GAMETOGENESIS

Fertilization :
Formation of zygote by the fusion of sperm & female pronucleus.

Gametogenesis

- Gametogenesis begins with primordial germ cells which are derived from epiblast.
- Primordial germ cells reach the yolk sac by 4 weeks.
- From the yolk sac, primordial germ cells reach the genital ridge by 5 weeks.
- Primordial germ cells can differentiate either into spermatogonia or oogonia.
- If primordial germ cells deviate from the normal pathway and move into neck area → formation of oropharyngeal teratoma.
- If primordial germ cells deviate and reach sacrococcygeal region → formation of sacrococcygeal teratoma.
- Primordial germ cells are pluripotent. Hence, they can lead to the formation of all 3 germ layers and teratoma.

- Totipotent : Cells have the ability to form embryo + extraembryonic tissue. Example : All cells are totipotent upto 8 cell staged zygote.

Cell divisions :

- Mitosis : Chromosome number remains the same.
- Meiosis : Chromosome number is reduced to half after meiosis I (reduction division). Chromosome number remains the same after meiosis 2.
- Different phases of cell division : Prophase, Metaphase, Anaphase, Telophase.

Spermatogenesis

00:09:40

Occurs in testis.

2 anatomical compartments in testis : Interstitial compartment and seminiferous tubules.

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Interstitial compartment contains :

- Leydig cells → release Testosterone.
- Fibroblasts.
- Neurovascular tissue.

Seminiferous tubules contain :

- Sertoli cells (sustentacular cells) → release Inhibin B.
- Germ cells in various stages of development.

Main hormone needed for spermatogenesis is Testosterone.
FSH and LH from anterior pituitary play an important role.

- Sertoli cells have tight junctions which form blood- testis barrier. It is present around the differentiated germ cells so that they are unaffected by hormones and other circulating factors.
- Cells which form blood - testis barrier → Sertoli cells.
- Cells that lie outside the blood - testis barrier → Leydig cells.
- Spermatogenesis begins at puberty.

At puberty :

- Spermatogonia (46 XY or 44 + XY) differentiates into two types :
  Dark spermatogonia.
  Pale spermatogonia (type B spermatogonia).

- Dark spermatogonia : Keeps undergoing mitosis until stores are replenished.

Active space

- Pale (type B) spermatogonia :

↓ mitosis

Primary spermatocyte (46 XY)

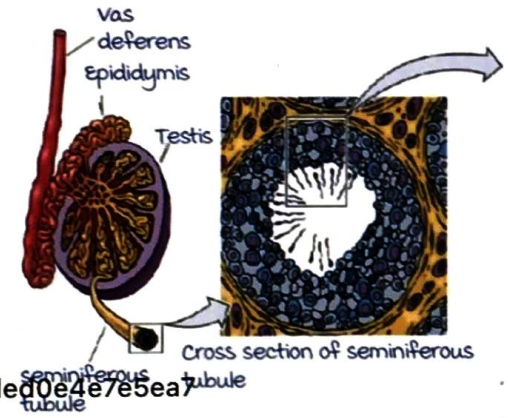
↓ meiosis I

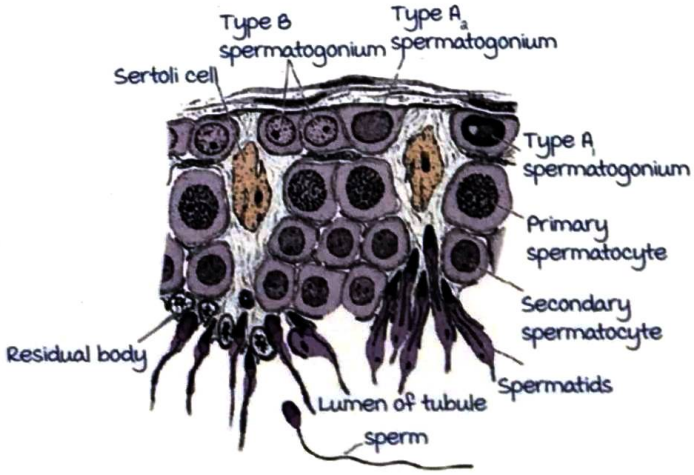
Two secondary spermatocytes (23 X, 23Y)

↓ meiosis 2

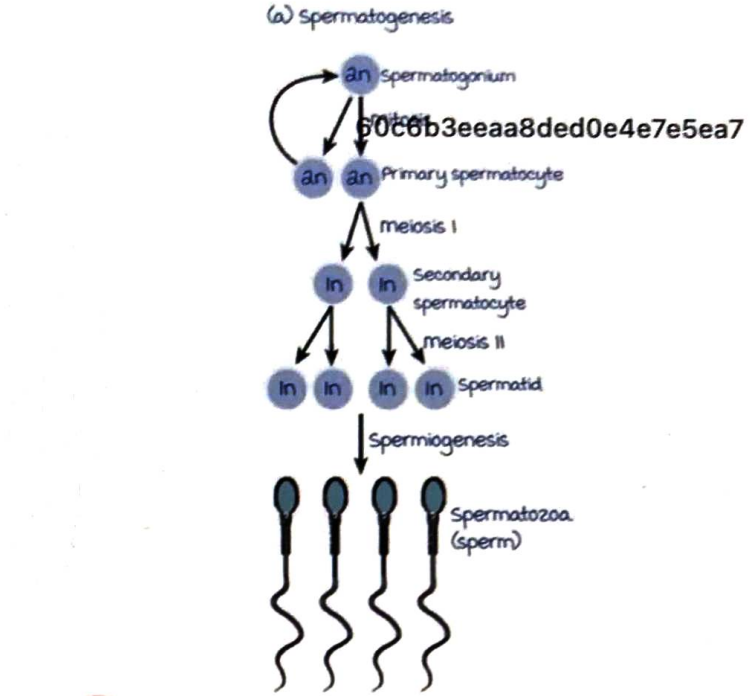
Two spermatids (23 X, 23Y) from each secondary spermatocyte.

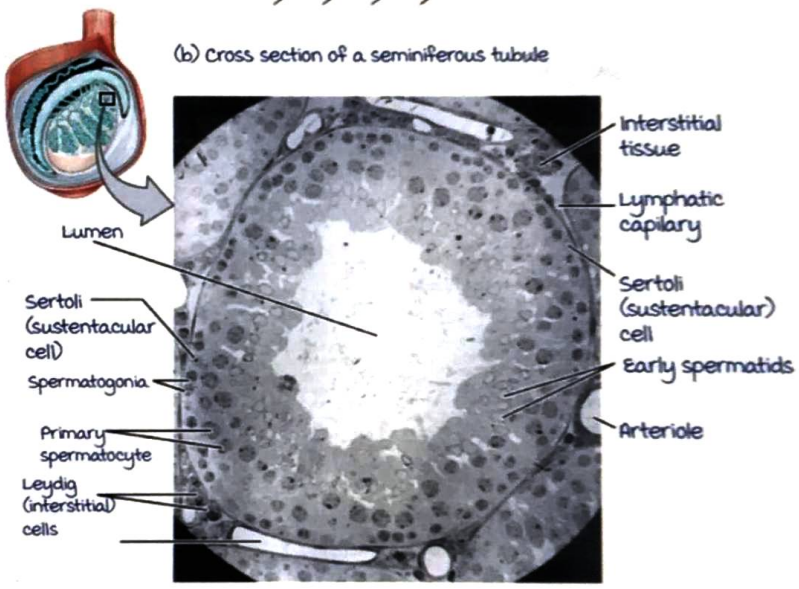
Spermatids undergo transformation called as spermiogenesis to form sperms.
Sperms are released into the lumen of seminiferous tubules → Spermiation (tail comes first into the lumen followed by the head of the sperm).





Active space





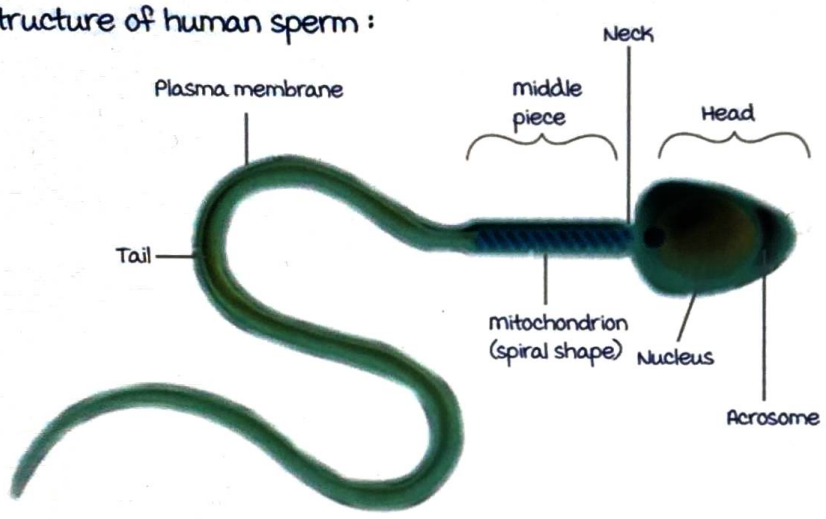
Important points related to spermatogenesis 00:23:28

- Spermatogenesis takes place in seminiferous tubules.
- Time taken for spermatogenesis = 74 days (70 – 74 days).
- Spermiogenesis : Transformation of spermatids to sperm. There is no mitosis or meiosis.
- Nucleus of spermatid transforms into head of the sperm.

Active space

- Mitochondria of spermatid transforms into the middle piece of the sperm.
- Golgi apparatus of spermatid transforms into the acrosomal cap.
- Centriole of the spermatid transforms into neck and tail of the sperm (axial filament).
- Arrangement in axial filament (tail) of the sperm is 9 + 2.
- Time taken for spermiogenesis = 10–14 days.

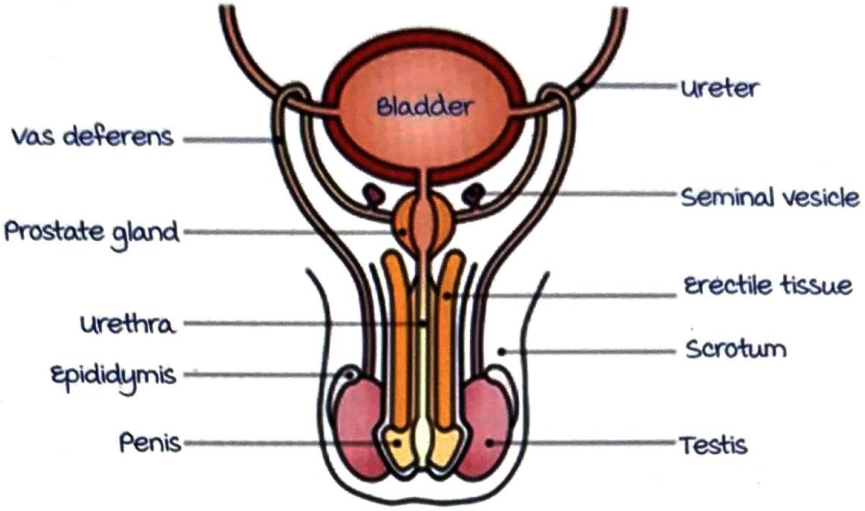
Structure of human sperm :



- Dynein protein in the tail (axial filament) holds the various microtubules together & plays an important role in motility of sperm.
- Size of the sperm : 50 – 60 microns.
- Fertilisable span : 48 – 72 hours.
- Sperms formed in seminiferous tubules are non motile and immature. They are emptied into a network of ducts called rete testis.
- From rete testis, sperms reach the epididymis.
- In the proximal part of epididymis, sperms attain maturity.
- In the distal part of epididymis, sperms attain motility. Beta defensin protein 126 helps with attainment of motility.

Active space

- Epididymis acts as a reservoir of sperms until ejaculation.
- Time taken for epididymal maturation : 2 - 14 days.



Capacitation

00:33:00

- The sperms stored in epididymis are mature but cannot fertilize ova.
  The final step that makes sperms capable of fertilizing ova is called capacitation.
- Capacitation occurs in female reproductive tract : Cervix.
- After capacitation, sperms become hypermotile.
- Time taken for capacitation : 6 - 8 hours.
- Sperms attain motility in the distal part of epididymis.
- Sperms become hypermotile in cervix (female reproductive tract).
- Time taken for invitro capacitation : 2 hours.
- Vagina serves as a reservoir for sperms for 2 hours.
- Cervix serves as a reservoir for 3 days.
- If sperms remain in vagina for more than 2 hours, they become immobile.

Oogenesis

00:37:24

Begins in intrauterine life.
Process gets arrested and it is resumed at puberty.

- Begins with oogonia (46 XX or 44 + XX)

↓

Undergoes mitosis

↓

Primary oocyte (46 XX)

↓

Starts to undergo meiosis I but
gets arrested in diplotene stage of prophase.

- In intrauterine life, primary oocyte gets surrounded by follicular cells (granulosa cells) of the ovary. This structure is called as primordial follicle.
- When a newborn is born, ovary has many primordial follicles.
- Ovary is a reservoir of millions of follicles.
- During menopause/ovarian failure, there will be no follicles in ovary.
- Test for ovarian reserve is done to see whether follicles are present in the ovary.
- The arrested state of primary oocyte is called as dictyate stage (no dictyate stage in spermatogenesis).

At puberty,

HPO axis matures and hypothalamus releases GnRH in a pulsatile manner.

GnRH acts on anterior pituitary which releases FSH & LH.

Under the effect of FSH, many follicles get stimulated & start to develop.

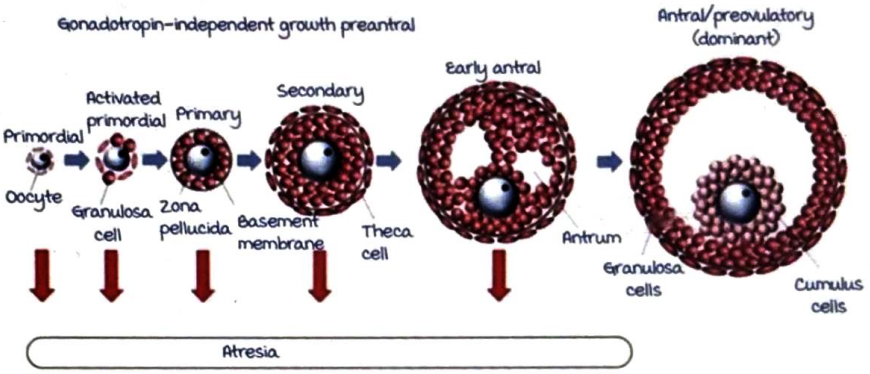
Later all the follicles undergo apoptosis except one follicle called as dominant follicle.

Stages in the development of follicle 00:48:18

- Primordial follicle : Primary oocyte is surrounded by a single layer of flat follicular cells. It gets converted into primary follicle.
- Primary follicle : Primary oocyte is surrounded by a single layer of cuboidal follicular cells (granulosa cells). It gets converted into secondary follicle.

- Secondary follicle (pre antral follicle) : Primary oocyte is surrounded by zona pellucida, multiple layers of granulosa cells and few theca cells. It has no cavity. It gets converted into tertiary follicle (antral follicle).

- Tertiary follicle (antral follicle) : Primary oocyte is surrounded by cumulus oophoricus & antral cavity. Primary oocyte is pushed to corner by antral cavity. Primary oocyte is connected to granulosa cells by discus proligerus & a layer of theca cells surrounds the structure.



- meiosis I is hormone dependent.
  Sudden increase in the levels of LH hormone from anterior pituitary (LH surge) is responsible for resumption of meiosis I.
- After meiosis I, primary oocyte (46 XX) gets converted into secondary oocyte (23 X) and first polar body (23 X) is released.
- Release of secondary oocyte from primary oocyte is called as ovulation.
- Graffian follicle is a tertiary follicle just before ovulation. It is 18-20 mm in size.
- Secondary oocyte (23 X) starts undergoing meiosis 2. meiosis 2 will be arrested in metaphase. meiosis 2 will be completed only at the time of fertilization.
  Completion of meiosis 2 results in release of female pronucleus/ova (23X) and second polar body (23 X).

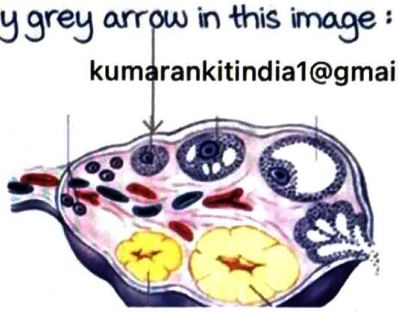
- 1st polar body is released at the time of ovulation.
- 2nd polar body is released at the time of fertilization.

- Size of ova is 120 microns.
- Fertilizable span of ova/secondary oocyte is 12-24 hours.
- Maximum number of follicles are seen at 5th month of intrauterine life (6-7 million).
- At birth, number of follicles are around 1 - 2 million.
- At puberty, number of follicles are around 4 - 5 lakhs.

MCQ :

Identify the structure marked by grey arrow in this image :

A. Primary follicle.
B. Primordial follicle.
C. Preantral follicle.
D. Antral follicle.



Answer : C. Preantral follicle.

Structure of a secondary oocyte 01:07:50

- Once secondary oocyte is formed after ovulation, cumulus oophoricus cells surround the secondary oocyte in a sunray pattern → Corona radiata.
- Vitelline membrane surrounds ooplasm and oolemma. Perivitelline space is the space between vitelline membrane and oolemma.
  Immediately outside the vitelline membrane, is the zona pellucida. Corona radiata is outside the zona pellucida.
- First polar body is present in the perivitelline space.

Events leading to fertilization :

- Ejaculation into female genital tract → from vagina, around 2 million sperms enter cervix → capacitation → sperms become hypermotile → sperms reach fallopian tube (around 300 - 500).
- Sperms attach to corona radiata & from the acrosomal cap of sperms, hyaluronidase is released which dissolves corona radiata.

Active space

- Out of 300 - 500 sperms, only 1 sperm attaches to ZP3 receptor of zona pellucida (Zona pellucida has ZP1, ZP2, ZP3 receptors).
- Sperm gets entry into perivitelline space & meiosis 2 will be completed, the head of the sperm attaches to oocyte membrane (oolemma).
- Cortical granules release cortical enzymes.
- Cortical enzymes make zona pellucida hard and inhibits entry of other sperms.

Function of zona pellucida : Prevents polyspermy.
Sequence of events before fertilization :
1. Capacitation.
2. Acrosomal reaction.
3. Cortical reaction.
4. Zona reaction.

Polyspermy occurs in partial mole.

Gestational age and fetal age 01:22:20

In obstetrics, we presume female has 28 days cycle, cycles are regular, ovulation and fertilization occurs on day 14.

Period of pregnancy/gestational age/period of amenorrhea is calculated from the first day of the last menstrual period.

Example : If urine pregnancy test is positive on day 28, she will be 4 weeks pregnant.

In embryology, fetal age/embryonic age/post conception age is calculated from the day of fertilization.

Example : If urine pregnancy test is positive on day 28, fetal age will be 2 weeks.
Hence, there will be a difference of 2 weeks between period of gestation and fetal age.
Gestational age = Fetal age + 2 weeks.

Example : Fetal cardiac activity is seen on TVS 21 days (3 weeks) after fertilization. Corresponding gestational age is 35 days (5 weeks).

Embryologists divide the development of conceptus into three growth periods :

Growth period	Embryology definition	Definition as per gestational age	Comments
Pre embryonic period	From the day of fertilization to 2 weeks after fertilization	From 2 weeks of gestation to 4 weeks of gestation	------
Embryonic period	3 weeks after fertilization till 8 weeks after fertilization	From 5 weeks of gestation to 10 weeks of gestation	most teratogenic period
Fetal period	9 weeks after fertilization till delivery	From 11 weeks of gestation till delivery	-----

FERTILISATION AND IMPLANTATION

Fertilization

00:00:10

Fertilization : Fusion of male and female pronucleus and a zygote is formed.
Occurs in the ampulla of the fallopian tube.

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A female pronucleus like secondary oocyte is still surrounded by zona pellucida (zygote also).

Function of zona pellucida in a zygote : Will not allow zygote to implant in the fallopian tube.

Zygote
↓ After 20-30 hours
2-celled zygote
↓
4-celled zygote
↓
8-celled zygote
↓
16-celled zygote

Morula (mulberry shape) : 8-16 celled zygote surrounded by zona pellucida.
Stay in a fallopian tube for 3 days.
Nutrition provided by the secretory cells of the fallopian tube.

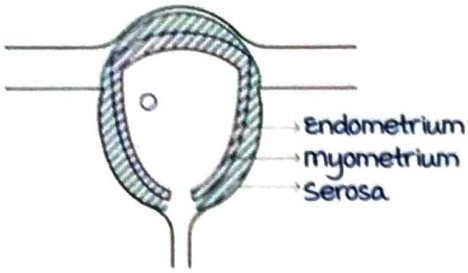
Fallopian tube has 3 types of cells :

1. Ciliated columnar cells : Push zygote to uterine cavity by peristalsis.
2. Secretary cells : Nutrition to early zygote.
3. Peg cells : Function unknown.

Zygote moves towards uterine cavity :

- Peristalsis in the tube (main reason).
- Ciliary movement.

Active space

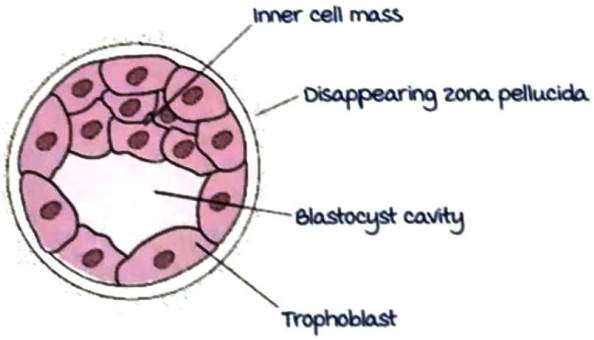


Progesterone (smooth muscle relaxant) contraceptives failure leads most commonly to ectopic pregnancy.
Zygote (16-celled morula stage) enters the uterine cavity on day 4 after fertilization (day 18 of the menstrual cycle).

Presumptions for maintaining uniformity in obstetrics :

- All pregnant females have a menstrual cycle of 28 days.
- Ovulation occurs on day 14.
- Day of ovulation is same as day of fertilization.

Day 5 : Zona pellucida is shed off (Zona Hatching).
As morula enters uterine cavity, fluid enters it.
↓
Blastocyst.
Blastocyst attaches to the endometrium of the uterine cavity.
↓
Implantation.



Implantation 00:10:49

Begins 6th day after fertilization.
Day 20 of menstrual cycle.
Implantation window : Day 20-21.
Ends : Day 10-11 after fertilization.

Active space

Interstitial implantation : In humans, blastocyst goes deep inside the endometrium to the implant.

Decidua : A pregnant endometrium.

Phases of implantation :

1. Apposition : Facilitated by Pino pods (villi like structures present in endometrium).
   morphological marker of endometrial receptivity and implantation.
2. Adhesion : Facilitated by integrin and selectin.
3. Invasion : Facilitated by metalloproteinase enzyme.

Nitabuch's layer : Limits penetration of the blastocyst.

Site of implantation : Upper posterior wall of uterus close to fundus.

Implantation is eccentric (on one side)

- Asymmetrical growth of the uterus in early pregnancy. → Piskacek Sign
- True gestational sac is always eccentric.

Hartman sign/Placental sign : Bleeding at the time of implantation.

Intradecidual sign : Earliest sign on ultrasound (Blastocyst implants deep in the endometrium).

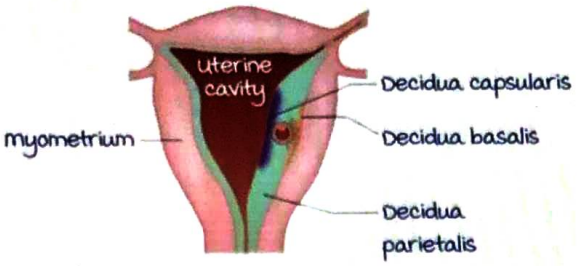
Subdivision of Decidua

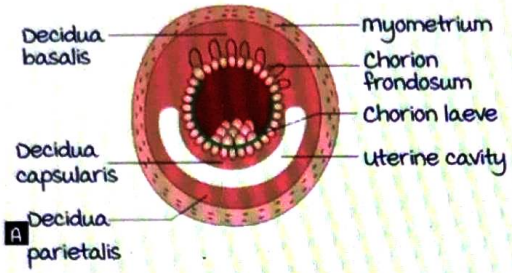
00:23:15

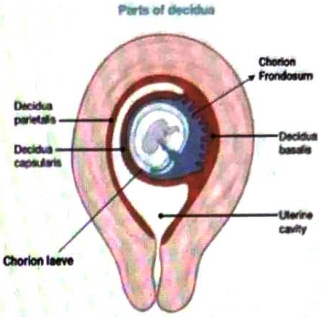
Endometrium after implantation : Decidua.

