Increased abdominal size/persistent bloating
  - Difficulty eating and feeling full quickly.
- Other symptoms such as change in bowel habit, urinary symptoms, backache, irregular bleeding and fatigue occur frequently and any women with persistence of these symptoms should be assessed by their GP.
- Pelvic and abdominal examination may reveal a fixed, hard mass arising from the pelvis.

## ➢ Diagnosis and investigations:

- If ovarian cancer is suspected, a **TVUSS is the initial imaging modality**
- **CA125 is a non-specific tumour marker** that is elevated in over 80% of epithelial ovarian cancers.

- The **CT scan** is useful for assessment of extra-pelvic disease and for staging. The MRI scan helps define tissue planes and operability
- If the patient presents with gross ascites or pleural effusion, paracentesis or pleural aspiration may be required.
- If the diagnosis is uncertain or if primary chemotherapy is being considered (for advanced disease, or in patients not fit to undergo surgery), a biopsy may be needed.

## ➢ Treatment:

- If the patient is suspected of having ovarian cancer, the surgery should only be performed by a gynaecological oncologist. The objective of surgery **[staging laparotomy]** is to stage the disease & remove all visible tumour.
- **Steps of staging laparotomy:**
  1. A midline vertical incision is required to gain access to all of abdomen
  2. Ascites or peritoneal washings are sampled
  3. Total abdominal hysterectomy and bilateral salping-oophorectomy
  4. Infracolic omentectomy
- **Lymph node resection** is important, particularly in early-stage disease where studies have found occult metastatic disease in nodes in up to 25 % of patients with stage I disease who underwent further surgical staging.
- **For fertility-sparing**, unilateral salpingo–oophorectomy, omentectomy, peritoneal biopsies and pelvic/paraortic node dissection can be performed with endometrial sampling to exclude a synchronous tumour.
- **Surgery combined with platinum-based chemotherapy** is the mainstay of treatment for advanced ovarian cancer.
- If a patient is unfit or unwilling to have surgery, primary chemotherapy may be offered. If the patient responds to the chemotherapy, interval surgery can be carried out after 3–6 cycles.

| Tumour Marker | Tumour type | Uses |
|---|---|---|
| CA 125 | Epithelial ovarian cancer, (Serous) borderline ovarian tumours | Preoperative, follow-up |
| CA 19-9 | Epithelial ovarian cancer, (Mucinous) borderline ovarian tumours | Preoperative, follow-up |
| Inhibin | Granulosa cell tumours | Follow-up |
| hCG | Dysgerminoma, Choriocarcinoma | Preoperative, follow-up |
| AFP | Endodermal yolk sac, Teratoma | Preoperative, follow-up |

| Stage | FIGO definition |
|---|---|
| I | Growth limited to ovaries |
| IA | Limited to one ovary: no external tumour, capsule intact, no ascites |
| IB | Limited to both ovaries: no external tumour, capsule intact, no ascites |
| IC | Either IB or IB, but tumour on surface of ovary or with capsule ruptured or with ascites positive for tumour cells |
| II | Growth limited to pelvis |
| IIA | Extension and or metastases to uterus or tubes |
| IIB | Extension to other pelvic organs |
| IIIC | As IIA or IIB, but tumour on surface of ovary or with capsule ruptured or with ascites positive for tumour cells |
| III | Growth limited to abdominal peritoneum or positive retroperitoneal or inguinal lymph nodes |
| IIIA | Tumour grossly limited to pelvis with negative nodes, but histologically confirmed microscopic peritoneal implants |
| IIIB | Abdominal implants <2 cm in diameter |
| IIIC | Abdominal implants >2 cm diameter or positive retroperitoneal or inguinal lymph nodes |
| IV | Growth involving one or both ovaries with distant metastases<br>Must have positive cytology on pleural effusion, liver parenchyma. |

| Prognostic factors in ovarian cancer |
|---|
| Stage of disease |
| Volume of residual disease post-surgery |
| Histological type and grade of tumour |
| Age at presentation |

| FIGO stage | 5-year survival (%) |
|---|---|
| I | 70–90 |
| II | 80 |
| III | 30 |
| IV | 10–20 |