Three parts :

1. Decidua basalis : Site for formation of future placenta. Forms the maternal side of placenta.
2. Decidua capsularis : It separates blastocyst from the uterine cavity.
3. Decidua parietalis : Rest of decidua.







Time of obliteration of the uterine cavity : 14–16 weeks.

Blastocyst grows and becomes larger.

↓

Decidua capsularis and decidua parietalis come closer and fuse.

↓

Uterine cavity becomes obliterated.

For twins : 2 ova fertilized by 2 sperms.

In same cycle	In 2 different cycle
↓	↓
Superfecundation	Superfetation
(Seen in humans)	(Not seen in humans)

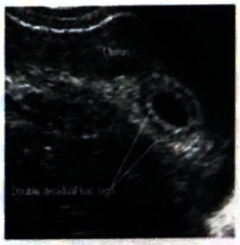
Theoretically, superfetation in humans is possible till 14 to 16 weeks.

Double Decidual Sac/Ring sign :

As blastocyst grows, it comes inside uterine cavity and causes indentation in the uterine cavity complex.

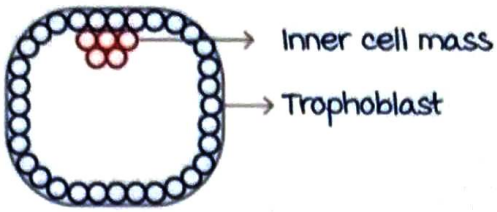
Surrounded by 2 layers/rings of decidua :

- Inner layer/ring by decidua capsularis.
- Outer layer/ring by decidua parietalis.



Blastocyst

00:40:28



Blastocyst has 58 cells : 5 cells form inner cell mass → Embryonic disc → Entire embryo.
53 cells form trophoblast.

Trophoblast divides 8 days after fertilization into :

Cytotrophoblast (Langhan cell layer)	Syncytiotrophoblast (multinucleated syncytium)
Inner cell layer : Retain their cell boundaries. Divides into Villous and Extravillous cytotrophoblast.	Outer cell layer : Do not retain their cell boundaries. Rises from the cytotrophoblast. Hormone factory of placenta.

6[illegible]e5ea7

- **Villous cytotrophoblast**
  - Form villi like structure near decidua basalis. → Chorion frondosum → Fetal side of placenta.
  - Rest of villous CT remains smooth. → Chorion laeve → Chorion
- **Non villous cytotrophoblast**
  - Endovascular CT: Replace lining of maternal spiral artery which open in intervillous space. → High resistance vessels into low resistance vessels. →
  - Interstitial CT: Forms cytotrophoblast shell.

Active space

↓

Trophoblastic invasion

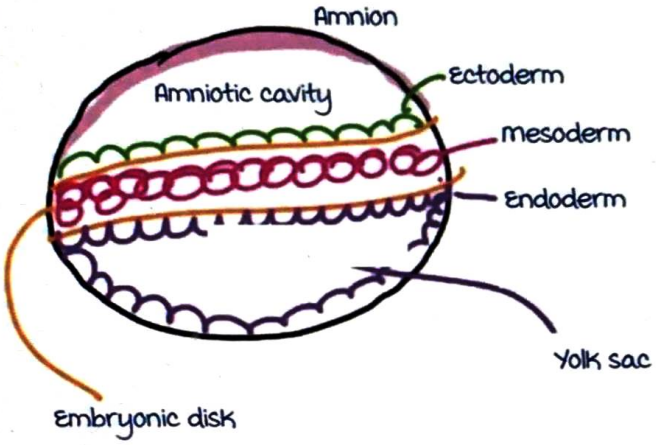
Occurs in 2 steps :

1. First wave :
   12 weeks
2. Second wave :
   16 weeks

If trophoblastic invasion does not happen, it can lead to : UPI, PIH, and IUGR.

Inner Cell Mass

00:51:50



Forms embryonic disc : Divides blastocyst cavity into Amniotic cavity and Yolk sac.

Amniotic cavity : Lined by ectoderm → Give rise to amnion.

Yolk sac : Lined by endoderm. Also called as endodermal sinus.

Mesoderm : From primitive streak.

1st germ layer to be formed is endoderm, followed by mesoderm and then the endoderm.

On USG : Double Bleb sign (2 cavities).

Embryonic disc :

Entire embryo formed from the embryonic disc.

Curving of caudal and cranial end.

These folds are seen as embryonic poles on USG.

CRL (Crown Rump Length) : Distance between these embryonic poles.

Heart starts beating on day 21 after fertilization.

Active space

USG in Early Pregnancy

00:57:56

Fetal structures	Seen on TVS
Gestational sac.	4 weeks 1 day to 4 weeks + 3 days.
Yolk sac.	4 weeks + 5days ~ 5 weeks.
CRL is also visible.	
Cardiac activity visible.	5 to 6 weeks.

For TAS (Transabdominal scan) : Time on TVs + one week.
(TVS - Transvaginal scan).
Cardiac activity can be seen on ultrasound at 6 weeks of pregnancy.

Pregnancy days calculated from 1st day of last menstrual period.
Number of days of pregnancy ≠ number of days after fertilization/conception.
Number of days of pregnancy > number of days after fertilization/conception.
On the day of the missed period : 4 weeks pregnant.

1st day of LMP Ovulation/fertilization UPT positive.

First sign of pregnancy on USG :

1. Intradecidual sign :
   Corresponds to formation of gestational sac.
2. Double decidual sac sign.
3. Double bleb sign : Corresponds to formation of yolk sac.

First fetal structure seen on USG : Gestational sac.
In gestational sac is 100% visible on transvaginal sonography if the β HCG value is > 2000 IU/L → Discriminatory zone/ Critical value of β HCG.

Critical value of β HCG : That value of HCG beyond which in intrauterine pregnancy in 100% cases gestational sac shall be visible.

- 2000 IU/L in TVS
- 6500 IU/L in TAS

Cases & Concepts 01:09:30

Case 1 : A pregnant female with β HCG value is ≥ 2000 IU/L but no gestational sac visible on TVS.

↓

Implantation has occurred somewhere else :
Ectopic pregnancy.

Case 2 : A pregnant female with β HCG value is < 2000 IU/L and no gestational sac visible on TVS.

↓

Repeat β HCG after 48 hours or repeat USG after 7 days.

If β HCG doubles : Intrauterine pregnancy

If β HCG increases but does not double : Ectopic.

1. If mean sac diameter (MSD)/ Gestational sac ≥10mm & no yolk sac seen : Pseudo gestational sac of ectopic pregnancy.
   Pseudo gestational sac : Thick decidua which appears like a gestational sac.

Pseudo gestational sac	True gestational sac
Seen in case of ectopic pregnancy.	Seen in case of intrauterine pregnancy.
Located centrally.	Eccentric in location.
Size remains constant.	Grows 1-2 mm/day.
Never show a double decidual sac sign.	Double decidual sac sign is present.
Yolk sac absent.	Yolk sac present.
Never get double bleb sign.	Double bleb sign seen.

Active space

2. If MSD ≥ 25mm & yolk sac present.
   No fetal tissue, No CRL, and No cardiac activity.
   ↓
   Blighted Ovum (anembryonic pregnancy).

3. If CRL ≥ 7mm + no cardiac activity.
   ↓
   missed abortion.

Ques : A female with UPT positive USG done :
Gestational sac present = 20 mm.
Yolk sac present.
No CRL.
No card activity.
Next Step : Wait and watch (wait till MSD = 25mm).

Ques : A female with UPT positive USG done :
Gestational sac present = 27 mm.
Yolk sac present.
No CRL.
No cardiac activity.
Diagnosis : Blighted ovum.

Active space

TERATOGENIC EXPOSURE OF CONCEPTUS

Teratogen- Introduction and effects 00:02:06

It's an agent which can cause abnormalities in the form or function of a developing fetus.

Can lead to :

- Birth defects.
- Foetal loss.
- Foetal growth restriction.
- Impaired neurological performance.

The effect depends on (1) Teratogen.
(2) Period of pregnancy at which exposure occurs.

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Entire pregnancy divided into 3 fetal growth periods,

Pre embryonic period :

Day of fertilisation up to 2 weeks after fertilisation.

Foetus follows All or None law.

i.e. Teratogenic exposure in this period = foetal loss or foetus escapes injury (no effect).

Embryonic period : 3 weeks after fertilisation to 8 weeks after fertilization.

main event that occurs is organogenesis.

If teratogenic exposure occurs in this period there will be maximum birth defects.

Most teratogenic period.

Fetal period is ≥ 9 weeks after fertilization.

Organogenesis is complete.

Growth of the foetus and neurological development occurs during this period.

Teratogenic exposure in this period : no birth defects as most

Active space

of the organogenesis is complete but, can lead to growth restriction and neurological impairment.

Teratogens :

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- Maternal illness; DM- hyperglycaemia is teratogenic.
- Maternal infection (TORCH).
- Drugs.
- Radiation exposure.
- Alcohol.
- Increased body temperature: if body temperature of mother rises by ≥ 1.5°C can lead to cleft lip and cleft palate.

Imaging in a female of child bearing age 00:08:31

General recommendations :

1. Before any radiological examination in a patient of child bearing age, always ask about pregnancy.
2. All non-emergency radiological examinations should be done in the first 10 days of the cycle. This is called as rule of 10.Least chances of being pregnant in this period.
3. Whenever examination is advisable a pregnancy test should be done out to rule out pregnancy.

Q. A pregnant female presents following a road traffic accident and was not in the condition of informing that she's pregnant. A chest X ray was performed at 6 weeks of pregnancy. What is the next step ?
Answer : Maximum radiological exposure permissible in pregnancy is up till 5 rads.
In chest X-ray or dental X-rays : the exposure is less than 5 rads.
So next step is continue pregnancy.
Overall safe limit of radiation exposure in pregnancy is 5 rads.
one rad = 0.01 Gy.
If radiation exposure is less than 5 rads, then there is no risk of :

- Fetal loss.

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- Birth defects.
- Growth restriction.
- Neurological impairment.
- Cancer in the fetus.

Period of pregnancy	Adverse effect seen
first 2 weeks after fertilization	Exposure is ≥ 5 rads Effect = fetal loss most commonly fetal death occurs when radiation exposure ≥ 10 rads.
upto 16 weeks	Congenital anomalies- microcephaly (most common). Intrauterine growth restriction (IUGR). Neurological impairment. Increased risk of cancers (most common cancer in fetus is leukaemia if exposure ≥ 20 rads)
≥ 16 weeks	Exposure upto 50 rads is safe

Investigations which are absolutely safe in pregnancy

1. Ultrasound.
2. MRI.
3. Dental x-rays (if absolutely required).
4. X-ray done for diagnostic purposes e.g. head and neck, limb, chest X ray (if absolutely required).

Gadolinium MRI and CT scans are not done in pregnancy but in case of absolute requirement (for e.g for head and neck) use abdominal and pelvic shield.

Drug exposure 00:17:04

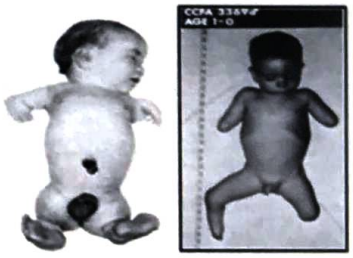
5 categories

Active space

Category	Safety in pregnancy	Human study	Animal study
A	Safety is established	No risk	No risk
B	Safety is likely	Not available	No risk
		No risk	Some risk
C	Teratogenicity maybe possible	Not available	Some risk
		Not available	Some risk
D	Drugs have risk but can be given under special circumstances	Shows risk	+ or −
X	Definite fetal risk present and should not be used at all	High risk	+ or −

Category X drugs :

- ACE inhibitors.
- Hormones : Diethylstilbestrol (DES)/ Testosterone / danazol.
- Valproate.
- Lithium.
- Isotretinoin.
- Thalidomide.
- methotrexate / misoprostol.
- Statins.



Drugs which leads to limb defect :

Thalidomide : Phocomelia.
It is a proximal limb defect.
In case of amniotic band syndrome (severe oligohydramnios) : distal limb
defect (digital amputation).

Warfarin : Di Salas syndrome.
Leads to defect in growth of cartilage.

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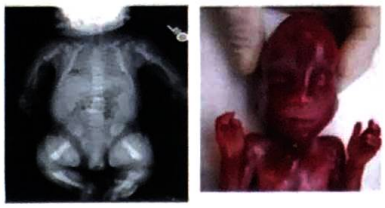
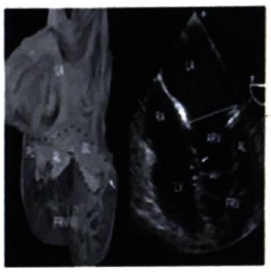
(chondrodysplasia punctata).
Depressed nasal bridge.
Stippled epiphysis in femur, humerus, calcaneum.
Choanal atresia.
50% cases : CNS abnormalities.



Warfarin embryopathy occurs maximally when warfarin is used between 6-9 weeks.
If dose <5 mg/day, it may be used in 1st trimester.

Drugs associated with cardiac defects :
Lithium : Ebstein anomaly



Downward displacement of posterior and septal leaflet of tricuspid valve
↓
Tricuspid regurgitation
↓
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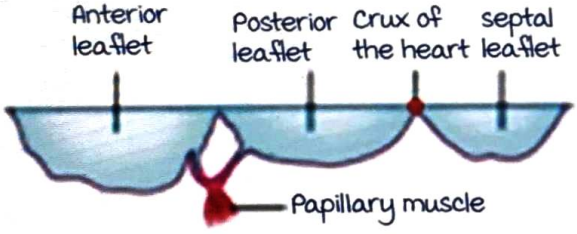
Atrialisation of right ventricle (ARV)



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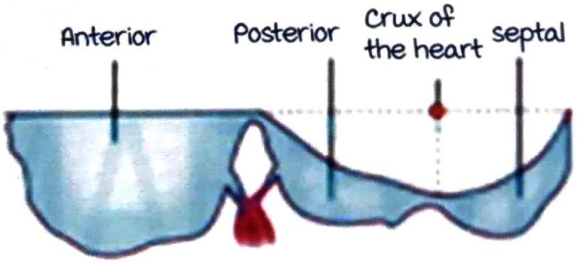
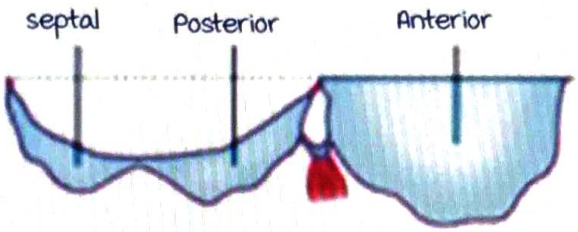


Ebstein's : Right - sided

Active space



Ebstein's : Left - sided

Clinical feature : cyanosis + heart failure

ECHO : ARV.

Selective serotonin reuptake inhibitors (SSRI) :

most teratogenic : paroxetine.

most common system involved is CVS.

most common cardiac defect is atrial septal defect (ASD).

In all pregnant females receiving SSRI - do ECHO.

Cardiac defects and facial dysmorphology :

Isotretinoin :

- Facial dysmorphia : Cleft lip, palate, microtia/anotia, micrognathia.
- CNS defects.
- Thymic defect.

Phenytoin - Fetal hydantoin syndrome.

Facial defect is limited to mid face :

- Flat facies.
- Depressed nasal bridge.
- Long upper lip, thin vermilion border of the upper lip.
- Smooth philtrum.
- Depressed nasal bridge.
- Upturned short nose.
- Cleft lip cleft palate.
- Ocular defects like ptosis and hypertelorism.

+

Limb defect (hypoplastic phalanges, small nails, digitalisation thumb)

+

Cardiac defect (ASD, VSD, Tetrology of Fallot).

Active space

Alcohol :

Facial dysmorphology + cardiac defects.

Drugs associated with nerve palsies :

Misoprost : Mobius syndrome (6th and 7th nerve palsy).

Limb reduction defect.

Misoprostol should not be used in 1st and 2nd trimester.

3rd trimester : can be used for cervical ripening.

If abortion didn't occur following attempt of medical termination with methotrexate and misoprostol, do not continue the pregnancy.

Drugs which reduce urine output :

ACE inhibitor/Trastuzumab

Fetal renal hypoperfusion- can also cause neonatal oliguria/ anuria.

↓

Decreased urine output

↓

Oligohydramnios

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↓

Pulmonary hypoplasia & limb reduction defects.

Drugs causing Facial dysmorphology :

Methotrexate : Methotrexate aminopterin syndrome.

- Cloverleaf skull, microcephaly
- Depressed nasal bridge, depressed supraorbital ridges.
- Micrognathia.
- Low set ears.
- Limb defects.

Phenytoin : fetal hydantoin syndrome

Isotretinoin.

Alcohol.

Glucocorticoids : rarely can cause cleft lip, cleft palate if used less than 10 weeks of gestation.

Active space

Drugs associated with cancer :

Diethyl stilbestrol (DES).

If a female fetus is exposed to DES in utero, it can develop :

- Clear cell adenocarcinoma of the vagina and cervix.
- Hypoplastic uterus.
- T shaped uterus.
- Breast cancer.
- Premature menopause.

Not associated with renal abnormalities in female fetus.

In male fetuses :

- Hypospadias.
- Cryptorchidism.
- Renal defects.

Alcohol related birth defects

00:39:47

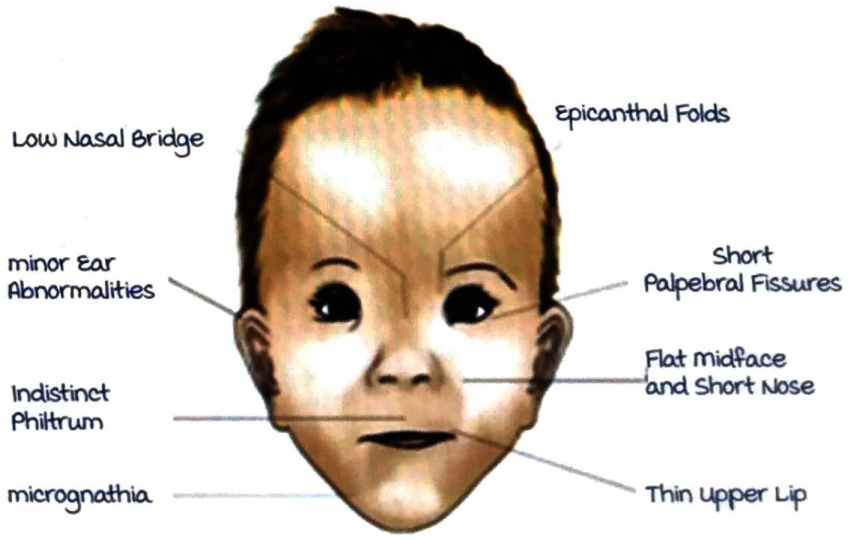
Seen in a pregnant female who consumes :

≥ 6 drinks/ week for ≥ 2 weeks or

≥ 3 drinks per occasion for ≥ 2 occasions

Binge drinking is more dangerous.

Fetal alcohol syndrome : diagnostic criteria (mnemonic : Goa's Famous Beer Bar)



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Goa's- Growth impairment ≤ 10 percentile.

Famous- Facial dysmorphology (2 or more) resembles fetal

Active space

hydantoin syndrome.

- Short palpebral fissure.
- Thin vermillion border of upper lip.
- Smooth philtrum.

Beer- abnormal Brain growth/ physiology :

- Head circumference < 3rd percentile
- Structural brain abnormalities.
- Recurrent non febrile seizures.

Bar- Behavioural impairment (below 1.5 SD).

Child <3 years : developmental delay.

Child > 3 years : cognitive impairment.

Other alcohol related birth defects :

Cardiac : ASD, VSD, TGA.

Renal : Aplastic/hypoplastic kidney, horsehoe kidney.

Skeletal : Synostosis, scoliosis.

Eyes : Strabismus, ptosis, optic nerve hypoplasia.

Ears : Conductive hearing loss, SNHL.

Teratogenic infections - CMV

00:44:29

Agent	History	Teratogenic period	Manifestation
Cytomegalovirus DNA virus. Infection does not give lifelong immunity.	Close contact with toddlers. Mostly asymptomatic. 10-18% cases: flu like symptoms like fever and lymphadenopathy.	Primary infection : maximal vertical transmission. Recurrent infection : 1% risk of verical transmission. MC time of transmission is 3rd trimester. Other modes of transmission : During labour. During breastfeeding.	Congenital cytomegalovirus syndrome is seen only in 10-15% cases. • CNS • Periventricular calcification. • Microcephaly. • Retinopathy/ chorioretinitis. • Intellectual disability. • SNHL.

Active space

CMV is the most common congenital infection.
It is the most common congenital cause of sensorinerual hearing loss (SNHL).

Diagnosis of CMV (congenital) :
maternal CMV :
IgM positive- recent infection.
IgG positive- past infection.

IgM	IgG	Condition
Negative	Positive	Past infection/ vaccinated
Positive	Negative	Recent infection
Positive	Positive	Perform Avidity test : Low avidity : recent infection. High avidity : remote infection.

Recent cytomegalovirus infection in pregnant female is an indication of doing amniocentesis.
Test for congenital infection via PCR/NAAT in amniotic fluid sample.
Perform USG for congenital malformation.

Teratogenic infections - Toxoplasma

00:56:56

Agent	History	Teratogenic period	Manifestation
Toxoplasma gondii. Obligate intracellular protozoan parasite.	Eating undercooked meat. Contact with cat feces. 80-90% females are asymptomatic.	MC time of transmission : 3rd trimester. Most severe infection occurs in 1st trimester.	• Intracerebral calcification. • Hydrocephalus • Chorioretinitis. • IUGR. • Intellectual disabilty.

Active space

Drug of choice for treating mother with toxoplasma infection : Spiramycin.
Spiramycin doesn't cross placenta.
If fetal infection present : pyrimethamine + sulphadiazine combination.
Since it is a folic acid antagonist : supplement with folinic acid.
Sulphadiazine can cause hemolysis in patients with G6PD deficiency.

Treatment regimen :
Alternate between Spiramycin x 3 weeks.
Pyrimethamine- Sulphadiazine x 3 weeks.

Teratogenic infections – Rubella 01:01:52

Agent	History	Teratogenic potential	manifestation
Rubella RNA virus most teratogenic congenital infection	25- 50% mothers are asymptomatic. In symptomatic cases : mild fever and maculopapular rash.	max transmission : 1ST trimester. most severe infection : upto 16 weeks although, most significant in first 2 months.	Congenital rubella syndrome (till 16 w). Microcephaly. Intellectual disability. Heart disease - PDA/ pulmonary stenosis. Cataract/ glaucoma. SNHL.

All pregnant females should be screened for rubella in 1st trimester -if present - indication to do MTP.

Rubella infection beyond 16 weeks :

Neonates with rubella infection :
- Neonatal purpura.
- Radiolucent bone disease.
- Hepatomegaly.
- SNHL.

Neonates with rubella infection :
- Neonatal purpura.
- Radiolucent bone disease.
- Hepatomegaly.
- SNHL.

Neonates with rubella infection shed virus for a long time and are threat to other neonates.

Screening for rubella : all pregnant females in 1st antenatal visit.

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Recent infection (IgM+, IgG-) : Perform MTP.

Not vaccinated (IgM-, IgG-) : Rubella vaccination is contraindicated in pregnancy.

Advise her to get vaccinated after delivery if she plans another pregnancy.

After giving rubella vaccine, pregnancy is contraindicated for 1 month.

If she conceives within 1 month after getting the vaccine, continue her pregnancy.

Important points :

Infection associated with congenital heart disease : Rubella

Infection associated with intracranial calcifications :

- Periventricular : cytomegalovirus – associated with microcephaly.
- Intracerebral : toxoplasma – associated with hydrocephalus..

SNHL is caused by CMV (mc), rubella.

Cataract is caused by rubella.

Teratogenic infections – Parvovirus B19 01:11:46

Agent	History	Teratogenic potential	manifestation
Parvovirus B19 DNA virus. Replicates in erythroblast precursors, causing anemia in fetus.	Contact with school children. Fifth disease. In children: slapped cheek appearance On trunk : lacy net like pattern rash. Due to fetal anaemia, increased urine output, mother will have polyhydramnios, Polyarthralgia.	most common infectious cause for hydrops fetalis.	• Abortion. • Still birth. • Non immune hydrops fetalis • Fetal anemia. It does not lead to any birth defects.

Active space

Hydrops fetalis :

- Ultrasound based diagnosis.
- most common infection causing hydrops fetalis is parvo virus B19 infection.
- The chances of hydrops fetalis is maximum if mother acquires parvovirus between 13 to 16 weeks of pregnancy (coincides with hepatic haematopoiesis).
- When mother is diagnosed with parvovirus infection : next 10 weeks are important as fetus can develop non immune hydrops in this period.
- Hence do targeted scan every 2 weeks +/- Peak systolic velocity of middle cerebral artery (if PSV ≥ 1.5 mom – Severe anemia).

Teratogenic infections: Varicella zoster 01:19:26

Agent	History	Teratogenic period	manifestation
Varicela zoster in pregnancy	Comes in contact with chicken pox patient. Mode : droplet, skin-skin contact. Fever and flu like symptoms. Rash- pleomorphic. Vesicle over red base. MC seen on trunk.	Within 20 weeks (13-20 weeks) Congenital varicella syndrome present : Indication for MTP Incidence is 2%	Congenital varicella infection (MC seen if infection occurs between 13 to 20 weeks) • Cicatricial skin lesion (scarring). • Limb contractures, deformities. • Ocular defects : cataract, chorioretinitis. • Brain defects : cortical atrophy. • Microcephaly.

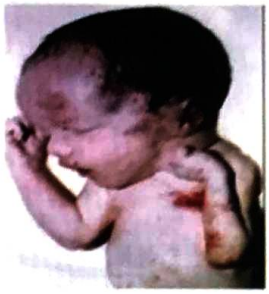
To prevent varicella zoster in pregnancy : VZ immunoglobin.
To treat varicella zoster in pregnancy : acyclovir.

- Cicatricial skin lesions seen in varicella and herpes

Active space

- Cataract : Rubella and varicella zoster
- Brain atrophy + microcephaly : Zika virus and congenital varicella zoster.

Infection	Maximum transmission
CMV	T3
Toxoplasma	T3 most severe in T1
Rubella	T1 (<16 weeks)
Parvovirus	T2 (13-16 weeks)
varicella	T2



Congenital varicella Syndrome

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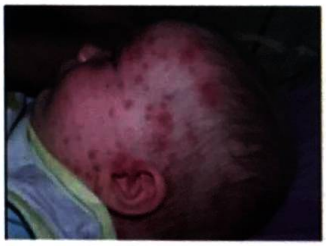
Neonatal varicella syndrome :

If pregnant female acquires chicken pox infection 5 days before delivery or 2 days after delivery : maternal antibodies haven't developed → 25-50% cases develop neonatal varicella syndrome.

Clinical features :

Generalised vesicular rash in various stages macule → papule → vesicle → crusting



Complications :

- Pneumonitis.
- Hepatitis.
- Meningoencephalitis.

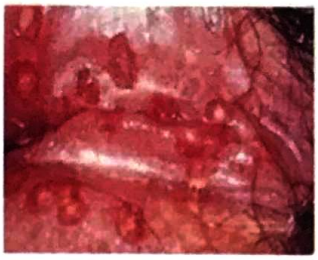
If pregnant female develops infection 5 days before or 2 days after delivery, and neonate hasn't developed neonatal varicella syndrome : Give VZ immunoglobulin.

If newborn develops neonatal varicella syndrome the DOC is Acyclovir.

Active space

Herpes infection

01:30:15



Herpes genitalis : multiple painful vesicles on vulva and no rashes on other parts of body.
Etiology : Herpes Simplex Virus
Incubation period : 3 to 12 days

Primary lesion : vesicles → rupture → multiple tender ulcers → margins of ulcer fuse with each other → Polycyclic erosions.
B/L enlarged tender inguinal lymphadenopathy.
No bubo formation.

Diagnosis : Tzanck smear.
Fluid from vesicles is taken → stained with Giemsa stain → multinucleated giant cells and acantholytic cells → PCR
Culture

Treatment : T. Acyclovir 400mg TDS for 7 days.

If patient has active genital herpes during labour- indication for Caesarean section.

Primary infection : treat with Acyclovir for 7-10 days + restart treatment at 36 weeks and continue until delivery (suppressive therapy).
Recurrent herpes infection : immediate treatment with Acyclovir may or may not be given.
Suppressive therapy has to be given at 36 weeks onwards.

Route of delivery :
Mandatory C-section :

1. If active genital herpes infection.
2. Prodromal symptoms (vulval pain, burning sensation).

Vaginal delivery (if active genital herpes isn't present) :

1. Artificial rupture of membranes should be avoided.

Active space

2. Instrumental delivery should be avoided.
3. Fetal scalp pH monitoring should be avoided.

Preterm labour/ PPROM : can be managed expectantly. Give antivirals.
Breastfeeding is contraindicated only if active lesions are present on breast.

Neonate with herpes :
Most common time of transmission: during labour.
Clinical features :

- Skin lesion – cicatricial skin lesion.
- Eye lesion.
- Mucocutaneous lesions.

Teratogenic infections: Zika virus 01:38:23

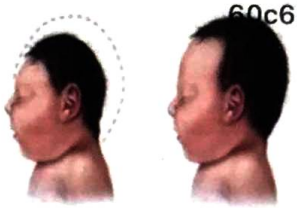
Family : Flavivirus.
Type of virus : RNA virus.
Affinity for : CNS.
Spread by : Aedes mosquito (vector borne teratogen).
Receptors : TIM-1 receptors and TAM-AXL receptors present on Keratinocytes and fibroblasts.
Symptoms : fever, cold, rash & polyarthralgia.

may have neurological syndromes like Guillain Bairre Syndrome or myelitis.

Zika virus of pregnant female
↓
Attached to TIM-1, TAM-AXL, Hoffbauer cells of placenta
↓
Vertical transmission
↓
CNS of fetus

Neurological features in neonate :

- Cortical matter atrophy : microcephaly.
- Ventriculomegaly.
- Intracranial calcifications.
- Ocular symptoms- macular scarring.
- Increased tone of limb.
- Congenital limb contractures e.g. clubfoot.



Active space

FETUS

Fetal hematopoiesis :

Duration of pregnancy	Main site of hematopoiesis	Main Hb
Until 6 weeks	Yolk sac	Portland Hb, Gower 1, Gower 2
From 6 weeks onwards	Liver (spleen)	Hb F ($\alpha_2\gamma_2$)
From 20 weeks onwards	Bone marrow	Hb A

Fetal Hb

00:02:34

- Chains : $\alpha_2\gamma_2$
- Oxygen affinity : more oxygen affinity than HbA.
- Oxygen dissociation curve : Lies to left of maternal curve.
- It has low 2, 3 – DPG and low carbonic anhydrase.
- Characteristic : Resistant to acids and alkali.
- At term (at time of birth) % of HbF : 75 – 80% (for newborn, Hb : 16 – 18 g/dl).
- At 6 months of birth : HbF < 1%.

Fetal RBC :

Cardiac output of fetus : 350 ml/kg/min.

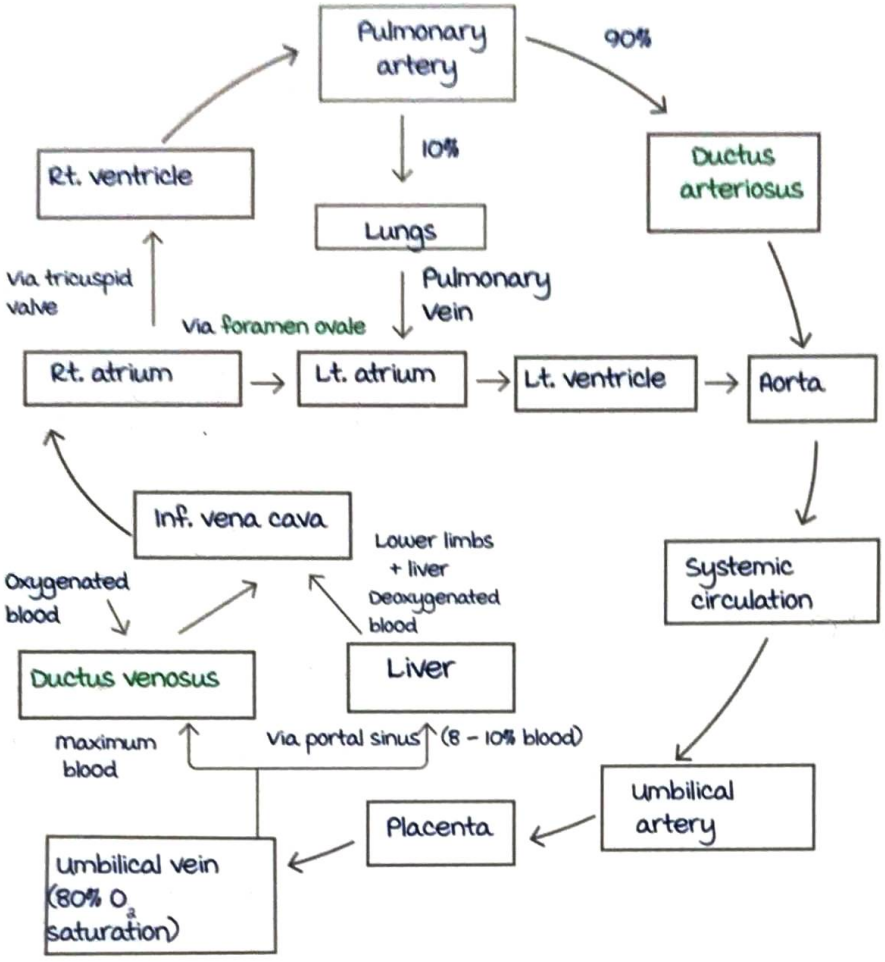
Cardiac output of newborn : 500 ml/min.

2 tests based on HbF characteristic (resistant to acids and alkali) :

1. Singers alkali denaturation test/ Apt test : Qualitative test used to differentiate vasa previa from placenta previa. Reagent : 1% KOH or NaOH.
2. Kleihauer Betke test/ acid elution test : Quantitative test used to calculate the dose of anti – D in Rh negative females. Reagent : Citric acid phosphate buffer.

Fetal circulation 00:08:20

Site of oxygenation : Placenta (not lungs).



Important events in fetal development 00:17:48

- Fetal breathing movements : 11 weeks.
- Fetal swallowing movements : 10 – 12 weeks.
- Fetal urine production as early as 8 – 11 weeks (definitely by 12 weeks).
- Meconium production : 16 weeks.
- Fetal limb movements : 7 weeks (but quickening is different which is the perception of fetal movements by the mother. (In primigravida : By 18 weeks, in multigravida : By 16 weeks).
- Fetal cardiac activity : 5 weeks (3 weeks after fertilization = Day 21 after fertilization).
- Surfactant production : Begins by 20 weeks.
- Surfactant seen in amniotic fluid : By 28 weeks.

Active space

- Gonads : 7 weeks (testes earlier than ovaries) that is (male > female).
- Internal genitalia : 10 weeks.
- External genitalia : 12 weeks(Formed earlier in females).
- Hormone production :
  Insulin : 12 weeks.
  HPA axis formed : 12 weeks.
  Glucagon synthesis : 8 weeks.

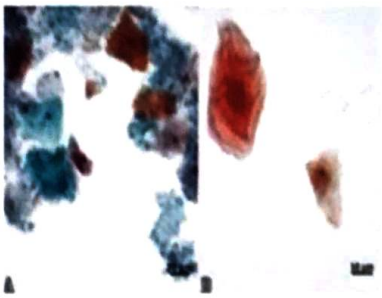
Fetal lung maturity tests 00:23:07

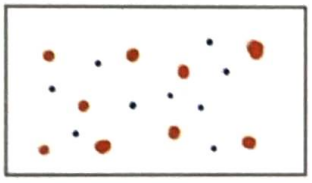
Done in cases of preterm labour, to know maturity of lungs.
The test is done in amniotic fluid (AF) which is taken out by amniocentesis.
Amniocentesis to be done in third trimester.

1. Lecithin – sphingomyelin ratio (L/S ratio) in AF (most common test) :
   - If L/S ratio is ≥ 2, lungs are matured.
   - If L/S ratio is < 2, lungs are not matured.
2. Phosphatidyl glycerol in AF (best and most specific test in any case) :
   - Present in AF : Lungs matured.
   - Absent in AF : Lungs not matured.
3. Lamellar body count :
   - Lamellar bodies : Packets of surfactants in AF and are the storage form of surfactant.
   - < 15 K/ μL : Not mature.
   - 15 K – 50 K/ μL : Undeterminate.
   - ≥ 50 K/ μL : Mature.
4. Shake test/ bubble test/ Clement test :
   - Primitive and outdated test.
   - Only bedside test.
   - AF and alcohol taken in test tube and shaken (surfactant is a soapy material).
     If bubbles formed : matured lungs.
     If bubbles not formed : Lungs not matured.
5. Nile blue sulphate test :

- Principle : Fetal skin cells are present in the AF.
- Presumption : If phospholipid (PL) is present in skin cells, PL will also be in fetal lungs. In other words, lungs will be matured.
- AF (by amniocentesis) + Nile blue sulphate dye.
- Skin cells with PL (mature skin cells) : Turn into orange colour.
- Skin cells without PL : Remain blue in colour.
- If ≥ 50% cells are orange in colour, lungs are matured.
- It is not a skin maturity test. Skin cells are used only to assess lung maturity.

Orange colour : Mature skin cells (with PL).
Blue colour : Skin cells without PL





6. Phosphatidyl choline test : ≥ 500 ng/ml in AF → Lungs are matured.
7. Optical density test : ≥ 0.15 at 650 nm → Lungs are matured.

Drug that accelerates fetal lung maturity → Corticosteroid.

Active space

PLACENTA

Introduction 00:00:33

Placenta is formed by :
Fetal side : Chorion frondosum > cytotrophoblast > trophoblast.
Maternal side : Decidua basalis.
Formation begins by 6 weeks.
Anatomically it ends by 16 weeks, physiologically may continue till term.
Weight at term : 500 g.
Ratio of weight of placenta : Fetus at term = 1 : 6
Gestational age at which weight of placenta = weight of fetus : 17 weeks of pregnancy.

Terms to describe human placenta :
Discoidal : Disc like shape.
Hemochorial : Lies in contact with maternal blood.
Deciduate : Shed off after delivery.

Diameter of placenta is 15-20/22 cm.

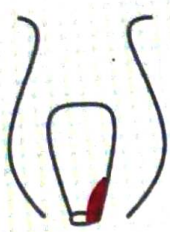
Thickness : Average 2.5 cm. Upto 4cm is normal. If > 4cm called as placentomegaly.

Causes of placentomegaly :
1. Conditions causing high cardiac output in fetus :
   - Fetal anemia.
   - Hydrops fetalis (Rh negative pregnancy, twin to twin transfusion syndrome, Parvovirus B 19).
2. Maternal diabetes.
3. Molar pregnancy especially partial mole.
4. Intrauterine infections (m/c : syphilis > CMV).
5. Placental conditions : Placental mesenchymal dysplasia and chorangioma (benign tumor).

Small placenta :
- Uteroplacental insufficiency in conditions like PIH, high maternal BP.

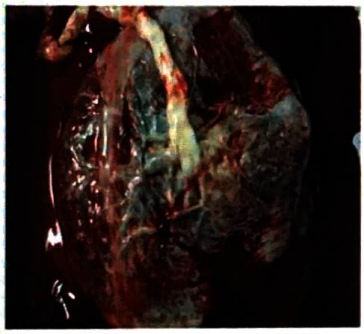
- IUGR.
- Constitutionally small baby.

Normal attachment of placenta : Upper uterine segment.
If placenta is lying in lower uterine segment and is within 2 cm of internal os : Low lying placenta.
If placenta is lying in lower uterine segment or if placental edge touches or covers the internal os : Placenta previa.
Best time to do USG to localize placenta is third trimester, because migration happens in 90% of cases before third trimester.

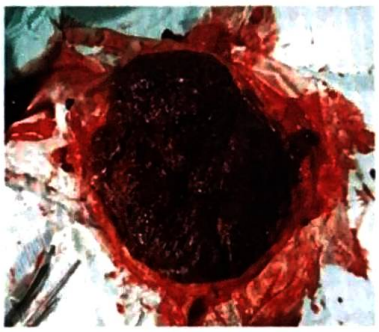


Placenta previa

Low lying placenta



Fetal side at term



maternal side at term

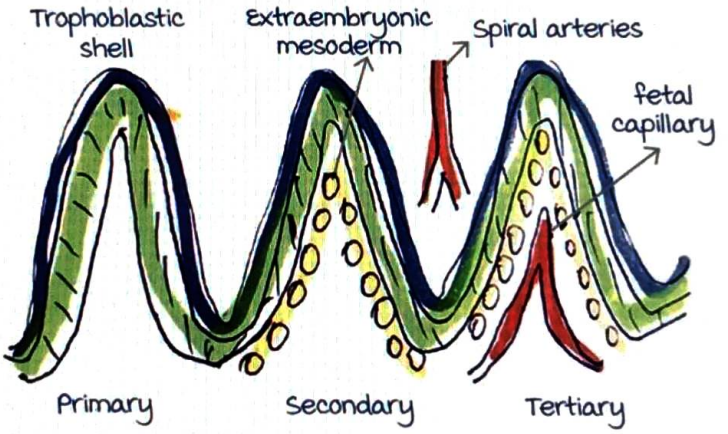
Fetal side (chorionic plate)	maternal side (basal plate)
Develops from chorion frondosum	Develops from decidua basalis
Forms 4/5th of placenta	Forms 1/5th of placenta
Shiny, grey in colour	Dull, red/maroon in color
membrane and cord are attached (usually at the center of fetal side)	Has polygonal areas known as lobes. Lobes are divided into lobules/cotyledons (functional unit of placenta)

The area occupied by placenta on the uterus by both maternal and fetal sides are same.

Formation of placenta

00:18:02

Chorion frondosum : Villi arising from cytotrophoblast.
Primary villi : Only syncytiotrophoblast and cytotrophoblast.
Secondary villi : Syncytiotrophoblast, cytotrophoblast with extra-embryonic mesoderm growing into the villi.
Space between the two villi is intervillous space where maternal spiral arteries open.
Tertiary villi : Syncytiotrophoblast, cytotrophoblast, extra-embryonic mesoderm and fetal blood capillaries open into villi.



Maternal blood is present in the intervillous space while fetal blood is present in the villi.

Structures separating maternal blood from fetal blood (outside to inside) :

- Syncytiotrophoblast.
- Cytotrophoblast.
- Extra embryonic mesoderm.
- Fetal capillary endothelium.

Placental membrane/ barrier

Villi	Composition	Formed by
Primary	Trophoblastic shell	D13 (after fertilization)
Secondary	Trophoblastic shell + mesodermal core	D16 (after fertilization)
Tertiary	Trophoblastic shell + mesodermal core + fetal blood vessels	D17 (after fertilization)

Fetoplacental circulation is established by D17 after fertilization.
Volume of maternal blood is 150ml.
Volume of fetal blood is 350ml.
Volume of placenta at term is 500 ml.

Placental circulation

00:27:11

	Uteroplacental	Fetoplacental
Present in	Intervillous space (IVS)	Villi
Volume of blood	150 ml	350 ml
Established by	D15 (after fertilization)	D17 (after fertilization)
Via	Spiral arteries Number of arteries is 120 (120-200). O_a saturation of IVS is 65 to 75%. Uteroplacental circulation at term is 500-750 ml/min. Uterine blood flow at term is 750 ml/min.	Oxygenated blood by umbilical vein (placenta to fetus) Deoxygenated blood by umbilical artery (Fetus to placenta) Fetoplacental blood flow at term is 400ml/min. Fetal blood flow at term is 125ml/kg. Rate of O_a delivery to fetus : 8ml/kg/min.

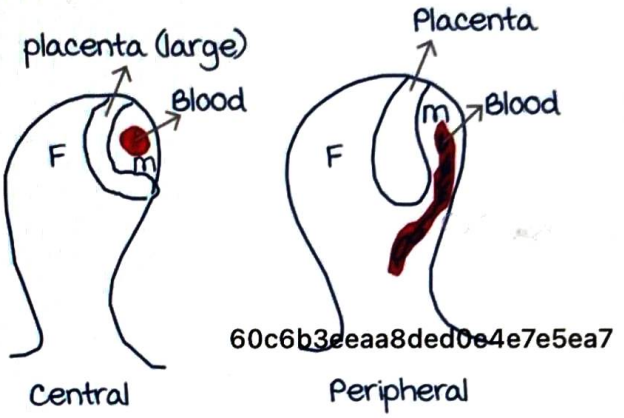
Active space

Fetal circulation is established by DAI after fertilization.

methods of placental separation :
Human placenta is deciduate (Shed off after delivery).
Placenta separates in the third stage of labor.
Plane separating runs through zona spongiosa.

Types of placental separation :

- Central separation/Schultz method.
- Peripheral separation/Duncan method.



Schultz method	Duncan method
Starts separating from center	Starts separating from margins/periphery
Formation of retroplacental clot	No retroplacental clot formation
Bleeding is evident only after placental separation	Bleeding is evident as soon as placental separation begins
Amount of bleeding is Less	more bleeding
Fetal side comes out first	maternal side come out first
m/c method	Less common method

S for Schultz, shiny fetal side.
D for Duncan, dull maternal side.

Molecular genetics of the placenta 00:38:38

Thrombosis of placental villi can lead to pregnancy loss (because pregnancy is a hypercoagulable state).
Annexin-5 protein (present on trophoblasts) can prevent this by its anticoagulant activity.
In APLA syndrome : Phospholipid antibodies oppose the action of Annexin A-5 protein (increased risk of thrombosis).

There is no autonomic innervation of placenta.
Vasoconstriction and vasodilatation are brought by autocrine, endocrine, and paracrine effects of mediators.

Effects of mediators :
Vasodilatation : CO, NO, histamine, serotonin, prostaglandin, Corticotropin Releasing Hormone.
Vasoconstriction : Endothelin, RAAS.
In the uteroplacental insufficiency (pre-eclampsia and high BP) : Vasoconstriction mediators will be increased while vasodilators decrease.

Vertical transmission across placenta :
Barriers present in placenta which prevent infectious agents from reaching fetus.

- Syncytiotrophoblast : Lacks intercellular junction.
- Trophoblast and decidua mediated cellular responses.
- Basement membrane (physical barrier).
- Anti viral proteins : Type 1 and 3 interferon.

Many viruses like Treponema pallidum, Listeria, Toxoplasma can break these barriers and cause placental and fetal infection.
Virus like Influenza and some bacteria affect type 1 interferon and lead to infection → Preterm labor.

Active space

Zika virus attaches to AXL receptors, TIM-1 receptor, and tyrosine 3 receptors present on trophoblast, fibroblast and Hoffbauer cells (macrophages). Enters placenta and knock off interferon 1 & 3 leading to fetal infection.

SARS COV2 virus : Attaches to ACE-2 receptors via spike proteins present in the cytotrophoblast and syncytiotrophoblast and enters placenta.
But post entry processing decreases vertical transmission rate of SARS COV2.

Note :
Hoffbauer cells are present in placenta.
Hoffbauer cells help in Zika virus transmission.
Langhans cell layer is also called as cytotrophoblast.

PLACENTAL FUNCTIONS

Functions of placenta 00:00:52

- metabolic function.

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- Endocrine function : Production of hormones.
- Transfer of substrates to the foetus and exchange of gases.

Metabolic functions :

Glucose : It is the main source of energy for foetus.
Fetus is dependant on the mother for glucose.
Transfers glucose to fetus via facilitated diffusion (GLUT receptors 1 & 3).
Also stores glycogen as reserve for fetus.
Main enzyme involved is Glycogenin.

Fatty acid : It is used by the foetus as source of energy and substrate to form cholesterol.
maternal triglycerides are broken down by lipase and fatty acids are transferred to fetus (storage).

Amino acid : used by foetus for growth.
Placental protein production is 1.5 g/day (1st trimester) and 7.5 g/day (3rd trimester).

Waste product : Lactate is transferred by placenta to the mother.

Endocrine function 00:06:18

Hormones produced by placenta :
Steroid hormones : Oestrogen, Progesterone, Corticosteroids.

Active space

Peptide hormones : hCG, HPL, CRH, IGF, VEGF, PLGF and soluble FMT like Tyrosine Kinase I.

hCG :

main site of production : Syncytiotrophoblast.

Type : Glycoprotein hormone (maximum carbohydrate content). 60c6b3eeaa8ded0e4e7e5ea7

molecular weight : 36,000 to 40,000 Dalton.

2 subunits :

Alpha subunit : Located on chromosome 6, non specific (common in LH, FSH & TSH).

Beta subunit : Located on chromosome 19, specific.

Applied aspect :

Pregnancy test (serum/urine) : Beta subunit assessed.

hCG is morphologically similar to LH, FSH & TSH and functionally similar to LH.

Applied aspect :

In IVF as ovulation trigger : Injection hCG is used. hCG acts via LH receptors. hCG secretion begins in pre implantation embryo.

hCG is detected earliest in serum by 8 days after fertilization/ day 22 of the cycle/ 5 to 6 days before missed periods.

most sensitive test to detect hCG : Serum quantitative tests (1 – 2 mIU/ml).

A negative serum hCG test : Value < 5 mIU/ml.

most sensitive serum quantitative tests :

FIA (fluorescent immunoassay) > RIA (radioimmunoassay).

On the day of missed period, female is 4 weeks pregnant (level of hCG in serum is 200 mIU/ml & urine is 50 mIU/ml).

Urine pregnancy test :

Qualitative test.

Less sensitive compared to serum test.

Can detect hCG : 20 – 50 mIU/ml.

It is a sandwich ELISA test.

Can detect pregancy as early as on the day of missed period. If negative, the test repeated after 1 week.

As pregnancy advances, hCG doubles every 48 hours (1.4 to 2 days) in early pregnancy.
In a viable intrauterine pregnancy, there will be an increase of 33 - 65% in the levels of hCG.
Maximum levels will seen at 10 weeks (60 - 80 days).
Minimum levels will seen at 16 weeks (16 - 20 weeks).
$T_{1/2}$: 36 hours.
The low levels are sustained throughout the rest of the pregnancy.
Serum hCG testing is relevant only in first trimester and not beyond this.

Applied aspects :

Day 1 to day 3, if hCG levels increase by 33 - 65% :
Viable intrauterine pregnancy.
Day 1 to day 3, if hCG levels increase <33% - 65% :
Slow rise (ectopic pregnancy).
Day 1 to day 3, if hCG levels are decreasing :
Dying/ non viable intrauterine.

hCG levels are higher than expected	hCG levels are lower than expected
Wrong dates : Underestimated gestational age.	Wrong dates : Overestimated gestational age.
Multifetal pregnancy.	Abortion.
Rh negative pregnancy/ erythroblastosis fetalis (because of placentomegaly).	Ectopic pregnancy.
Gestational trophoblastic disease : Molar pregnancy, choriocarcinoma.	Trisomy other than Down's syndrome.
Down's syndrome : Trisomy 21.	

Absolute levels of hCG levels will be lower in ectopic pregnancy than a normal intrauterine pregnancy at that

Active space

particular gestational age.
Repeat hCG after 48 hours will show slow rise in ectopic pregancy.

Functions of hCG :

- Maintains corpus luteum in pregnancy.
- First stimulus for testosterone release from Leydig cells in male fetus.
- Smooth muscle relaxant.
- Prevents rejection of fetus.

The amount of hCG in liquor is same as the levels in maternal plasma.
Placental GnRH stimulates hCG production.
Clearance : Liver (70%), Kidney (30%).
Corpus luteum of non pregnant female is maintained by LH.
Every month corpus luteum is formed & undergoes luteolysis.
When a female becomes pregnant, hCG is secreted which prevents corpus luteum from undergoing luteolysis.
Hormone that maintains corpus luteum in pregnancy : hCG.

Human placental lactogen (HPL) 00:40:58

Other names : Human chorionic somatomammotrophin.
Placental growth hormone.
Synthesized by : Syncytiotrophoblast.
Type : Single non glycosylated polypeptide chain.
Molecular weight : 22,000 Dalton.
Structurally similar to GH (96%) and prolactin (65%).
Detected earliest by 3 weeks of pregnancy, levels increase throughout pregnancy (marker for placental function).
Peaks at 34 – 36 weeks.
$T_{1/a}$ is 20 – 30 min.
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Production rate at term is 1 g/day.
Hormone which is produced maximally at term is HPL.

Maximal HPL secretion is seen in :
Maternal plasma > amniotic fluid > fetal blood.

Functions :

Provide glucose to fetus :

Insulin resistance (increase glucose levels in mother).

Promotes lipolysis (used by mother for energy requirement and glucose is spared for fetus).

Angiogenic in nature.

HPL has no role in breast feeding.

Insulin resistance increases in pregnancy as period of gestation increases.

Significant Insulin resistance is seen beyond 24 weeks of gestation, leading to GDM in pregnancy.

Best time to test for GDM is 24 - 28 weeks.

Insulin resistance : Mainly due to HPL.

Others : Oestrogen, Progesterone, Cortisol except hCG.

Fasting : maternal hypoglycemia (as glucose is transferred to fetus).

Postprandial : Hyperglycemia (due to insulin resistance)

Insulin like growth factor (IGF)

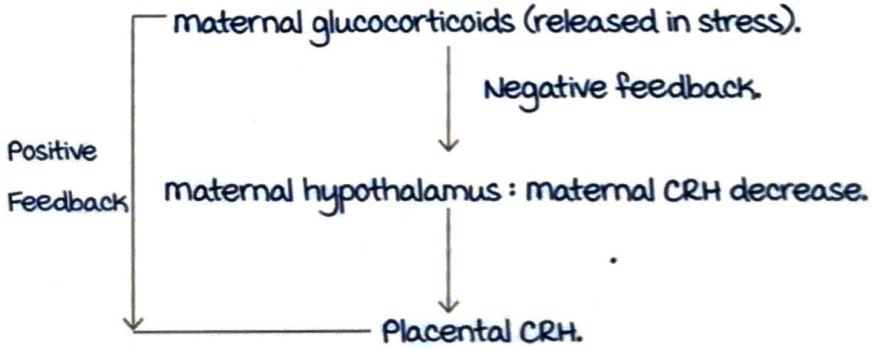
00:50:28

Placenta produces IGF - 1, 2 & IGF binding protein.

IGF - 2 acts by binding to IGF - 1 & leads to foetal growth.

main hormone leading to foetal growth is IGF.

Corticotrophin releasing hormone (CRH) :



Placental CRH increases throughout gestation but is bound to CRH binding protein.

Active space

At term CRH binding protein decreases.

↓

free Placental CRH increases.

↓

Activates fetal HPA axis.

↓

Labour.

Placental CRH acts as a placental clock.

Applied aspect : maternal stress like anxiety, depression can cause increase in placental CRH leading to preterm labour.

Vascular Endothelin Growth Factor (VEGF) & Placental Growth Factor (PLGF)

00:56:47

Both are produced by villous trophoblasts.

Role of VEGF : Angiogenesis in early pregnancy (T1).

Role of PLGF : Angiogenesis in late pregnancy (T3).

Soluble FMT like tyrosine Kinase 1 :

Binds to VEGF and PLGF 2.

Prevents angiogenesis and inhibits the vasodilatory effects of VEGF & PLGF.

Normally, balance is maintained between VEGF, PLGF and SFMT like tyrosine Kinase 1.

Pre eclampsia : Increased SFMT like tyrosine Kinase 1 production. No angiogenesis or vasodilatory effects. Causes vasoconstriction leading to pre eclampsia.

SFMT like tyrosine Kinase 1 is a recent predictor of pre eclapmsia. VEGF & PLGF are decreased.

Oestrogen :

Placenta cannot synthesise oestrogen using maternal precursors because it lacks 17 alpha hydroxylase enzyme.

17 OH progesterone (C21 steroid).

↓ 17 alpha hydroxylase.

Androstenedione (C19 steroid)

(needed for oestrogen synthesis).

Fetal adrenal glands produce DHEA - S (C19 steroid) by stimulation of fetal ACTH. DHEA - S is utilized by placenta to synthesise oestrogen (using sulfatase, 3 - HSD, aromatase). Oestrogen plays an important role in initiating uterine contraction.

Applied aspects :

At term, production of estrogen increases with a corresponding increase in oestrogen receptors.

Anencephaly : Absent/ hypoplastic adrenal gland.

DHEA - S will be absent or decreased. Placenta produces decreased oestrogen.

Therefore, increased chance of post term pregnancy.

M/c Estrogen in pregnancy : Estradiol (E2).

Most specific Estrogen in pregnancy : Estriol (E3).

Conditions with increased Estrogen	Conditions with decreased Estrogen
Erythroblastosis fetalis	Intrauterine foetal demise
Maternal androgen producing tumour	Anencephaly
	Placenta lacks sulfatase/ aromatase enzyme
	Down syndrome (overall C19 corticosteroid production is decreased)

Placental aromatase deficiency 01:08:29

Decreased Estrogen : Post term labour.

Aromatase is required to convert androgens to Estrogens.

Deficiency will lead to increased androgen levels : Maternal hirsutism, ambiguous genitalia in female fetus.

Progesterone :

Placenta will produce progesterone using mother's LDL cholesterol.

Begins at $\geq$ 8 weeks.

Before 8 weeks : Corpus luteum of pregnancy produces Progesterone.

Active space

Role : Smooth muscle relaxant, prevents expulsion of fetus.

Applied aspects :

- For onset of labour, decreased Progesterone (functional withdrawal) and increase in Estrogen is needed.
- Functional withdrawal : Levels of Progesterone do not decrease but its receptors decrease.
- If a female is at a risk of preterm labour : Prophylactic Progesterone can be given.

During pregnancy, if levels of Progesterone decrease.

↓

Increased uterine contractility.

↓

Expulsion of conceptus.

↓ < 20 weeks

Abortion.

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Luteal phase defect : Decreased levels of Progesterone in early pregnancy.
Management : Progesterone.

Other functions of Progesterone :

Immunosuppressive action.
Anti inflammatory action.

Daily rate of production of Progesterone is 250 mg/day.

PLACENTAL ANOMALIES

Outline 00:00:20

- Succenturiate placenta
- Placenta bilobata
- Placenta multilobata
- Placenta Spuria
- Placenta membranacea
- Fenestrated placenta
- Circumvalate and circummarginate placenta
- Placenta accreta spectrum

Abnormal lobes of placenta 00:00:56

Placenta succenturiate : A small lobe of placenta separated from main placenta and remains connected to it with blood vessels.

Placenta Bilobata : Two equal lobes of placenta separated from each other and umbilical cord is supplying blood. Such placenta is called placenta bilobata. It is also called Placenta bipartite or placenta duplex.

Complications :

1. Placenta previa
2. Vasa previa.

In post-partum period :

1. It can lead to PPH
2. Infection

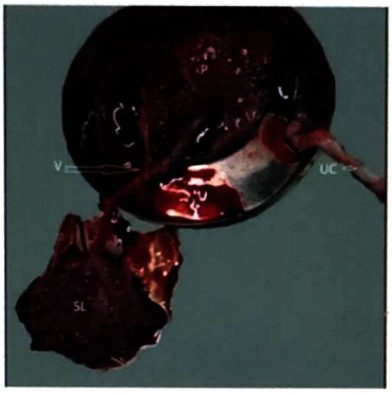
Placenta Bilobata

Note :

- In placenta of twin pregnancy, two umblical cords will be present.
- If placenta has more than 2 lobes it is known as Placenta multilobata.

Placenta succenturiata

00:05:44



Placenta previa means either entire placenta or part of placenta is in lower uterine segment.

In Placenta succenturiata, small part of placenta may lie in lower uterine segment leading to placenta previa. Bleeding will be maternal in placenta previa.

In placenta succenturiata : Vasa previa can occur. Bleeding will belong to fetus in vasa previa. If the connecting blood vessels between main lobe and small lobe are lying in the internal OS, when patient's membrane rupture or when OS is dilated, there will be trauma to these blood vessels which are a part of umbilical cord and when they get ruptured it will result in fetal blood loss.

Placenta Spuria : Small part of the placenta separates from the main placenta and is not connected by any blood vessels. It is very rare.

membranous placenta : Thin placenta which covers the entire uterus or entire chorionic sac. Villi are present through out the uterus.

Occasionally these be villi may be deeply embedded giving rise to placenta acreta.

If membranous placenta is in ring shaped, it is called annular placenta.

Complications of membranous placenta 00:13:54

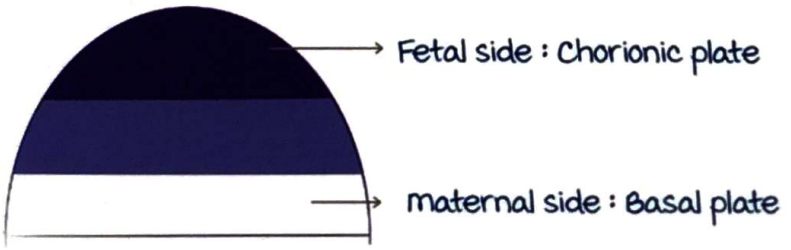
1. 2nd trimester abortions. As the placental function is not proper, there will be decreased progesterone and this leads to increased chances of abortions
2. Pre-term labour
3. APH.
4. PPH.

Fenestrated placenta 00:15:14

A part of placenta or may be cotyledon is naturally absent.

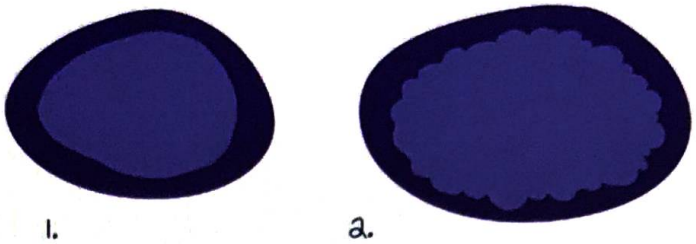
It generally does not lead to any complications.

Extrachorial placenta 00:15:44



Sometimes, the fetal side = chorionic plate is small and maternal side (basal plate) is big. This fetal side of placenta is going to be surrounded by maternal side in the form of a ring.

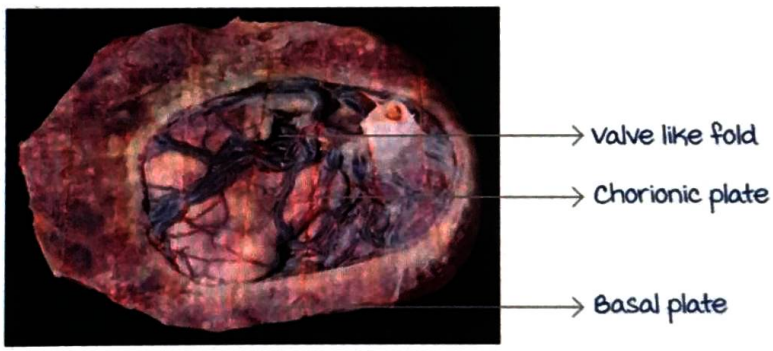
It can be of 2 types :



1. 2.

1. Circummarginate placenta : Basal plate is surrounding the chorionic plate in the form a ring. And the transition between them is smooth. Such placenta is called cicrummarginate placenta. Basal plate is bigger due to fibrin + clots.

2. Circumvalate placenta : Basal plate is bigger due to fetal membranes which forms the extra curves or folds. Valve like folding of amnion and chorion is seen. If such valve is seen between basal plate and chorionic plate, such placenta is called Cicrumvalate placenta. Fetal blood vessels do not extend beyond the chorionic plate.



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Complications of extra chorial placenta

1. Abruptio placenta – APH.
2. Pre-term labour.
3. Fetal growth restriction – as fetal side is smaller, less blood goes to fetus.

more commonly associated with cirumvalate placenta than with circummarginate placenta.

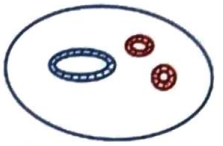
Circummarginate placenta

Active space

CORD AND ANOMALIES

Umbilical cord 00:01:12

Contains 3 vessels : 2 arteries and 1 vein.
Right and left umbilical arteries and left umbilical vein.
Umbilical arteries arise from internal iliac artery.
O_2 saturation of umbilical vein is 80%.
Remnant of umbilical artery in adults : Medial umbilical ligament.
Remnant of umbilical vein in adults : Ligamentum teres.
(Mnemonic → AMUL)
Length of the cord : 40 – 70cms.
Short cord : < 32cm.
Long cord : > 70cm (some books say > 100cm).
Connective tissue of cord : Wharton's jelly.
Folds of cord are known as folds of Hobokon.
Funisitis : Inflammation of cord and fetal surface of placenta (chorionic plate).
Funic/ cord presentation : When umbilical cord is felt first on per vaginal examination.
Hyrtl anastomosis is present between umbilical arteries near the placenta.



Fetal membranes 00:05:16

1. Chorion :
Formed from chorion laevae/ cytotrophoblast/ trophoblast.
It is the outermost fetal membrane.
Formed approximately by day 8 after fertilization.

2. Amnion :
Formed from fetal ectoderm.
Avascular : No blood vessel.
Has no lymphatics or nerve supply.
Tensile strength of membranes is due to amnion.

It is formed after chorion, approximately by day 10.
It is the innermost fetal membrane.

3. Yolk sac :
First site for hematopoiesis in fetus.
Forms primitive hemoglobin like Portland Hb, Gower Hb.
Source of alpha fetoprotein (also produced in fetal liver and GIT).

4. Allantois :
Diverticulum that connects hindgut to connecting stalk.

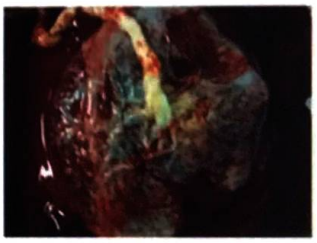
Fetal membranes are rich in PGE 2.

Cord insertion

00:10:41

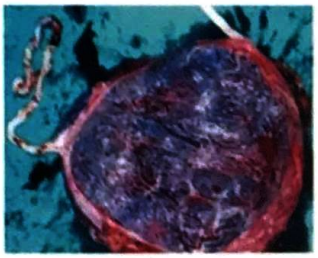
Normally, umbilical cord is attached to the center on fetal side of placenta.

Marginal insertion of cord :
When cord is attached to margins of placenta.
Also called Battledore placenta.
Cord is attached within 2cms of placental edge.


Normal placenta

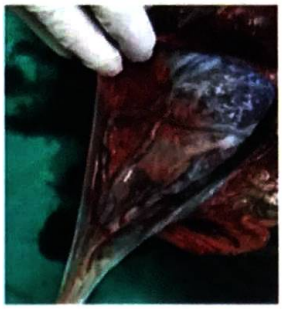
Complications :

- Cord avulsion may occur during cord traction in 3rd stage of labour.
- may lead to retained placenta and post partum hemorrhage.
- Vasa previa.


Marginal insertion

Velamentous insertion of cord :
Cord ends before attaching to the placenta, instead diversified blood vessels without Wharton's jelly are attached to the margins of placenta and fetal membranes.
more commonly seen is monochorionic twins and placenta previa.

Definition of velamentous attachment :
The normal cord can end several cm away from the placenta, at which point the umbilical vessels separate from each other and cross between amnion and chorion before connecting to placenta.


Velamentous insertion

Placenta bilobata :
Having velamentous blood vessel.

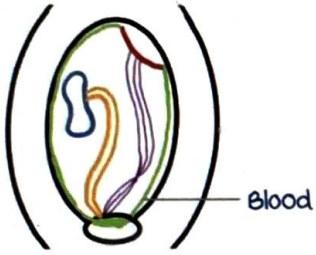

Placenta bilobata

Risks of velamentous insertion of cord :

1. Compression of blood vessel.
2. Kinking of blood vessel.

→ Reduced blood supply to fetus

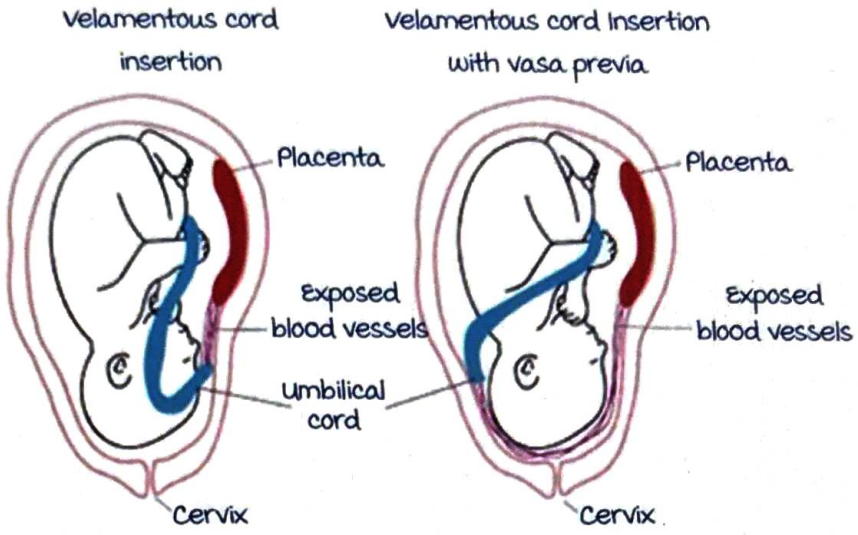
- Fetal distress.
- IUGR.
- Oligohydramnios.



3. Blood vessels cross directly over internal os and attach to membranes. → During labor, membranes rupture. → Blood vessels get injured → Fetal blood loss → Vasa previa.

most common cause of vasa previa : Velamentous cord insertion.
Prenatal diagnosis : Vasa previa can be detected on USG with Doppler.
Management : Manage oligohydramnios, IUGR, vasa previa.

Active space



Vasa previa

00:27:33

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Obstetric emergency : Fetal blood loss increases perinatal mortality, not maternal mortality.

It is the condition where fetal vessels are present over the membranes covering internal os.

Conventionally, vasa previa was considered to occur only due to velamentous insertion.

3 types of vasa previa :

Type 1 : Associated with velamentous insertion/marginal insertion of cord (most common).

Type 2 : Associated with succenturiate lobe/ bilobata.

Type 3 : Associated with placenta previa (rarest).

In all patients of placenta previa, rule out vasa previa.

Investigation of choice : TVS with Doppler.

Fetal monitoring should begin from 32 weeks (high risk pregnancy).

NST, BPS to be done weekly to rule out fetal distress due to pressing of head onto the blood vessels.

Antenatal steroids to be given before 34 weeks.

Management :

Plan cesarean section between 34 - 37 weeks.

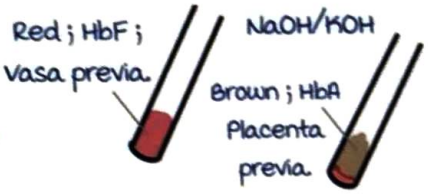
Most common abnormal CTG finding in vasa previa : Variable decelerations due to cord compression.

If vasa previa is undiagnosed in pregnancy :

Active space

Patient goes into labour → membranes rupture/ ARM done → Bleeding (fetal blood loss) → Fetal distress occurs which is out of proportion to blood loss.
Vasa previa should always be considered in differential diagnosis of antepartum hemorrhage.

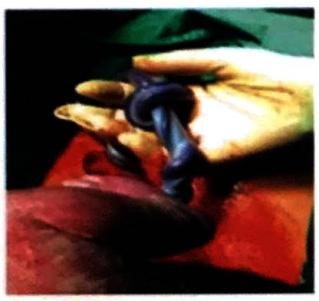
Singer's alkali denaturation test/ Apt test :
Theoretically, it is a test to differentiate vasa previa (fetal blood) from placenta previa (maternal blood).



Qualitative test.
Reagent used is 1% NaOH/ KOH.
Principle :
HbF (major Hb in fetal blood) is resistant to acid and alkali.
HbA (adult Hb) is sensitive to acids and alkali (hemolysis occurs).
On adding 1% NaOH/ KOH to the sample, if color changes to brown, hemolysis has occurred, HbA present : Placenta previa.
If no color change, no hemolysis, HbF present : Vasa previa.

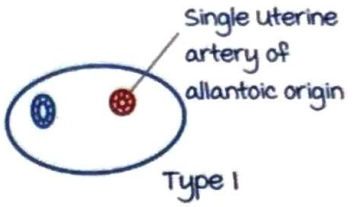
Kleihauer Betke test :
- Quantitative test.
- Used to calculate dose of anti - D in Rh -ve patients.

Vasa previa diagnosed at time of labour : Emergency caeserean section to be done.

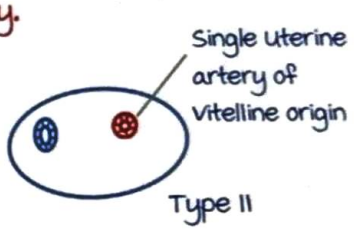
True Knot	False Knot
Actual knots in cord. Increase chances of fetal distress.	Tortuosities in umbilical vessels which forms bulges. Not associated with adverse outcomes.
	

Single umbilical artery(SUA)

00:41:30



m/c vascular anomaly of cord.
Incidence : 0.5%
4 types :
Type I : most common (98% cases).
Single artery of allantoic origin + Left umbilical vein present.
It is associated with genito urinary anomalies & CVS anomalies of fetus.
Most common anomalies associated with single umbilical artery : Genito urinary/ renal anomaly.



Type 2 : Seen in 1.5% cases.
Single artery of vitelline origin arising from superior mesenteric artery.
It is associated with caudal regression syndrome of fetus or sirenomelia.

Finding of SUA on doppler USG is a significant finding as it may be associated with congenital anomalies of fetus.
m/c renal > CVS anomalies.

SUA along with congenital anomalies are at an increased risk of aneuploidy. So karyotyping should always be done.

Most common aneuploidy : Trisomy.
most common trisomy associated is trisomy 18.
Other trisomies : Trisomy 21, Trisomy 13.

Doppler showing : SUA.
↓ next step
Anomaly scan
↙ ↘
Anomaly present → Karyotyping
Normal fetus → No Karyotyping required

Isolated SUA without gross congenital anomalies : No risk of aneuploidy. Karyotyping not required.

SUA is more common in :

- Twin pregnancies.
- Increased maternal age.
- European female.
- Maternal smoking.
- Diabetes.
- Seizure disorder.
- Hypertension.

SUA may lead to :

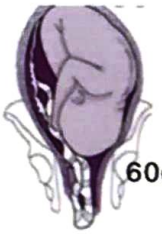
- Preterm labour.
- IUGR.

Any problem of cord :
SUA/Velamentous insertion/Vasa previa can lead to fetal stress, prematurely activates HPA axis of fetus and thus leads to preterm labor.

Cord prolapse

00:52:16

During labour, post rupture of membranes if cord comes out first, it is termed as cord prolapse.



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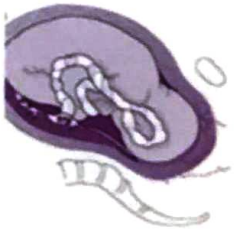
Overt cord prolapse

Nomenclature :
Overt cord prolapse :
Cord slips ahead of fetal presenting part & prolapses into cervix, vagina & beyond.
Problem : Cord is exposed to external environment which leads to vasoconstriction.



Occult cord prolapse

Occult cord prolapse :
Cord slips alongside but not ahead of presenting part.
Problem : Cord compression.

Active space

Vasoconstriction/ cord compression

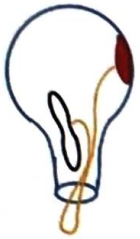
↓

Occlusion of blood vessels

↓

Fetal distress.

Based on relationship between cord, fetal presenting part & cervix :

Cord prolapse	Cord/ funic Presentation	Compund Presentation
Cord is present beyond the presenting part & beyond internal os. 	Cord is present ahead of the presenting part but is above internal os. 	Cord and presenting part of fetus are alongside each other & above internal os. 

Cord prolapse occurs :

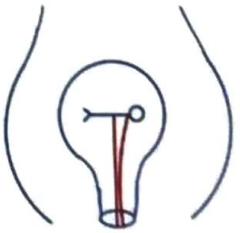
- If membranes rupture and head/ presenting part is not engaged.
- Disengagement of presenting part during obstetric procedures.

Risk factors :

1. Malpresentation.

Maximum risk : Transverse lie > footling > knee.

most commonly is seen with vertex presentation.



Transeverse lie

2. Preterm delivery.
3. Polyhydramnios.
4. Twin pregnancies.
5. Multiparity.

Management :

Obstetric emergency.

Active space

In utero resuscitation :

- Place mother in left lateral position. moves presenting part away from the cord thereby removing pressure on it.
- Call for help.
- O_2 inhalation to mother.

Case 1. Cord lies outside vagina.

Aim : To place cord inside vagina.

- Minimal handling of cord.
- Use wet gauze.
- Place cord inside vagina, not uterus.

Manual repositioning of cord (putting cord back in uterus) should not be done.

Case 2. Cord lies inside vagina.

Do not reposition cord into uterus.

In both cases :

Do per vaginal examination.

- Assess dilatation of cervix.
- Lift pressure away from cord by pushing presenting part up.

Maneuvers to lift presenting part away from cord.

- Retrograde filling of bladder with 500 ml NS.
- Trendelenburg position (head end lowered & foot end elevated).
- Knee chest position.

Stop uterine contraction by giving tocolytics and stop oxytocin.

Tocolytic drugs relax the uterus.

Fully dilated → Stop oxytocin & tocolytics → may go for vaginal delivery.

Mode of delivery :

1. Cord presentation with membranes intact :

Do not push the cord behind the presenting part as it leads to membrane rupture causing cord prolapse.

Management : Emergency C - section.

2. Cord prolapse with dead fetus :

Vaginal delivery unless contraindicated (transverse lie).

3. Cord prolapse with fetus alive :

- Cervix fully dilated : Vaginal delivery with help of forceps.
- Cervix not fully dilated : Emergency C-section.

AMNIOTIC FLUID AND ITS DISORDERS : PART 1

Basic characteristics of amniotic fluid 00:00:50

Amniotic Fluid /Liquor Amnii :

Specific gravity : 1.008 – 1.010

Osmolality : 260 mOsm/L

Hypotonic to maternal & fetal plasma.

Isotonic to fetal urine.

pH : 7–7.5 (7.2), while vaginal pH is 3.5 (acidic).

Colour : Colourless.

At Term : Turbid /cloudy, straw coloured.

Odour : Odourless.

Applied aspect :

In PROM :

Vaginal pH : Acidic, amniotic fluid pH : Alkaline.

Amniotic fluid vs Urine :

Urine : Typical odour, amniotic fluid : Odourless.

Foul smelling liquor : Chorioamnionitis.

Gestational age	Volume of amniotic fluid
10 weeks	30 mL
12 weeks	50 mL
16 weeks	200 mL
20 weeks	400 mL
34 weeks (32–34 weeks)	1000 mL (maximum)
At term/40 weeks	800 mL(volume decreases at term)
At ≥ 42 weeks	200 mL (volume drastically decreases at and beyond 42 weeks)

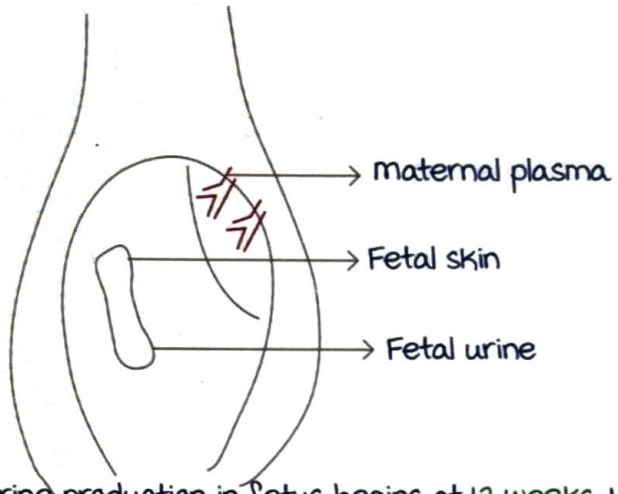
Applied aspect:

In post term pregnancy : Decreased amniotic fluid. (Oligohydramnios)

Source of amniotic fluid

00:06:47

Gestational age	Main contributor
First trimester	Ultrafiltrate of maternal plasma through the placenta
12 - 20weeks	Fetal skin
≥ 20 weeks	Fetal urine



- Urine production in fetus begins at 12 weeks. Hence renal defects are not the cause for oligohydramnios in first trimester.
- Main contributor overall : Fetal urine.
- Skin does not contribute to amniotic fluid after keratinization occurs.
- Keratinization of fetal skin occurs by 22-25 weeks of pregnancy.

Applied :

- If there is a defect in fetal skin like neural tube defects, omphalocele, gastroschisis.

  ↓

  Increased transudation from fetal skin.

  ↓

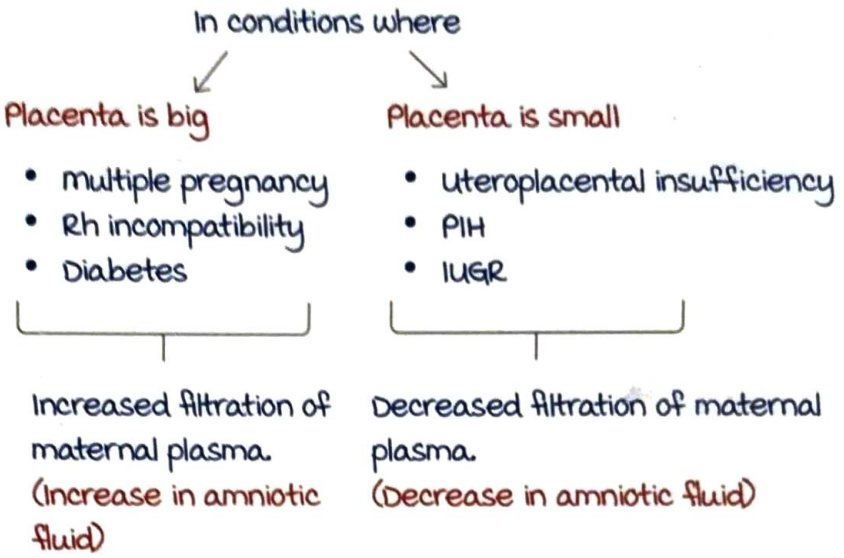
  Increased amniotic fluid.
- Increased urine production by fetus : Increase in amniotic fluid (maternal diabetes/multifetal pregnancy)

- Decreased urine production by fetus : Decrease in

Active space

amniotic fluid (in Kidney diseases like renal agenesis/ polycystic kidney disease of fetus/posterior urethral valve).

- Drugs that decrease amniotic fluid by decreasing urine production in fetus :
  1. ACE inhibitors
  2. Indomethacin



Amniotic fluid is kept in balance by fetal swallowing.

Applied :

In fetal swallowing defect : Increase in amniotic fluid.

Rate of production of amniotic fluid :

Fetal urine : 650 – 1000 mL/day.

Fetal lung : 350 mL/day.

Resorption of amniotic fluid :

Fetal swallowing : 750 mL/day.

Intramembranous flow : 400 mL/day.

Composition of amniotic fluid

00:19:40

98 – 99% water.

Applied : No nutritional value for fetus.

Hormones present in amniotic fluid :

- Prolactin.
- Renin.
- Insulin.

Colour of amniotic fluid at term :

Straw coloured, may be turbid.

Colour	seen in
Green colour (due to meconium : presence of biliverdin)	Fetal distress Transverse lie/ Breech. Listeria infection.
Golden colour (due to bilirubin)	Rh incompatibility.
Tobacco juice/Brown	Intrauterine demise of fetus.
Saffron colour, Yellowish green	Post term pregnancy.
Dark red coloured	Concealed hemorrhage (Abruptio placenta).

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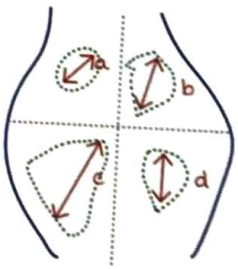
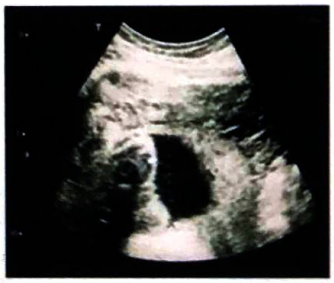
Investigation of choice to measure amniotic fluid : USG.

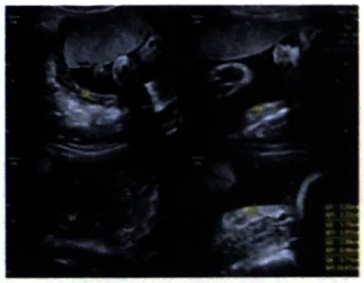
Amniotic Fluid Index (AFI)

00:24:46

Arbitarily, abdomen in divided into 4 quadrants to measure amniotic fluid by USG.
Umbilicus for upper & lower division.
Linea nigra for right & left division.







Active space

AFI : Sum of largest vertical diameter of amniotic fluid pocket in each quadrant.

AFI = 5 – 24cm : Normal.

AFI ≤ 5cm : Oligohydramnios.

AFI ≥ 25cm : Polyhydramnios.

This method is not the most sensitive method.

It cannot be used in twin pregnancy.

Best or the most sensitive parameter for measuring amniotic fluid : Vertical diameter of the largest single pocket/SVP.

(SVP : Single largest Vertical Pocket or SDP : single Deepest Pocket)

- Normally, SVP or SDP = 2–8 cm.
- < 2cm : Oligohydramnios.
- ≥ 8 cm : Polyhydramnios.
- This method is used in twin pregnancy.

moderate/severe oligohydramnios/polyhydramnios make the pregnancy high risk.

In all high risk pregnancies :

- Fetal monitoring should be done from 32 weeks.
- Induction of labour is done.

AMNIOTIC FLUID AND IT'S DISORDERS : PART 2

Polyhydramnios 00:00:08

Amniotic Fluid Index (AFI) ≥ 25 cm.

Single largest Vertical Pocket (SVP) ≥ 8 cm.

Absolute value of amniotic fluid is ≥ 2L.

Mechanism : Excessive urine production 00:00:30

1. Multifetal pregnancy.
2. Twin to twin transfusion syndrome
   (one fetus : Oligohydramnios, other fetus : Polyhydramnios)
3. Maternal diabetes.
   ↓
   Maternal hyperglycemia.
   ↓
   Fetus hyperglycemia.
   ↓
   Polyuria.
4. Fetal high cardiac output states.
   ↓
   Increased renal blood flow to kidney.
   ↓
   Increased GFR.
   ↓
   Polyuria.

High cardiac output

Fetal anemia :

- Parvovirus B19 infection.
- Alpha thalassemia.
- G6PD deficiency.
- Arteriovenous shunting seen in :
  1. Twin to twin transfusion syndrome.
  2. Sacrococcygeal teratoma.
  3. Chorangioma of placenta.

Fetal heart failure :

Hydrops fetalis due to

- Parvovirus B19 infection.
- TORCH infections.

Active space

TORCH infections can cause calcification of placenta leading to oligohydramnios.

Two conditions that cause both oligohydramnios and polyhydramnios are :

- Twin to twin transfusion syndrome
- TORCH infections (oligohydramnios > polyhydramnios)

5. Fetal kidney disorders :

Bartter syndrome :

Congenital defect in kidney.

↓

Salt wasting and polyuria.

↓

X linked recessive disorder and should be suspected when a pregnant female carrying a male fetus develops sudden severe polyhydramnios in 2nd trimester.

Congenital mesoblastic nephroma :

Hyperperfusion of kidney.

↓

Increased blood flow.

↓

Increased GFR.

↓

Polyuria.

Mechanism : Fetal swallowing defects 00:10:48

Fetal swallowing defects

Primary :

Due to GI anomalies :

- Duodenal atresia.
  Associated with Down syndrome.
  On USG : Double bubble sign.
- Oesophageal atresia.
- Cleft lip/ cleft palate.
- Neural tube defect.

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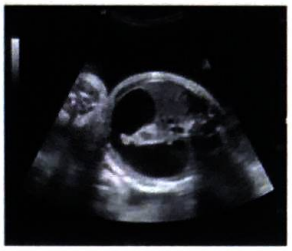
Secondary :

Due to pressure effect on esophagus :

- Thoracic masses.
- Congenital diaphragmatic hernia.
- Thyrotoxic goiter.

Q. A 25 year old primi presents to routine antenatal examination at 20 weeks. On P/A examination, her FH corresponds to 24 weeks. The obstetrician refers the patient for USG. On USG, following image was obtained, what is the next step in management?



A. Doppler of umbilical artery.
B. Karyotyping.
C. NST.
D. AFP levels in mother.

Explanation : Suspect polyhydramnios when height of fundus is ≥ 3 weeks ahead of period of gestation.
In USG, double bubble sign is seen.
In moderate to severe polyhydramnios/ oligohydramnios with gross congenital anomaly seen in USG, there is an increased risk of chromosomal anomalies, hence the next step should be Karyotyping.
Karyotyping should be done to rule out Down's syndrome.

Most common cause of mild polyhydramnios : Idiopathic.
Most common cause of moderate/ severe polyhydramnios : Congenital anomalies (GI anomaly).

Other mechanisms :
Increased transudation across fetal skin :
Due to skin defects seen in

- Neural tube defects.
- Abdominal wall defects : Omphalocoele & gastroschisis.

Unknown mechanisms :
Trisomy 18 : IUGR + polyhydramnios.

Problems due to polyhydramnios 00:20:47

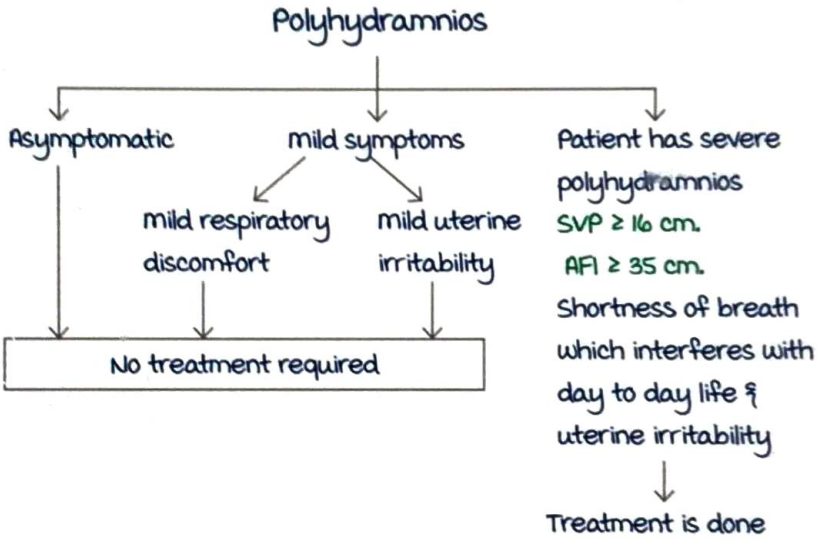
Respiratory difficulties : When the distended uterus pushes upwards on the diaphragm.
Unstable lie/ malpresentation.

Overdistension of uterus causes :

- Preterm labour.
- PPROM/ PROM.
- Abruptio placenta :
  Following rupture of membranes, loss of large volume of amniotic fluid can lead to sudden shrinkage of distended uterus causing early detachment of placenta. This leads to abruptio placenta.
- PPH due to the reduced tone of overdistended uterus.

Management of polyhydramnios

00:24:16



Treatment options :

Amnioreduction : Taking out amniotic fluid by doing therapeutic amniocentesis.

Indication : Severe respiratory discomfort.

Advantage : Respiratory discomfort is relieved immediately.

Disadvantages :

- Refilling of amniotic fluid.
- Complications :
  1. most common : Preterm labour/ PROM.
     Give short term tocolytic for 48 hours while doing the procedure.
  2. Intra amniotic infection.
  3. Abruptio placenta.
  4. Hypoproteinemia.

Procedure :

Do it under USG guidance.

With 18 G spinal needle.

In one sitting, 2 to 2.5 L fluid removed at rate of 1000 ml in 20 minutes.

Tocolytics : For severe uterine irritability leading to preterm labour (PTL).

< 32 weeks (Polyhydramnios + PTL)	32 – 34weeks	≥ 34 weeks
1. Indomethacin • Tocolytic. • Decreases urine output of fetus which reduces amniotic fluid. 2. Corticosteroids.	1. Nifedipine Indomethacin should not be used ≥ 32 weeks as it can cause constriction of ductus arteriosus. 2. Corticosteroids.	Corticosteroids only. No tocolytics.

Corticosteroids should always be given in preterm labour/ uterine irritability < 37 weeks.

Tocolytics should not be used ≥ 34 weeks.

Indomethacin should not be used ≥ 32 weeks.

Management of labor in patients of polyhydramnios

00:35:48

Normal Artificial Rupture of Membranes (ARM) or Amniotomy : Done with Kocher's forceps.

PGE_a released and process of labour gets accelerated.

Amniotomy is contraindicated in polyhydramnios.

Controlled ARM : Tiny holes are made in membrane using needle and syringe, so that amniotic fluid gradually reduces, and size of the uterus decreases slowly, thereby preventing abruption. Hence, done in polyhydramnios.

But sometimes, due to tense membranes, on making tiny

holes, membranes rupture and amniotic fluid rushes out.
Take a gauze and close the vulval outlet with your hand.
Now, slowly move your hand and release the fluid.

Timing of delivery :

Mild to moderate polyhydramnios : Induction of labour at 39 to 40 weeks + 6 days.

Severe polyhydramnios : Induction of labour done at 37 weeks.

Oligohydramnios 00:41:57

AFI ≤ 5cm.

Single Deepest Pocket (SDP) ≤ 2cm.

Absolute value of liquor ≤ 200 ml.

Most common cause of mild oligohydramnios : Idiopathic.

Most common cause of severe oligohydramnios : Congenital anomalies of fetus (renal anomalies : Oliguria/anuria).

Causes of oligohydramnios 00:42:54

Congenital defect of renal system :

- Renal agenesis.
- Cystic disorders of kidney.
- Obstructive disorders like posterior urethral valve.

Fetal urine production occurs at 12 weeks.

Hence, kidney disorders cannot lead to oligohydramnios in 1st trimester.

Hence, can cause oligohydramnios only in 2nd and 3rd trimesters.

Most common time for oligohydramnios to develop due to renal defect is 2nd trimester (2nd > 3rd).

Rupture of membranes :

Leads to oligohydramnios in 2nd trimester & 3rd trimester (3rd > 2nd).

Decreased urine production due to uterplacental insufficieny:

In 3rd trimester.

Decreased blood flow to fetus.

↓

60c6b3eeaa8ded0e4e7e5ea7
Decreased renal blood flow.

↓

Decreased GFR.

↓

Oliguria/ oligohydramnios.

Causes of uteroplacental insufficiency :

- PIH in mother :

  BP increases.

  ↓

  Volume of blood going to placenta decreases.

  ↓

  Decreased blood flow to fetus causing reduced renal blood flow and eventually oliguria.

- IUGR :

  Fetus gets less blood.

  ↓

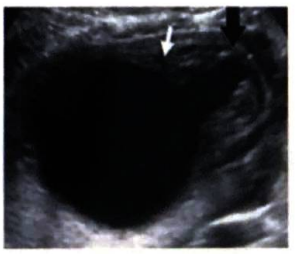
  Brain sparing effect (blood from all organs goes to the brain). ↓

  Decreased renal blood flow.

  ↓

  Oliguria due to reduced GFR/ oligohydramnios.

- Post term pregnancy : ≥ 42 weeks.
- TORCH infections : Calcification of placenta causing oligohydramnios (oligohydramnios > polyhydramnios).
- Drugs : ACE inhibitors & indomethacin.
- Placental abruption.



Keyhole sign : Distended bladder seen in posterior urethral valve syndrome.
mother will have oligohydramnios.

Active space

Consequences of oligohydramnios 00:51:00

Mild oligohydramnios : No consequences.

Moderate to severe :

- T1
  - 1. Pulmonary hypoplasia (mc).
  - 2. Limb amputation.
- T2/ T3
  - Organogenesis is complete.
  - Less space can cause,
    - Limb deformities.
      - e.g. Clubfoot/ CTEV.
    - Cord compression.
      - ↓
      - Fetal distress.
      - ↓
      - Pass meconium,
      - leading to Meconium Aspiration Syndrome.

Clinical applications :

Most common CTG finding in oligohydramnios : Variable deceleration due to cord compression.

Potters' syndrome :

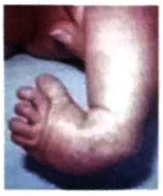
Severe oligohydramnios due to kidney defect (polycystic kidney/ renal agenesis)

↓

Lung hypoplasia.

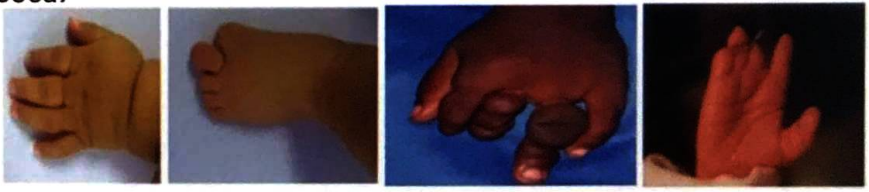
Typical facial features : Flat facies.

CTEV : mother must have had oligohydramnios.



club foot

Amniotic band syndrome :



Distal digital amputations

Also Known as : Constriction band syndrome.
Streeter syndrome.

Pathophysiology :

Membranes rupture.
↓
Severe oligohydramnios.
↓
Membrane wraps tightly around the fetus causing constriction bands or rings.
↓
Decreased vascular supply to part distal to the ring.
↓
Distal limb amputation (digital amputation : most common)
craniofacial abnormalities.

Management of oligohydramnios 00:59:36

Moderate to severe oligohydramnios is high risk pregnancy due to increased chances of fetal distress.

Hence fetal monitoring is to be done from 32 weeks onwards by :

- NST weekly.
- Biophysical score weekly.
- Doppler of umbilical vessels to monitor uteroplacental insufficiency.

Termination of pregnancy :
Mild/ no complications : 39 weeks.
Moderate/ severe/ complications present : 36 – 37 weeks + 6 days.

To manage oligohydramnios :

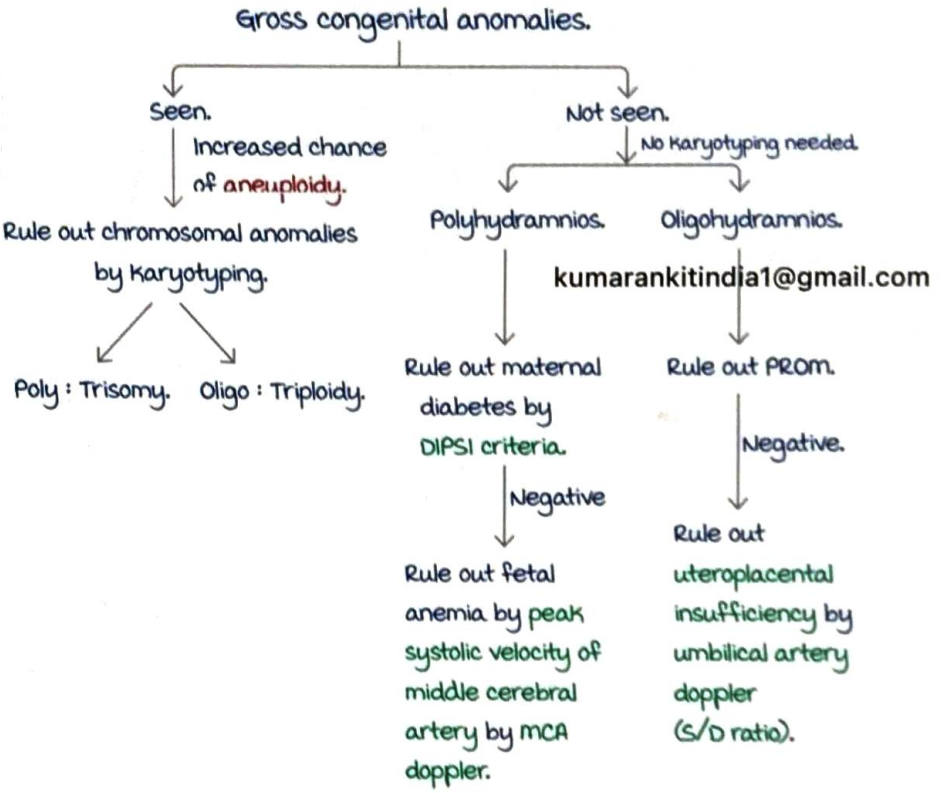
- Improve maternal oral hydration.
- Amnioinfusion.
  Indication : Recurrent variable decelerations.

Active space

Approach to a case of polyhydramnios/ oligohydramnios

01:02:58

mild poly/ oligohydramnios : No evaluation required.
moderate/ severe poly/ oligohydramnios :
1st step : Evaluate for congenital anomalies by anomaly scan/ level 2 scan.



ANTENATAL PATIENT HISTORY

Antenatal history

00:01:15

The 1st day of last menstrual period (LMP) must be enquired about to all the patients visiting an antenatal clinic.
It helps in calculating :

- Gestational age : It is same as the period of pregnancy or period of amenorrhea.
  In a woman with regular 28 day cycle, ovulation occurs on the 14th day.
  Fertilization is presumed to occur on the 14th day as the life span of secondary oocyte is 12 – 24 hours.

  If a patient presents with a history of missed periods and urine pregnancy test positive, she is 4 weeks pregnant and fertilization has occurred 2 weeks before missed period.
  There is gap of 2 weeks between the time of fertilization and gestational age.
  Gestational age = fetal age + 2 weeks. Fetal age is calculated from the day of fertilization.
- Expected date of delivery.

A gestational age of 36 + 6 weeks means 36 weeks and 6 days (first number = weeks, second number = days).
Fetal urine production begins by 12 weeks. The time is calculated from the first day of LMP.

Duration of pregnancy

00:10:18

The total duration of pregnancy is
280 days / 40 weeks / 9 months + 7 days / 10 lunar months.
Preterm labor/birth :
If delivery occurs at < 37 weeks of gestational age.
Post term delivery/birth :
If delivery occurs at >/= 42 weeks / 294 days.
Term delivery :
If the delivery occurs between 37 weeks to 41 weeks+6 days.
Term delivery can be classified into :

- Early term : Delivery occurring between 37 weeks to 38 weeks + 6 days.
- Full term : Delivery occurring between 39 weeks to 40 weeks + 6 days.
- Late term : Delivery occurring between 41 weeks to 41 weeks + 6 days.

Abortion is defined as pregnancy loss at < 20 weeks of gestation.
Intrauterine fetal demise/death is defined as pregnancy loss >/= 20 weeks of gestation.

Calculation of expected date of delivery (EDD) :
Naegle's rule (clinically) : 1st day of LMP + 7 days and 9 months (either 9 months forward or 3 months backwards).
Naegle's rule assumes that :

- The previous menstrual cycles were regular (28 days).
- The patient was not on any oral contraceptive pills (OCPs).
- The patient is not lactating.

When Naegle's rule is used to calculate EDD and the 1st day of LMP is beyond 22nd day of any month, 7 days must be added first before adding 9 months.

Case I : A patient gives h/o LMP on 20th February 2022. Her EDD is 27th November 2022.
Case II : A lady gives history of having her period on June 26th, 2021. She had bleeding till the 4th of July.

She missed her periods in August and a UPT was done which came as positive.
EDD : 3rd April 2022 (add 7 days first and then 9 months).

Only 4% women deliver on the exact EDD.
50% women deliver one week before or after the EDD.

Corrected EDD 00:22:24

For applying Naegle's formula, the menstrual cycle is assumed to be 28 days and regular.
If a woman presents with a cycle length of 26 days (less than 28 days) :

- A rough EDD is calculated using Naegle's formula.
- If the cycle is shorter, the difference between the cycle length and 28 is subtracted from the rough EDD i.e., Rough EDD – (28 – 26).
  Corrected EDD will thus be Rough EDD – 2.

If a woman presents with a cycle length of 32 days (longer than 28 days), the corrected EDD will be Rough EDD + the difference i.e., (32 – 28).

Corrected EDD = Rough EDD + Number of days the cycle length is longer than 28 days.
In lady with LMP on 20th February and a cycle length of 35 days, EDD will be on 4th December 2022.

Naegle's formula is not a reliable method for calculating EDD in :

- A lady with history of OCP intake.
- Irregular cycles.
- LMP is unknown (Example : Lactating female).
- If the height of the uterus on physical examination is not corresponding to LMP.

USG is the best method to calculate the gestational age in such cases.
The best parameter to calculate gestational age is crown rump length (CRL). It is measured in the first trimester.

The best time to perform the USG to figure out the gestational age is first trimester.

Question : A 30 year old woman on OCP for the past 6 months presents with amenorrhea for the past 6 weeks. What would be the best method of assessing gestational age of fetus in such a female ?

A. CRL by USG.
B. Adding 280 to LMP.
C. Fundus examination.
D. Adding 256 to the LMP.

Answer : A. CRL by USG.

Question : A client tells the junior resident on duty that her LMP was on July 25, 2021. What is the estimated date of delivery ?

A. 1st April 2022.
B. 2nd April 2022.
C. 1st may 2022.
D. 2nd may 2022.

Answer : C. 1st may 2022.

Other important history to be taken from a pregnant woman :

- If the conception was natural or by in vitro fertilization (IVF).
- How the pregnancy was confirmed (UPT/USG/βhCG levels). 60c6b3eeaa8ded0e4e7e5ea7

If the pregnancy has been attained by IVF, it could be :

- Fresh IVF cycle.
- IVF with frozen embryo.

In IVF, the secondary oocyte is taken from the female partner (day of retrieval) and the sperms from the male partner.
The oocyte and the sperm are kept on a petri dish for fertilization to occur.
The embryo is then transferred back into the female's uterus on day 3 or 5 after fertilization.

Active space

In a fresh cycle, the day of oocyte retrieval = day of fertilization.
1st day of LMP = Day of oocyte retrieval – 14 days.
EDD = 1st day of LMP + 280 days or 9 months and 7 days.60c6b3eeaa8ded0e4e7e5ea7
EDD = Day of retrieval + 266 days.

In a pregnant woman who conceived after a fresh cycle of IVF and the day of retrieval is 20th march, the first day of LMP is calculated by subtracting 14 days from the day of retrieval. The EDD is calculated using Naegle's formula with the calculated last day of LMP.

IVF with frozen embryos 00:42:55

In IVF with frozen embryos, after retrieval of the secondary oocyte it is immediately frozen. The oocyte is taken out on a later date and fertilized with the sperm on a petri dish.
The embryo is then placed inside the uterus on day 3 or 5 after fertilization.
For IVF with frozen embryo, the day of egg retrieval and day of fertilization are not same.
The EDD is calculated based on the day of transfer (Day 3 or 5) of the embryo in such cases.

Day 3 transfer : The embryo was transferred on day 17 of the menstrual cycle.
The first day of LMP is calculated by subtracting 16 from the LMP.
The EDD can be then calculated using Naegle's formula or by adding 263 days to the day of transfer.

If the transfer is done 5 days after fertilization, the embryo was transferred on 19th day of the menstrual cycle. The first day of LMP can be calculated by subtracting 18 from the day of transfer. EDD can then be calculated using Naegle's formula or by adding 261 days to the day of transfer.

Active space

Obstetric score

00:50:24

Gravida : Number of times a woman has conceived irrespective of the outcome, including the present pregnancy.

Twins or triplet pregnancies are counted as 1 (from a single conception).
All pregnancies irrespective of the outcome is considered.
Outcomes such as :

- Abortion.
- Intrauterine death.
- Still birth.
- Ectopic pregnancy.
- Molar pregnancy.
- Live birth.

Parity : Number of previous pregnancies which have gone beyond the period of viability.

Period of viability : Period beyond which the fetus is capable of independent existence when born.

In developed countries like USA, the period of viability is 20 weeks. In India, the period of viability is 28 weeks.
The present pregnancy is not included in parity.
Twins and triplets are counted as one as they are result of a single conception.

Earlier, the obstetric formula used the GPAL system where :

- G : Gravida.
- P : Parity (>/= 28 weeks).
- A : Abortion. Included all pregnancy loss with gestational age < 20 weeks. Ectopic and molar pregnancies are counted as abortions.
- L : Living children at present. Twins and triplets are counted as 2 and 3 respectively.

In GPAL system a pregnancy between 20 to 28 weeks could not be included in any of the components and hence is no longer used.

GTPAL system

00:58:35

GPAL system is now replaced with GTPAL system where :

- G : Gravida.
- T : Number of previous term deliveries (If delivery occurs between 37 weeks – 41 weeks + 6 days).
- P : Number of previous preterm deliveries (20 weeks to 36 weeks + 6 days).
- A : Number of abortions (pregnancy loss occurring < 20 weeks including ectopic and molar pregnancies).
- L : No of living children at present.

Question : A pregnant woman came for her first antenatal visit at 32 weeks of pregnancy. She has previous history of stillbirth at 39 weeks 2 years back, twin daughters 3 years ago at 36 weeks of gestation and a history of ectopic birth 5 years back. Her obstetric score?

A. G_4P_1+2+1+2
B. G_4P_1+1+1+2
C. G_4P_3+2+0+3
D. G_4P_1+1+1+3

Answer : B. G_4P_1+1+1+2 according to GTPAL system and G_4P_a+1+2 according to GPAL system.
If only 2 numbers (a and b) are given, it is G_aP_b.
As per the above mentioned case it will be G_4P_a.
If 3 numbers are given, it is G_aP_b and A (abortion).
G_4P_a+1 according to the case scenario.

To summarize :

- 5 numbers given : GTPAL system.
- 4 numbers given : GPAL system.
- 3 numbers given : GP and Abortion.
- 2 numbers given : G and P.

Confirmation of pregnancy

01:09:58

The pregnancy can be confirmed by detecting hCG in blood or urine or by performing an ultrasound scan.

hCG secretion begins in the preimplantation zygote but it can only be detected earliest by 8 days after fertilization by serum pregnancy tests.
Urine pregnancy tests (UPT) can detect hCG as early as the day of missed period. If the UPT is negative on the day of missed period, it must be repeated after a week.

Urine pregnancy test	Serum pregnancy test
• Minimum hCG levels for a positive test = 20 – 50 mIU/ml. • Qualitative test. • Less sensitive.	• Minimum hCG levels for a positive test : Qualitative = 5 – 10 mIU/ml. Quantitative = 1 – 2 mIU/ml. • Qualitative or quantitative test.

Serum pregnancy test is more sensitive compared to urine pregnancy tests.
Quantitative serum pregnancy tests are mostly used. They are either fluorescent or radioimmunoassays.
A negative serum pregnancy test means a value of hCG < 5 mIU/ml.

Causes for false negative test :

- Test performed too early.
- Hook effect : If the levels of hCG are very high (like in gestational trophoblastic neoplasia), there could be a false negative result.

Causes for false positive test :

- Observer's misinterpretation.
- hCG producing tumor.
- Exogenous hCG was given to the patient.
- Chemical pregnancy : Pregnancy has terminated immediately after implantation.

The antenatal history should also include the following :

- Diet history.
- History of drug exposure.
- History of radiation exposure.
- History of substance abuse.

Active space

ANTENATAL PATIENT - SIGNS, SYMPTOMS AND MINOR AILMENTS

Trimesters of pregnancy :

	New	Old
1ST Trimester :	1 to 13 wks + 6 days.	1 to 12 wks.
2nd Trimester :	14 to 27 wks + 6 days.	13 to 28 wks.
3rd Trimester :	≥ 28 wks.	29 to 40 wks.

Symptoms of first trimester

00:03:33

1. Amenorrhea : Due to progesterone
2. Vomiting : mainly due to HCG. Estrogen and progesterone are also responsible
3. Fatigue.
4. Breast tenderness.
5. Urinary frequency : Enlarged Uterus being a pelvic organ irritates the bladder.

Amenorrhea :

- Cardinal presenting symptom of pregnancy.
- Most common cause of 2° Amenorrhea.
- Cause : Persistently high levels of progesterone (P).
  Its source during
  Early weeks : Corpus luteum.
  Later weeks : Placenta.
- Cause of lactational amenorrhea : Increased levels of prolactin.

Vomiting :

- Most commonly pregnant females experience nausea + vomiting, typically starting from 5-6 weeks of pregnancy maximally at 10 weeks and subsides by 16 weeks. Corresponding to hCG levels during pregnancy.

- most emetogenic hormone : Human chronic gonadotropin (HCG).
  Estrogen & progesterone also contribute to emesis.
- In 15–20 % cases : Vomiting persists till 3rd trimester.
- In 5 % cases : Vomiting persists till delivery.
- Referred as morning sickness, but vomiting can occur throughout the day.
- Rule out the cause in case vomiting beginning after 10 weeks of pregnancy or present in later half of pregnancy or persisting beyond few days post-partum.
- Vital signs, lab investigations and physical examination is normal in cases of morning sickness.

Management :

- Dietary modifications :
  Consume small frequent meals every 2 hours.
  Do not overfull stomach.
  Consume snacks before rising from bed.
  Avoid sleeping/lying down immediately after eating.
  Liquids to be avoided 30 min before and after meals
  Avoid fatty and spicy foods.

Medical Treatment :

1st line : Pyridoxine.

- Starting dose : 10 mg.
- Range : 10 to 25 mg.
- Repeat every 6 to 8 hours.
- Maximum dose : 200 mg/day.

2nd line : Doxylamine (10mg) + pyridoxine (10mg) combination.
2 tablets at night.

3rd line : Discontinue both Doxylamine and pyridoxine.
Start on Diphenhydramine or Dimenhydrinate.

Hyperemesis Gravidarum 00:14:00

Excessive vomiting of pregnancy.

Diagnostic criteria :

Severe nausea & vomiting.

+

Weight loss ≥ 5% of pre pregnant weight or ≥ 3Kg

+

Ketonuria not due to any other cause.

International criteria : All 4 to be fulfilled.

1. Severe nausea & vomiting.
2. Should begin early in pregnancy.
3. Unable to eat or drink due to excessive vomiting.
4. Daily activity is affected.

Risk factors :

High levels of hCG as in twin, multifetal pregnancy, gestational trophoblastic diseases.

Female fetus.

H. Pylori infection.

Family history of hyperemesis gravidarum.

Evaluation :

Weight : Assess for weight loss.

Vitals : Pulse, blood pressure. (Orthostatic hypotension)

Lab investigations :

- Serum electrolytes :
  - Hypokalemia.
  - Decreased Cl^- levels.
  - metabolic alkalosis.
  - Ketonuria.
- CBC : Raised hematocrit (due to hemoconcentration).
- Sr. Creatinine.
- Urine ketones & specific gravity.

USG : To assess Fetal viability.

Multifetal pregnancy.

GTD (molar pregnancy).

Assess for complications like wernicke's encephalopathy and mallory weiss syndrome.

Active space

Management :

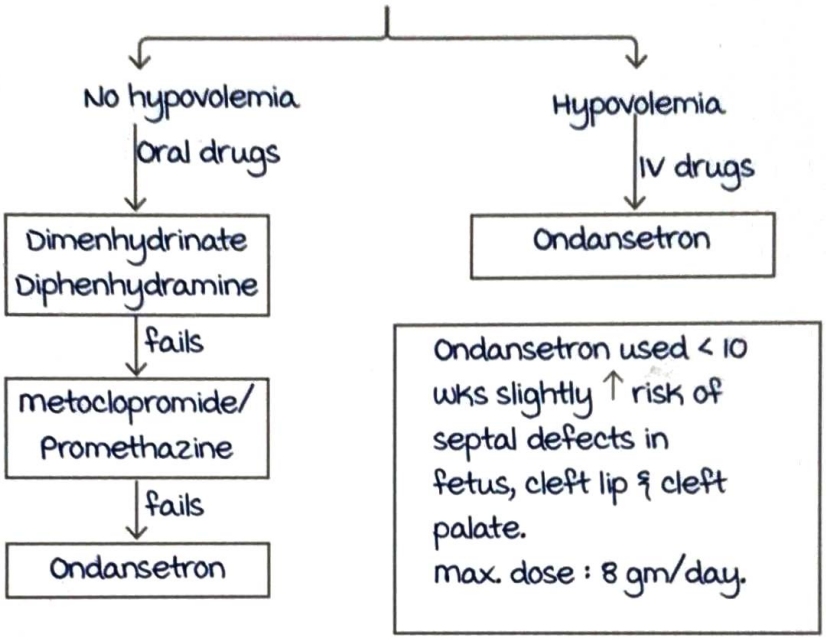
IV fluids for dehydration.

Thiamine : multivitamin injections.

H_a antagonists : Ranitidine, PPIs : Omeprazole etc., to prevent acid reflux.

Correct electrolyte imbalance.

Antiemetics :



Before 10 weeks of pregnancy, in case of hypovolemia combination of two antiemetics should be tried intravenously before starting with ondansetron intravenously.
Similarly, in case of no hypovolemia, combination of 2 antiemetics should be tried orally before starting with Ondansetron.

Examination

00:24:14

Breast examination : 60c6b3eeaa8ded0e4e7e5ea7

- Breast becomes fuller.
- may become tender.
- Areola darkness.
- Veins under breast skin becomes visible.

Active space

Per abdomen examination :

- Linea nigra is a darkly pigmented line running from xiphisternum up to the pubic symphysis.
- Striae gravidarum are light pink colored stretch marks, present in infraumbilical areas representing current pregnancy.
- Striae albicans : Silvery scaly stretch marks of previous pregnancy.
- Uterus being a pelvic organ before 12 weeks of pregnancy, cannot be palpated.
- At 12 wks of pregnancy, fundus can be palpated at the level of pubic symphysis.
- Fetal cardiac activity can be first heard by a hand held doppler by 10 weeks of pregnancy (10 – 12 wks).

Per vaginal examination :

- Pregnant uterus is more globular than non-pregnant uterus and is enlarged.
- Size of uterus increases by 1 cm/week after 4 weeks of gestation.

Size of uterus	Comparable with
6 weeks	Hen's egg
8 weeks	Cricket ball
12 weeks	Fetal head

Signs Of Early Pregnancy 00:28:12

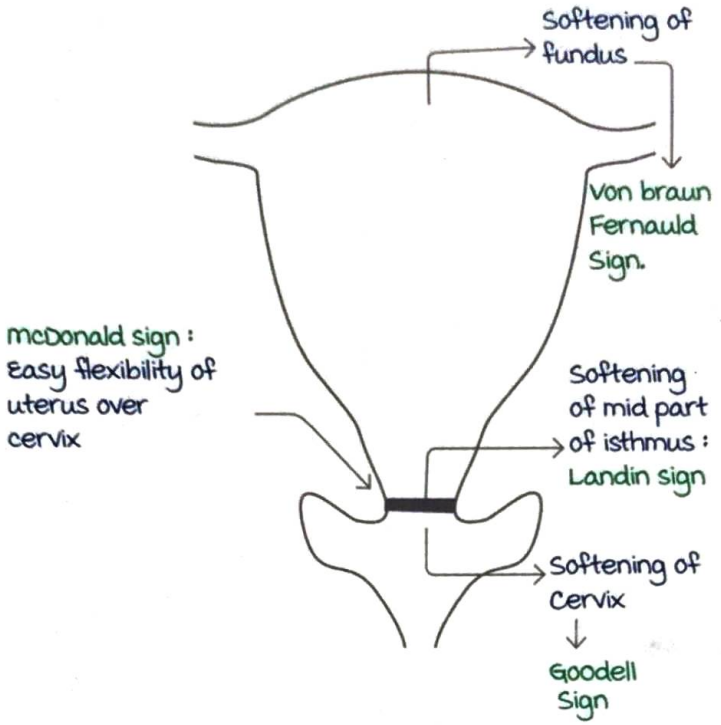
Goodell Sign : Softening of cervix. Earliest sign, visible by 6 weeks.

Chadwick sign/Jacquemier sign : Bluish discoloration of cervix and vagina. Seen by 8 weeks.

Osiander sign : Pulsations felt in lateral fornix of vagina of uterine artery. Seen by 8 weeks.

Palmer sign : Irregular contractions of uterus. Seen by 8 weeks.

Piskacek's sign : Asymmetrical enlargement of uterus due to eccentric implantation.



Hegar's sign : On bimanual palpation fingers of both hands approximate as lower part of uterus is soft and empty.
Seen at 6-10 weeks of pregnancy.
Von Braun Fernauld sign : Softening of fundus.
Landin sign : Softening of mid part of isthmus.
McDonald sign : Easy flexibility of uterus over cervix.

Second trimester symptoms :

- Progressive enlargement of abdomen.
- Quickening : Perception of fetal movements by pregnant females for the 1st time.
- In primigravida at 18-20 weeks, while 2 weeks earlier in multigravida.
- Braxton Hicks contraction are irregular, infrequent spasmodic and painless contractions without any effect on dilatation of cervix. These are felt after 16 weeks. Also felt in hematometra, submucous fibroid. Absent in abdominal pregnancy.

Active space

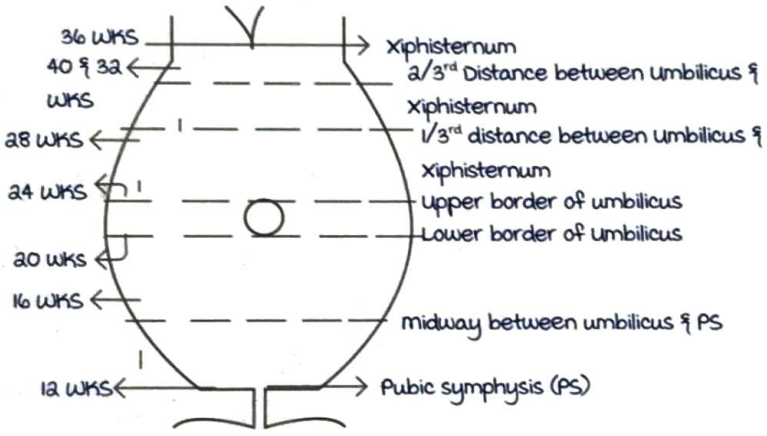
Thrid trimester symptoms :

- Frequency of micturition increases as head goes into pelvis and irritates the bladder.
- Respiratory discomfort as uterus pushes diaphragm upwards.
- Lightening : Relief from respiratory discomfort as head of fetus goes down pelvis. Also called as welcome sign.

Clinical Assessmentof Gestational Age

00:37:12

1. Per abdominal examination :



Fundus palpated at	Weeks of Gestation
Level of pubic symphysis	12 weeks
Midway between umbilicus and pubic symphysis	16 weeks
Lower border of umbilicus	20 weeks
Upper border of umbilicus	24 weeks
1/3rd distance between umbilicus and xiphisternum	28 weeks
2/3rd distance between umbilicus and Xiphisternum	32 & 40 weeks
Level of xiphisternum	36 weeks

2. Measurement of symphysiofundal height (SFH) :
   - After 20 weeks, SFH (in cms) corresponds with weeks of gestation.
   - Always empty bladder before examination.
   - Conditions where height of uterus >> Period of

Active space

gestation :
Wrong dates.
Full Bladder.
Twin pregnancy.
Polyhydramnios.
GTD.
Pregnancy associated with fibroid.

3. Auscultation of fetal heart sounds can be heard by Stethoscope at 18-20 weeks of pregnancy.

Absolute Signs Of Pregnancy 00:43:30

1. FHS heard by stethoscope.
2. Fetal movements can be felt.
3. Fetal parts can be felt.
4. On USG : Evidence of pregnancy.
5. On X-Ray : Fetal skeleton is visible (> 16 weeks).
   X-ray is contraindicated in pregnant females.

Pseudocycesis/false pregnancy :
The female assumes she is pregnant but is not pregnant.
None of the absolute signs of pregnancy are positive.

Minor Ailments Of Pregnancy And Their Treatment 00:45:49

Complaints	Symptoms and causes	Management
Supine hypotension syndrome	Dizziness on lying supine. Gravid uterus presses on IVC→ ↓VR→ ↓CO →↓BP & ↓CO can lead to fetal distress.	Lie in left lateral position.
Bleeding gums		Conservative. Maintain oral hygiene.
Pregnancy tumor/ Epulis/ Pyogenic Granuloma	Reddish purple exophytic growth. 	Conservative. No excision required.

Varicose veins	1. Lower limbs. 2. Vulval. 3. Hemorrhoids. Reasons : • Increased blood volume. • Increased femoral venous pressure due to ↓VR. • Reduced vascular resistance. Progesterone acts as a smooth muscle relaxant.	1. Varicose veins : • Conservative. • Avoid standing for long hours. • Use compression stockings. • Elevate lower limbs while resting. • Lie in left lateral position. • Medical/surgical management should not be given during pregnancy. To be deferred for 3-6 months after delivery. 2. Hemorrhoids : • Increase fibre intake. • Increase fluid intake. • Local anesthetic gels, anti inflammatory for pain. 3. Vulval varicosities : • Vulval compressions can be used.
Leg Cramps	• Due to accumulation of lactic acid. • Reduced Mg^{2+} levels. • Most commonly at night in 2nd half of pregnancy.	Prevention : 1. Massage. 2. Hot shower before going to bed. 3. Improve hydration, at time of leg cramps, extend knees and dorsiflex the toes. 
Carpal tunnel syndrome	Numbness and tingling in thumb, index and middle finger due to fluid retention in pregnancy causing compression of median nerve.	• Symptomatic treatment. • Apply wrist splint with wrist in either resting/neutral position or slightly extended position. • Avoid corticosteroid injection. • Avoid surgery.
Bell's palsy	Due to perineural edema, hypercoagulability or immunosuppression.	• Short term glucocorticoid treatment (to be avoided during organogenesis as causes cleft lip, cleft palate).
Backache	Seen in 50 % females • Due to laxity of joints (estrogen, relaxin). • Weight gain. • Faulty posture. • Hyperlordosis.	• Correction of posture. • Elevate lower limbs while resting. • Use of hard bed. • Back massage. • Analgesics, if needed.

Active space

ANTENATAL PATIENT : INVESTIGATIONS AND ADVISE

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Investigations in 1st antenatal visit

00:01:08

1. ABO and Rh typing :
   To arrange for blood in case of any antenatal bleeding.
   If a female is Rh negative, her husbands Rh typing should also be done.
   Rh negative female with husband Rh Positive (50% chances of fetus being Rh positive) : High risk category.

2. Hb, hematocrit and blood picture, MCV or CBC
   As per GOI : CBC should be done 4 times during pregnancy.
   - Hb <11 gm % : Anemia in pregnancy.
   - Hb <7 gm % : Severe anemia in pregnancy (High risk category).

   Blood picture :
   - Microcytic hypochromic red cells : Iron deficiency anemia.
   - Macrocytes : Vitamin B12 and folic acid deficiency anemia.
   - Hypersegmented neutrophils : Vitamin B12 deficiency.

   MCV : Helps to differentiates between iron deficiency anemia (MCV < 80 fL) and B12 deficiency anemia (MCV > 115 fL).

3. Test for Syphilis :
   - Rapid plasma reagent (RPR)
   - VDRL test.

4. Testing for HBsAg : Even if females is vaccinated.

5. HIV testing : Universal screening of all pregnant females

Active space

should be done.

Females may opt out from the screening test.

Screening test : ELISA test.

If ELISA Positive : Western blot.

6. Rubella susceptibility screening :

Female is tested for presence of Ig G antibody to Rubella.

- Positive : She is immune to Rubella infection.
- Negative : She is susceptible to Rubella.

But Rubella vaccine should never be given to a female.

She should receive Rubella vaccination in post natal period to prevent future pregnancy.

Pregnancy is contraindicated for 1 month post Rubella vaccination.

But if the patient concives within a month after Rubella vaccination, it is not an indication for MTP.

7. Screening for gestational diabetes :

As per Diabetes in Pregnancy study group India (DIPSI) guidelines.

Should be done twice during pregnancy.

- Done in 1st antenatal visit (To diagnose pregestational diabetes).
- Repeat : 24-28 weeks (To diagnose gestational diabetes as in this period, insulin resistance is maximum)

8. Urine routine and microscopy : Every trimester

Urine protein : By Dipstick (during every AN visits, to detect pre-eclampsia).

Urine culture should ideally be done to detect asymptomatic bacteriuria because it can lead to preterm labour and if untreated can lead to pyelonephritis (not all centers have this facility).

Routine screening for TORCH testing is not advised.

Not indicated even with H/O RPL.

Active space

Wherever resources are available :

- Aneuploidy screening : 11 weeks – 13 weeks +6 days.
- National guidelines recommend testing for hypothyroidism in females who are at high risk.
  Screening for subclinical hypothyroidism is not currently recommended.

Hypothyroidism in pregnancy

00:09:43

kumarankitindia1@gmail.com

Prevalence of hypothyroidism in pregnancy in the Indian population is 4.8 to 12 %.

Risk of hypothyroidism in pregnancy includes :

Maternal :

- Recurrent pregnancy loss.
- Miscarriage
- Stillbirth
- Incidence of pre-eclampsia
- Incidence of abruptio placentae.

Fetal :

- IUGR.
- Preterm delivery.
- Delayed cognitive development.
- Mental retardation

Screening of hypothyroidism :

Is recommended in pregnant woman (PW) with following risk factors :

- Residing in area of known moderate to severe iodine deficiency.
- Obesity.
- History of prior thyroid dysfunction, goiter.
- History of mental retardation in family or previous birth.
- History of recurrent marriage/stillbirth/preterm delivery / IUD/ abruptio placentae.
- History of infertility.

Diagnostic criteria in pregnancy :

TSH levels during pregnancy are lower as compared to TSH

levels in non pregnant state. Pregnancy specific and trimester specific reference levels for TSH are as follows :

- First trimester is 0.1 to 2.5 ml U/L
- Second trimester is 0.2-3 ml U/L
- Third trimester is point 0.3-3 ml U/L

In pregnancy subclinical hypothyroidism is defined as serum TSH between 2.5 and 10 ml IU/L with normal FT_4 concentration.

(OH) Over hypothyroidism is defined as serum TSH > 2.5 - 3 ml IU/L with low FT_4 levels .

TSH > 10 ml IU/L irrespective of FT_4 is OH.

management of hypothyroidism in pregnancy :

Levothyroxine sodium is the drug of choice to be taken empty stomach in the morning.

TSH level is <2.5 in 1st trimester and <3 in 2nd and 3rd trimester.	No further management is required and pregnant woman will continue routine pregnancy care.
If TSH is between 2.5/3 to 10	To be started on 25 µg of levothyroxine per day.
TSH is > 10	To be started on 50 µg of levothyroxine per day.

Once treatment started, TSH levels to be repeated after 6 weeks of starting date of treatment and modify the dose accordingly.

USG in pregnancy 00:14:35

1. Dating/viability scan : 6-8 weeks (POG, viability of the fetus)
2. Nuchal translucency scan : 11-13 weeks +6 days.
3. Anomaly scan/target scan/booking scan : 18-20 weeks.
4. Growth scan : 30-32 weeks.

If needed ECHO : 22-24 weeks.

Pregnancy risk assessment :

Based on history and investigations, GOI considers following as high risk pregnancy :

1. Previous H/O LSCS
2. Bad obstetrical history.
3. Present H/O systemic illness.
4. Age : < 20 years or > 35 years.
5. Increased BP (PIH/Gestational hypertension/PE)

Obstetric complications :

6. Malpresentations
7. Twin pregnancy.
8. Placenta previa/lowlying placenta

Investigations :

9. Severe anemia
10. Rh negative
11. Syphilis/HIV positive
12. GDM
13. Hypothyroidism.

Based on risk : Following color stickers should be stuck onto AN cards :

- Green : Females with no risk factors detected.
- Red : Females with High risk pregnancy.
- Blue : Females with PIH.
- Yellow : Females with comorbid conditions : Diabetes/ thyroid.

Subsequent prenatal tests :

1. Between 15-20 weeks :
   If 1st trimister screening was not done for aneuploidy.
   Do T2 screening
   Anomaly scan in all females.
   Earlier maternal S. AFP was done to screen for NTD.
2. Betweeen 24-28 weeks :
   In western countries : Hemoglobin and hematocrit reassesd again (1st visit and at 24-28 weeks).
   GOI guidelines : Hb and hematocrit 4 times during each AN visits.

DIPSI recommends screening for GDM at 24–28 weeks.
Antibody screening for Rh negative females (if antibody test is negative, prophylactic Anti-D antibody administration at 28 weeks of pregnancy).

3. Between 32–36 weeks :
   Educate the female about the signs of PTL.
   Growth scan is done.
   Confirmation of low lying placenta/placenta previa.
   Malpresentation (breech/transverse lie), ECV is done at 36 weeks if there are no contraindications.
4. 35–37 weeks : Vaginal and rectal swab for group B Streptococci culture (MC cause of neonatal sepsis).

Advise to patient

00:22:26

Weight gained in pregnancy : 12.5 Kg
Factors which affect weight gain :

- Socioeconomic status.
- Parity : Primigravida gain more weight compared to multigravida.
- Ethnicity : American > Africans.
- Pre-pregnancy weight : Higher the prepregnancy weight, more is the weight gain during pregnancy.

Smoking doesnot affect maternal weight gain in pregnancy.

Pre-pregnancy BMI :	Recommended weight gain
Thin (BMI < 18.5 Kg)	12.5–18 Kg
Normal (BMI 18.5 –24.5)	11–15 Kg
Obese (BMI > 30)	5–9 Kg

Those females who gain :
Less weight : Increased chances of SGA.
More weight :

- Increased chances of hypertension
- Macrosomia
- Failed induction
- C-section

Weight loss after delivery :

- Immediately : 5.4 Kg (weight of foetus, placenta, fluids)
- Next 2 weeks : 4 Kg (because of diuresis).
- 2weeks to 6 months : 2.5 Kg (lactation)

Average pregnancy weight retained : 1 Kg.

Calorie requirement in pregnancy 00:26:34

Pregnancy requires additional 80,000 Kcal mostly in the last 20 weeks.

To meet this demand, ACOG and AAP recommends : 100-300 Kcal/day additional calories during pregnancy (not divided equally in all trimisters).

Institute of medicine :

- T1 : 0 additional calories.
- T2 : 340 Kcal/day (additional).
- T3 : 452 Kcal/day (additional).

Sedentary female requires : 2110 Kcal/day (additional is to be added to this value).

Whenever calorie intake is less : Proteins are metabolized than being spared for its vital role in fetal growth and development.

BMR : Increases during pregnancy, in T3 it increases by 20%.

Water retained in pregnancy : 6.5 L

In pregnant females : Na^+ and K^+ retention (due to estrogen)

Na^+ and K^+ concentration decreases in females due to increased water retention.

Due to water retention : Physiological edema in pregnancy.

Decreased plasma osmolality (10 mmol/L).

Recommended daily dietary allowance for pregnant and lactating females

00:30:40

Nutrient	Pregnant	Lactating
Protein	71 g (Non pregnant : 45g, T1=nil, T2= +10g, T3=+20)	71 g
CHO	175 g	210 g
Fat	28 g	28 g
Calcium	1000 mg	1000 mg (1200mg)
Iodine	250 mcg/day	280 mcg/day

Folic acid supplementation :

To prevent NTD in pregnancy Prophylactic dose		To prevent recurrence of NTD Therapeutic dose
400 mcg/ day	Dose	4 mg/day
1 month before conception	Start	3 months before conception As soon as she plans pregnancy (better)
3 months after conception	End	3 months after conception
IFA as advised by GOI	After 3 months (from 4th month)	IFA as advised by GOI

FA supplementation in diabetic pregnant females : 400mcg/ day.

FA supplementation in pregnant females on antiepileptic drugs : 4 mg/day on any antiepileptic drug. (as per Williams 26/e pg 166).

ACOG 400mcg /day with all antiepileptic drugs except Valproic acid, Phenytion and Carbamazapine.

FA supplementation to prevent megaloblastic anemia : 1 mg/ day.

FA supplementation to treat sickle cell anemia : 5 mg/day.

Active space

Iron supplementation in pregnancy : IFA tablets : Anemia in pregnancy.

Calcium supplementation in pregnacy :
Females with low dietary calcium :
500 mg twice daily.
Not to be taken with iron.
Taken after food.

Vitamin D supplementation in pregnancy :
Vit D deficiency in pregnant female can lead to :

- LBW
- Neonatal hypocalcemia
- Seizures
- Skeletal problems in infancy.

Routine testing in females not needed.
Risk factors present :

- Limited exposure to sunlight.
- South Asian origin (includes Indians).
- Diet low in vitamin D : No fish, egg, meat.
- Pre-pregnancy BMI ≥ 30.

If vitamin D deficiency : 1000-2000 IU/day.

Fish oil capsules/DHA : Does not improve cognitive development
Not recommended.

Vaccination in pregnancy

00:41:09

All pregnant females should be given : Td vaccine (Tetanus Diptheria).
Number of doses : 2
Time : 1st dose at 1st AN visit and 2nd dose after a gap of 4 weeks.
If pregnant female was immunized in past 3 years and received 2 doses : Only one booster dose is needed.

Tdap vaccine : Tetanus toxoid + reduced Diptheria toxoid + Acellular pertusis is also recommended during pregnancy.

Atleast one Tdap should be given between 27-36 weeks to all pregnant females to protect newborn from Pertusis.

Influenza Vaccine :

All pregnant females, regardless of trimister during flu season (October to May) should receive Influenza vaccine.
One dose I. M

Covid-19 vaccine can be given in any trimester.

Vaccines which are safe :

All dead vaccines can be given :

- Hepatiits B
- Hepatitis A
- Pneumococcus
- Meningiococcus
- Rabies

Vaccine to be given in speacial circumstances :

- Yellow fever
- Polio
- Typhoid.

Vaccines absolutely contraindicated :

- Mumps
- Measles
- Rubella
- Small pox
- Chicken pox
- BCG
- HPV vaccine.

Exercise in pregnancy :

Encourage regular moderate exercise x 150 minutes/week (walking, stationary cycling, Swimming)

Contraindication :

- Heart/pulmonary disease.

Active space

- Risk of PTL : Example : Cervical cerclage done, multifetal gestation, significant bleeding.
- Obstetrical Complications :
  1. PIH
  2. Placenta previa.
  3. Poorly controlled diabetes.
  4. IUGR
  5. Morbid obesity
  6. Anemia
  7. Epilepsy

Sexual activity in pregnancy : Not contraindicated in pregnancy, but should be avoided in :

- Threatened abortion.
- Placenta previa
- PTL

Air travel in pregnancy :
ACOG : Travel till 36 weeks of pregnancy.

Caffeine intake :
Heavy intake : ≥ 5 cups/500 mg of caffeine : Increases the risk of miscarriage.
moderate intake < 200 mg : Not associated with miscarriage or PTL but may or maynot be associated with IUGR

Warning signs to be explained to each pregnant woman using the safe motherhood booklet.
Following warning signs require immediate visit to the doctor/ health facility:

- Fever > 38.5°C for more than 24 hours.
- Headache,blurring of vision.
- Generalised swelling of the body and puffiness of face.
- Palpitations,easy fatigability and breathlessness at rest.
- Pain in abdomen
- Vaginal bleeding/watery discharge
- Reduced fetal movements.

ANEUPLOIDY SCREENING

General terms and Protocol

00:00:10

Aneuploidy : Defect in chromosomal makeup/number.

Normally chromosome number : 46.

- Down syndrome : Trisomy 21 (they have 47 chromosomes).

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- Edward syndrome : Trisomy 18.
- Patau syndrome : Trisomy 13.
- Turner syndrome : Monosomy X (44+XO).

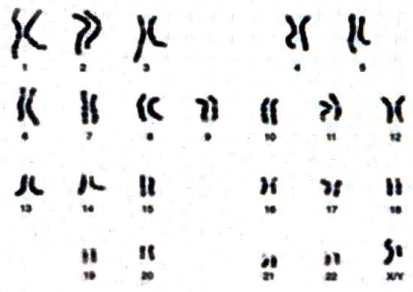
Aneuploidy screening : Should be done in all pregnant females irrespective of maternal age.

To detect any kind of trisomy or monosomy (mainly trisomy 21 and trisomy 18).

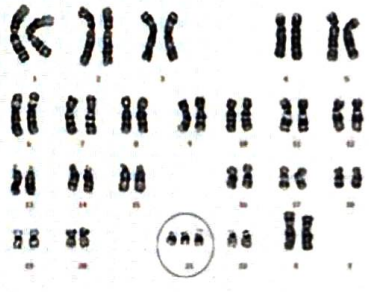
Aneuploidy screening test.
↓ If positive
Diagnostic test (Karyotyping) → Confirmatory test.

Normal Karyotype: 22 pairs + XY/XX.

Karyotyping requires fetal tissue → Invasive approach.
↓
Risk of abortion.



Normal Karyotype of male fetus



Trisomy 21 (Female fetus)

Active space

Two approaches :

If Screening test is positive :

Karyotyping	Cell free fetal DNA in
(Diagnostic test)	mothers blood (2° screening
1st trimester :	test) [Non-Invasive but costly]
Chorionic villi sampling.	↓ if positive
2nd trimester :	Karyotyping (Diagnostic test).
Amniocentesis.	

If the pregnant female has previous history of Down syndrome baby → Straightly do Karyotyping (Diagnostic).

Screening test in 1st Trimester 00:12:16

Best time : 11 weeks to 13 weeks + 6 days.

Biochemical :

Dual Test :

- PAPP-A (Pregnancy associated plasma protein A).
- β hCG.

Down syndrome : β hCG ↑ & PAPP-A ↓.

Edwards syndrome : β hCG ↓ & PAPP-A ↓.

Report (Ratio mentioned) : Cut off → Relative Risk.

If report has risk more than cut off values → Positive screening test.

- Down syndrome : 1 in 250.
- Edwards syndrome : 1 in 100.

Case 1 : Down syndrome suspected. Report is 1 in 300.

↓ Because it is less than 1 in 250.

Low risk for Down syndrome → Screening is negative.

Case 2 : Edward's syndrome suspected report is 1 in 250

↓ Because it is less than 1 in 100.

Less risk for Edward's syndrome → Screening is negative.

If report is 1 in 30, it is more than 1 in 100. High risk for Edward's syndrome -> Screening is positive.

Ultrasound :

measure Nuchal translucency : Sonographic appearance of fluid-filled area (black) below skin below neck region.

Correct way to measure Nuchal translucency :

1. measured in a mid-sagittal plane.
2. Head of the fetus should be in a neutral position : Neither extended nor flexed.
3. Head, neck, and thorax area should be magnified.
4. Amnion should be seen separately.
5. measured from inner border to inner border at widest plane.
6. Best time to measure : 11 weeks to 13 weeks + 6 days (CRL : 45-84mm).

If nuchal translucency ≥ 3mm → Problems in the fetus.

1. Trisomy (MC) : Trisomy 21 > 18 > 13.
2. Turner syndrome.
3. Cardiac defects in the fetus.

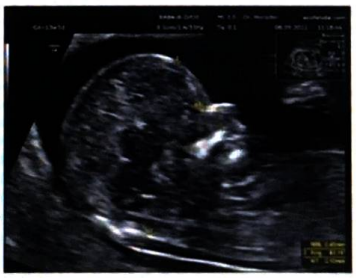
When nuchal translucency is abnormal.

↓

Karyotype

↓ if normal.

Echocardiography.



Cystic Hygroma

00:23:37

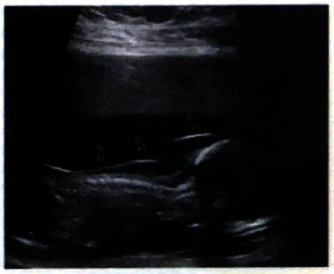
Fluid-filled area extending downwards (not restricted to the neck). Not localized.

much more fluid collection than nuchal translucency.

Presence of a septa.

When cystic hygroma is seen

↓



Active space

Better marker of aneuploidy than the nuchal translucency

↓

If seen in

1st trimester scan	2nd trimester scan
Down syndrome (mc).	75% chances : Turner syndrome.
Then Turner syndrome.	
Then Trisomy 18.	

Next step : Karyotyping.

In absence of aneuploidy (~ Karyotype is normal) cystic hygroma indicates :

- Congenital heart disease : Hypoplastic left heart & Coarctation of aorta.
  Do echocardiography.
- Genetic syndrome : Noonan syndrome.
- Hydrops fetalis.

In first trimester, if for screening both Dual test & NT are done → Combined test (sensitivity : 85%).

When screening test is done, confirmatory → Karyotyping.

In first trimester, source of fetal tissue for Karyotyping → By doing chorionic villi sampling.

Screening test in 2nd Trimester

00:29:55

Done between 15 to 20 weeks (Best : 16 to 18 weeks).

Biochemical :

Triple test/Kettering test/Bart's test → Outdated.

1. α Fetoprotein.
2. hCG.
3. Unconjugated E3 (Estriol).

Down syndrome : ↓ fetoprotein, hCG ↑,
Unconjugated E3 ↓.
Edward syndrome : α fetoprotein ↓, hCG ↓,
Unconjugated E3 ↓.
Sensitivity : 70%.

Quad test : Triple test markers + Inhibin A.
Down syndrome : α fetoprotein ↓, hCG ↑,
Unconjugated E3 ↓, Inhibin A ↑
Sensitivity : 80%.

Ultrasound :

Look for soft tissue markers : Positive if any 2 are present.

1. Nuchal skin fold thickness ≥6 mm : Abnormal.
2. Absent nasal bone.
3. Short humerus.
4. Short femur.
5. Simian crease.
6. Sandal gap.
7. Echogenic cardiac focus.
8. Echogenic bowel.
9. Pelvicalyceal dilatation.
10. Choroid plexus cyst.

If one positive :

- Highest risk : Nuchal skin fold thickness > Short femur.
- Lowest risk : Choroid plexus cyst.

Integrated screening :

1st trimester screening combined with
2nd trimester screening.
Dual test + Nuchal translucency + Quad test.
↓
5 Biochemical markers + Nuchal translucency.
(hCG + PAPP-A + α FP + E3 + Inhibin A)

If second trimester screening is positive, Confirmatory test : Karyotyping.

Sample is obtained by : Amniocentesis.

Non-invasive Prenatal Test (NIPT) 00:39:06

In either 1st or 2nd trimester screening test becomes positive, patient has an option of secondary screening test (NIPT).

Done any time ≥ 10 weeks.

Done by taking mother's venous blood → Check for Cell-free fetal DNA.

↓

Source : Placenta → maternal blood.

Sensitivity : 99%.

Disadvantages :

- Very expensive.
- Available only for trisomy 21, 18, 13 and Turner syndrome.
- Cannot give entire Karyotype.
- It is a secondary screening test → if positive → Karyotyping has to be done.

Prenatal Genetic Diagnostic test 00:42:00

1. Confirmatory test.
2. Give complete chromosomal makeup of fetus.

Karyotyping (most common)

FISH (Fluorescent in situ hybridization) (Quick results)

Need fetal tissue : (can be obtained by)

1. Chorionic villi sampling.
2. Amniocentesis.
3. Cordocentesis.

Chorionic Villi Sampling vs Amniocentesis 00:44:00

	Chorionic villi sampling	Amniocentesis
Sample	Chorionic villi.	Amniotic fluid.
Route	Trans-cervically/ abdominally.	Abdominally.
Study material	Trophoblast (Chorion frondosum).	Fibroblast & amniocytes.
Time : Can be done Best time Not done	≥ 10 weeks of pregnancy. 11–13 weeks. <10 weeks : Complication. ↓ 1. Oromandibular defects. 2. Limb defects.	15–20 weeks. 16–18 weeks. 11–14 weeks (early amniocentesis). ↓ ↑ chances of fetal loss.
Advantage	Result in 1st trimester. Trophoblasts are actively dividing cells. ↓ Result in 2–4 days.	Safest procedure. most reliable. No problem of 2 cell lines.
Disadvantage	High fetal loss rate. May get 2 placental lines : Placental mosaicism.	Wait till the 2nd trimester. Result takes longer : 7–10 days.
Fetal loss	1% (1 in 100).	<0.5% (0.3%).

Other uses of Amniocentesis :

- Therapeutic : Polyhydramnios.
- Fetal lung maturity evaluation in 3rd trimester
- In neural tube defects (NTD) : Amniocentesis was earlier used as a diagnostic test.
  Two markers : Rise in levels of → α FP, Acetylcholine esterase (most specific).
  Current diagnostic method : USG.
- In fetal hemolytic anemia (E.g. RH isoimmunization)
  ↓
  Golden coloured amniotic fluid (high levels of bilirubin).
  Current diagnostic method : Doppler of MCA (middle cerebral artery) → Look at peak systolic velocity (PSV).
- In acute fetal infections like TORCH : PCR or NAAT of amniotic fluid.

Cordocentesis

00:55:40

Sample taken from umbilical vein near the placental end (as umbilical vein has wide lumen).
Fetal loss rate : 2-3% → Not used for genetic testing.
Done ≥18 weeks.
Used in RH incompatibility to know exact Hb of fetus when PSV of MCA is ≥ 1.5 MOM (multiple of median).

- Most common cause of Down syndrome : Nondisjunction of chromosome.

  ↓

  Recurrence rate : 1%.
- If Down syndrome is due to Balanced translocation : (21 : 21) translocation.

  ↓

  Recurrence rate : 100%.

- Preimplantation genetic testing : IVF (done with help of polar body or blastocyst).

FETAL MONITORING

Screening test done when patient has c/o Decreased fetal movements :

Best : Modified biophysical score: NST + AFI.

2nd best : Non stress test.

Diagnostic test : Biophysical score (BPS).

Non stress test

00:02:49

Evaluating fetal heart in antenatal period in graphical manner.

Cardiotocography (CTG) : During uterine contractions in intrapartum period.

Two graphs → Fetal HR (upper part).
→ Uterine contractions (lower part).

Components of NST :

1. Fetal heart rate

< 110 Bradycardia : marker of fetal distress.

2. Beat to beat variability :

FHR is not constant.

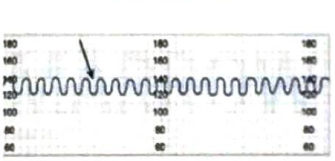
Beat to beat variability is a good sign.

Normal beat to beat variability is 5-25 bpm.

Absent variability or <5bpm : marker of fetal distress.

Sine wave pattern : Sinusoidal patern.

Indicates fetal anaemia, seen in :



- Vasa previa.
- Twin to twin transfusion syndrome.
- Rh isoimmunization.

Management : Immediate termination of pregnancy / Emergency C - section.

Active space

3. Fetal heart rate acceleration :

When fetal movement occurs

↓

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FHR increases by 15bpm x 15 secs.

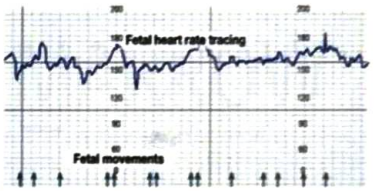
It denotes a healthy fetus.

most important component in NST is fetal HR acceleration.

- In left lateral position.
- Performed for 20 minutes.
- Fetal movements noted and mother pushes a button on the belt during each movement.

↓

Arrow (↑) appears on CTG graph.



In a period of 20 minutes

↓

≥ 2 accelerations

NST : Reactive

Fetus healthy.

<2 accelerations

Repeat NST for another 20 mins.

In 40 mins, < 2 accelerations

Non - reactive CTG.

↓

Biophysical score.

Modified biophysical score 00:15:25

NST + AFI.

NST : Acute distress in fetus.

AFI : Chronic distress of fetus.

If any parameter is abnormal ⟶ Biophysical score.

NST is done in all high risk pregnancies above 32 weeks regularly.

Normal fetal movements :

- 10 movements in 2 hrs of rest.
- 10 movements in 12hrs of activity.

Active space

Daily fetal movement count is to be advised in mothers in third trimester.

Cardiotocography 00:18:04

Intrapartum fetal monitoring.

When uterus contracts, pressure increases

↓

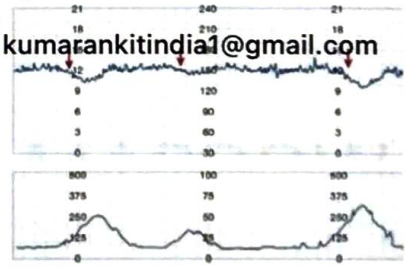
Volume of blood going to fetus decreases

If fetus healthy,	Compromised fetus,
Tolerates this decrease &	Can't tolerate and
no change in FHR.	FHR decreases
	(FHR deceleration)

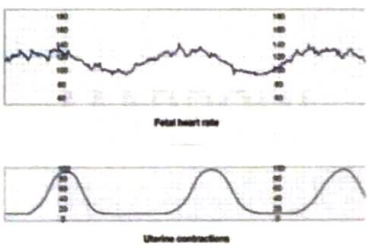
FHR deceleration is a dip by 15bpm for 15 seconds.
It is mostly pathological.

Types of deceleration 00:21:39

1. Early acceleration :
Due to head compression (physiological).
Onset of dip coincides with onset of uterus contraction.
End Dip in FHR ends along with uterus contraction.
Gradual dip (≥30 secs) → Time from onset of dip & peak of dip ≥ 30 secs.
Management : Wait and watch.



2. Late deceleration :
In utero-placental insufficiency.
Most ominous type of deceleration.
Onset of dip in FHR after the beginning of contraction.
Nader of deceleration and peak of contraction do not coincide.
Nader of FHR dip is later than peak of contraction.



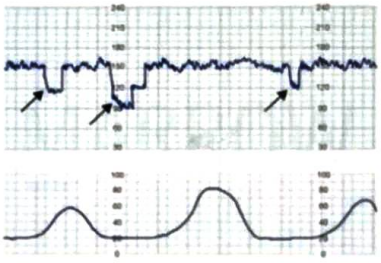
End point : The FHR dip does not end with uterine contraction (ends later). Dip is gradual (≥ 30 secs).

Management :
Pt. in left lateral position, IV fluids, oxygen. Stop uterotonic drugs. These steps increases placental perfusion.

↓ If persists

Indication for C-section.

3. Variable deceleration :
In cord compression.
There is no fixed pattern between FHR dip & uterine contraction.
Dip is sudden (< 30 secs).



Management :
Put mother in head low position.
Check for cord prolapse.
IV fluids.
Amnio infusion.

↓ If persists

Persistent variable deceleration.
Indication for C - section.

Classification of CTG tracing 00:40:35

Category I : (Normal)	FHR : 110 - 160 bpm. Beat to beat variability : 5-25 bpm. No late deceleration. No variable deceleration. Early deceleration : +/- Deceleration : +/-
Category 3 : In utero resuscitation + immediate delivery	Absent variability of FHR with : Bradycardia. Persistent late deceleration. Persistent variable deceleration. (Or) Sinusoidal HR pattern.

Biophysical score

00:44:32

A/K/A manning score.
Done with help of USG.
Done over 30 minutes.

5 components :

- Fetal tone : In 30 minutes, 1 episode of fetal extension-flexion.
- Fetal breathing movement : ≥ 1 breathing movement x 30 secs.
- Gross body movements of fetus : ≥3 body movements.
- Single largest vertical pocket of amniotic fluid : ≥2 cms.
- NST : Reactive (20-40 mins).

Each of these parameters is given a score of either 0 or 2.
If total score is 8 or 10/10 : Healthy patient.
Score 6/10 or less : Reassessment after 24 hours.
< 6/10 on reassessment : Fetal hypoxia - Terminate pregnancy.

Active space

MATERNAL ADAPTATION IN PREGNANCY

Changes in metabolic system in pregnancy 00:00:50

Pregnancy is an anabolic state.
BMR increases by 10 to 20%.
Oxygen consumption increased :
(Pregnancy : 20%, Labor : 40 to 60 %).
Total serum Calcium decreases : (Ionized Calcium remains normal + non ionized Calcium decreases).

Fetus is dependent on mother for Calcium : At term 30 g of Calcium.
Vitamin D levels increased in pregnancy.
Calcitonin requirement increased.
Parathyroid hormone increased in late pregnancy & decreased in early pregnancy.
Vitamin D requirement in pregnancy : 10 mcg (400 IU /day).
Calcium requirement in pregnancy : 1200 mg/day.

Carbohydrate metabloism in pregnancy 00:04:26

Insulin resistance in pregnancy.

- Mainly due to human placental lactogen (HPL).
- Others : Estrogen, progesterone, cortisol.
- Maximum between 24 to 28 weeks.

Pregnancy is a diabetogenic state.
Fetus dependent on mother for its glucose requirement.

↓

Facilitated diffusion of glucose across placenta using GLUT 3 and GLUT 1.

In pregnancy :

- Fasting : Hypoglycemia.
- Postprandial (due to insulin resistance) : Hyperglycemia.

Note :

Insulin secretion increases during pregnancy.

In pregnancy there is physiological glycosuria.

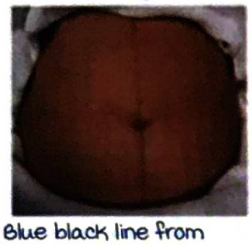
Proteinuria is abnormal always.

Lactosuria is physiological during breast feeding.

Skin changes in pregnancy

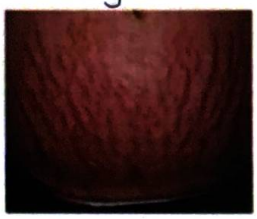
00:08:37

Linea nigra



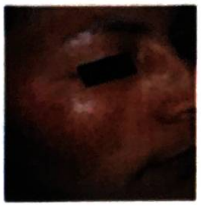
Blue black line from xiphisternum to pubic symphysis. Increased melanocyte secreting hormone due to increased estrogen.

Striae gravidarum



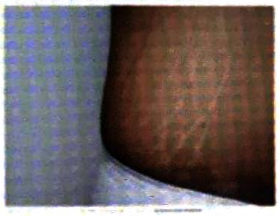
Stretch mark of present pregnancy. Pink in color.

Chloasma Gravidarum



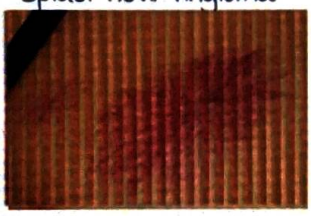
Pregnancy mask (hyperpigmentation) due to increased melanocyte secreting hormone. Resolves after delivery.

Striae albicans



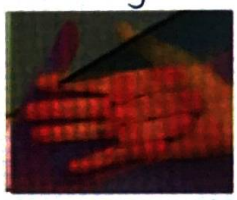
Stretch marks due to previous pregnancy. Silvery white in color.

Spider nevi/ Angioma



Dilated capillaries below the skin due to increased estrogen.

Palmar erythema



Red areas of skin due to increased estrogen.

Basal body temperature in pregnancy is increased due to progesterone (Thermogenic hormone).

Changes in breast during pregnancy

00:11:47

1. Size and weight is increased :
   - Increased fat due to insulin.
   - Increase in number of alveoli due to progesterone, estrogen, prolactin.
   - Increase in ducts due to estrogen.
2. Hyperpigmentation of breast.
3. Appearance of secondary alveoli.
4. Montgomery tubercles appear :modified sebaceous gland.

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Colostrum :

- Colostrum can be seen early as 12 weeks.
- Has everything more than breast milk except :

  K : Potassium.

  F : Fat.

  C : Carbohydrates.

Breast milk lacks Vitamin K and less in vitamin D.

For milk ejection / Galactokinesis / milk let down reflex.

↓

Oxytocin.

↓

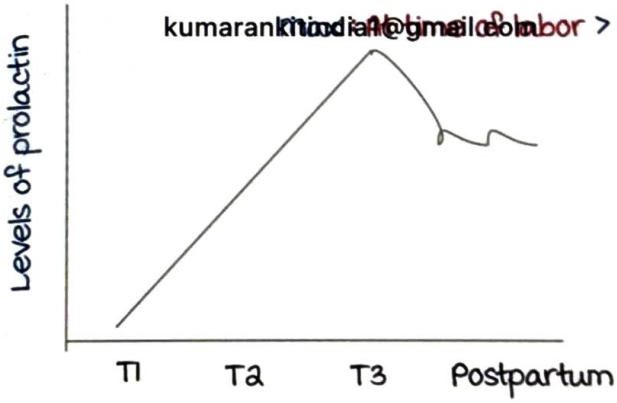
Causes contraction of myoepithelial cells of alveoli.

For continuous milk production (Galactopoiesis) :

- Prolactin.
- Suckling by neonate.

Prolactin in pregnancy

00:16:10



Third trimester > Time of labor

In non pregnant female prolactin = 15 ng/ml (> 25 ng/ml : hyperprolactinemia).

In pregnant female prolactin level = 150 ng/ml (max at labor).

Influences on prolactin :

1. Estrogen :

Estrogen

+ve effect on lactotropes. → Increased prolactin level.

Keeps check on activity of prolactin by -ve effect.

After delivery, levels of estrogens decrease causing decrease in levels of prolactin and increase in activity of prolactin leading to milk production.

2. Dopamine : Prolactin inhibiting hormone.

Case 1 : Females after delivery with low milk production :

↓

metoclopramide is given

(decrease dopamine level causing increased milk production).

Case 2 : Female with IUD to stop lactation : Dopaminergic drugs are given :

- Cabergoline.
- Bromocriptine.
- Pyridoxine.
- High doses of estrogen : not recommended, as it can lead to DVT.

Case 3 : Female with breast engorgement (milk production normal) :

- Advise use of breast pumps.
- Oxytocin.

Vaginal, cervical & uterine changes in pregnancy

Vaginal changes :

Chadwick sign : Bluish discoloration of vagina.

Increased doderlein's bacteria (inhabitant bacteria) :

Lactobacilli

↓

Glycogen in vaginal epithelium. → ↑Lactic acid.

↓

Increased acidity.

↓

Decreased pH.

↓

Decreased pathogenic bacteria.

Candida can survive in acidic media.

Most common vaginitis in pregnancy is candidiasis.

Cervical changes in pregnancy :

Cervix mouth is closed by cervical mucous plug to prevent infection.

It is released when cervix dilates at the time of labor (+ bleeding) : Show.

Vaginal changes & cervical changes during pregnancy are natural defense mechanism against infections.

Uterine changes in pregnancy :

	Non pregnant	Pregnant
Weight	50 to 80 g.	1100 g. Marked hypertrophy. Limited hyperplasia.
Length	7.5 cm.	35 cm.
Volume	5 to 10 ml	5 L (upto 20 L)
Shape	Pear shaped.	Globular ⟶ 12 wks (spherical) ⟶ ovoid

From 2nd trimester :

Braxton Hicks contraction :

- Sporadic.
- Infrequent.
- Painless.
- Intra uterine pressure : 5 to 25 mm of Hg.
- Near term : Becomes more frequent & shift to false labor pain.

Once uterus becomes an abdominal organ, there is dextro rotation of uterus due to sigmoid colon on left side.

Hematological changes during pregnancy 00:32:10

Increased	Decreased
Blood volume increases : Maximum : Third trimester. • Plasma volume increases in 40 to 50 %. • RBC volume increase in 20 to 30 %. • Number of erythrocyte & reticulocytes increases.	Viscosity of blood decreases (blood thickens): • Hemodilution : (Liquid component increases more than solid component). • Packed cell volume decreases. • Hematocrit decreases. • Rbc life span decrease (110 days).
Hemoglobin mass increase (g) causing increased oxygen carrying capacity of blood. • Maternal erythropoietin levels increases.	Hemoglobin concentration decreases (g/dl). ↓ Physiological anemia. Hemoglobin concentration never less than 11 g%.
Total leucocyte count (WBC count) increases : • Normal TLC : 10,000. • Pregnant TLC : 15,000. • Postpartum TLC : 25,000. • DLC : Neutrophils & lymphocytes increase. • T lymphocytes increase. • B lymphocytes and CD 4 : CD 8 remains unchanged.	Platelet decreases (but remains within normal range). • A/K/A benign gestational thrombocytopenia • Occurs due to hemodilution & splenomegaly. • Eosinophil count decrease.
Plasma protein mass (g) increases. Globulin increases (due to estrogen) : • Sex hormone binding globulin. • Thyroid binding globulin.	Plasma protein concentration decreases (g/dl). Albumin decreases.
Normal Albumin : Globulin = 1.7 : 1 Pregnant Albumin : Globulin = 1 : 1	
All inflammatory markers increases : • CRP. • ESR. • Leukocyte alkaline phosphatase. • Complement C3, C4.	
Pregnancy is an immunocompromised state.	

Humoral immunity increases. T helper cell 2 increases.	Cell mediated immunity decreases. T helper cell 1 decreases.
In normal pregnancy, there is shift from TH1 to TH2. TH 1 to TH 2 shift is not seen in pregnant women with PIH.	
• Interleukin 4 increases. • Interleukin 10 increases. • Interleukin 13 increases. Diseases mediated by TH 2 flare during pregnancy. Eg : SLE.	• Interleukin 2 decreases. • TNF decreases. • Interferon alpha decreases. Diseases mediated by TH 1 improve in pregnancy. Eg : Hashimoto's thyroiditis, multiple sclerosis, rheumatoid arthritis.
All clotting factors increases. Pregnancy is a hypercoagulable state. Serum fibrinogen level (Clotting factor I) increases.	• Clotting factor II & 13 decreases. Factor 13 : fibrin stabilizing factor. • Fibrinolytic activity decreases : Plasminogen gets converted to Plasmin by TPA (Tissue plasminogen activator). • During pregnancy : TPA inhibitor increases. • Anticoagulants decreases. • Protein C & protein S decreases.

The size of spleen increases by 50%

Blood parameters unchanged in pregnancy :

- B lymphocytes.
- CD4 : CD8.
- Bleeding time and clotting time.
- Antithrombin time.

Changes in respiratory system in pregnancy 00:54:57

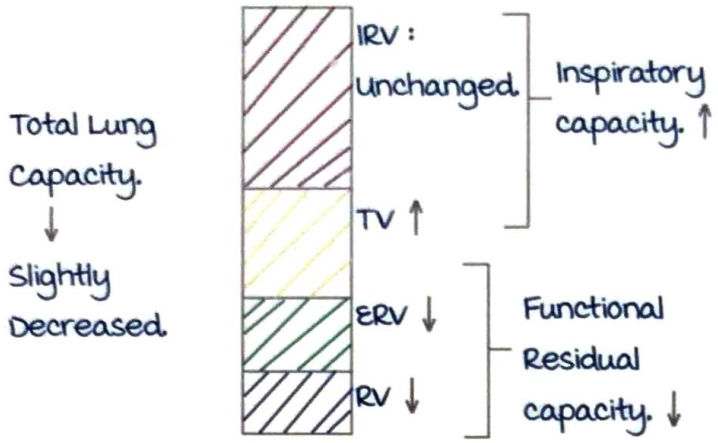
2 cm : Transverse diameter of chest (lungs) increased by 2 cm.

4 cm : Diaphragm is pushed up by the gravid uterus by 4 cm.

6 cm : Circumference of the chest increases by 6 cm.

Subcostal angle :

- Non pregnant females : 68°.
- Pregnant : 103° (obtuse).



Tidal volume increases in pregnancy.

Tidal volume x Respiratory rate (unchanged) = Minute ventilation (increases).

Residual volume and expiratory reserve volume decreases.

IRV + TV + ERV = Vital capacity remains unchanged.

Total lung capacity slightly decreases.

Parameters which increase in pregnancy :

- Inspiratory capacity.
- Tidal volume.
- Minute ventilation.

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Parameters which remain unchanged in pregnancy :

- Inspiratory reserve volume.
- Respiratory rate.
- Vital capacity.

Pregnant females

Functional residual capacity ↓
↓
Increased amount of air trapped in lungs.
↓
Blood CO_2 levels ↓
↓
Respiratory alkalosis.
↓
To compensate Kidney excrete more HCO_3.
Blood HCO_3 decreases.
↓
Metabolic acidosis (compensatory).

Tidal volume ↑
↓
Amount of air coming in lungs ↑
↓
Blood O_2 levels increases.

BOHR effect
(pH remains normal, bicarbonate decreases).

1. Oxygen binding capacity of blood increases due to decreased bicarbonate.
2. Blood oxygen carrying capacity increases.
3. Oxygen consumption increases.

Active space

Arterio venous oxygen gradient decreases.

Changes in GIT during pregnancy 01:09:27

Progesterone : Smooth muscle relaxant.

- Lower Esophagal Sphincter relaxed. ↑GI reflux during pregnancy.
- Gall Bladder motility decreased. Increased cholelithiasis due to estrogen.
- GI motility : Normal : Antenatal. Decreased in labor.

Vomiting in pregnancy (Called as morning sickness) :

- Physiological.
- most commonly due to hcg.
- MC seen in first trimester (9 to 10 weeks).
- Subsides by 16 to 20 weeks.
- Most common in primi than multigravida.
- More intolerant towards liquids.
- No admission needed.

Treatment : Doxylamine 10mg + Pyridoxine 10mg (2 tab at bedtime) Or Hyoscine (antihistamine).

Hyperemesis gravidarum :

Non physiological excessive vomiting diagnosed by :

- Weight loss > 5% of pre pregnancy weight.
- Ketosis.
- Vitals unstable.

Presents in 1st trimester.

Due to excessive hcg conditions (Twins, Molar pregnancy, Down syndrome, Rh negative pregnancy), estrogen (when fetus is female) and progesterone.

Clinical features :

- metabolic alkalosis.
- Electrolyte abnormalities : Hypokalemia.
- Ketosis.

LFT can be abnormal in 50% cases :

In cholestasis of pregnancy or Acute fatty liver of pregnancy, vomiting presents in third trimester.

Can lead to Wernicke encephalopathy (Thiamine deficiency) + Vitamin K deficiency.

H pylori may or may not be a risk factor.

Scoring system :

Mother PUQE scoring.

Rhodes index.

Management : Admit.

- NPO.
- IV fluids.
- Antihistamines : promethazine, prochlorperazine.
- Dopamine antagonist : Metoclopramide.
- Last drug : Ondansetron.

Changes in renal system 01:20:24

Anatomical change :

Size of kidney increases by 1 cm.

Urinary stasis due to progesterone (Decreased peristalsis in ureter).

B/L hydroureter occurs, more on right side, due to dextrorotation of uterus.

Bladder mucosa congested.

Intravesical pressure increases and to maintain continence, intraurethral pressure increases.

Physiological changes in renal system :

Increased renal blood flow.

↓

Increased GFR.

↓

Increased filtering capacity of kidney.

↓

Increased excretion of urea, uric acid, creatinine.

↓

Decreased S. urea, S. uric acid, S. creatinine.

Note :

Most common organ involved in PIH : Kidney.

In PIH : GFR decreased.

Most common cause of UTI in pregnancy : E.coli.

Asymptomatic bacteriuria can lead to preterm labor and

Active space

pyelonephritis.

Asymptomatic bacteriuria should always be treated in pregnancy.

In spite of treatment, asymptomatic bacteriuria has a recurrence rate of 30 %.

Antibiotics for UTI :

- DOC : Nitrofurantoin 100mg BD for 3 days or 100 mg at bedtime for 10 days.
- For recurrent cases, Nitrofurantoin 100mg bedtime for 21 days given.
- Ampicillin/ Amoxicillin.
- Cephalosporins.
- Levofloxacin.
- Ciprofloxacin.

Changes in endocrine gland during pregnancy 01:29:59

Increased	Decreased
All adrenal hormones.	Except DHEAS.
Pancreas : Insulin secretion.	
Pituitary gland : Size and weight : increases by 125 % (anterior pituitary > posterior pituitary). Note : After delivery if there is PPH, it will lead to anterior pituitary necrosis known as Sheehan syndrome. • Growth hormone. • Prolactin. • ACTH. • Oxytocin : Late third trimester.	LH. FSH. TSH (within normal limits).

Pituitary hormone that remains normal : ADH.

most common cause of hypothyroidism :

- Developing countries : Iodine deficiency.
- Developed countries : Hashimoto's thyroiditis.

most common cause hyperthyroidism in pregnancy :
Grave's disease.

most common cause postpartum thyroiditis :
Antimicrosomal antibodies.

Active space

OBSTETRICS AND PHARMACOLOGY INTEGRATION

Anticoagulants in pregnancy 00:01:37

Case scenario :

A pregnant woman with mitral regurgitation or stenosis undergoes valve replacement surgery.

Valve replacement can be : 60c6b3eeaa8ded0e4e7e5ea7

- Bioprosthetic valve replacement : Performed currently.
  Advantage : No need for anticoagulation therapy.
  Disadvantages : The valve may need to be replaced (after 10 – 12 years) due to valve degeneration. These valves are expensive.
- Mechanical valve replacement : Performed rarely.
  Advantage : Need not be replaced.
  Disadvantages : Increased chances of thrombosis.
  Hence, anticoagulants must be given throughout life.

Anticoagulant of choice in a non pregnant woman who underwent mechanical valve replacement : Warfarin + low dose aspirin.

Aspirin is given to non pregnant women who undergo bioprosthetic valve replacement, if required.

If a woman with bioprosthetic valve conceives, low dose Aspirin (75–100 mg/day) must be continued throughout pregnancy.

If a woman with mechanical valve conceives,
European guidelines : Only anticoagulant. No need for Aspirin.
American Heart Association (2020) : Anticoagulant + Aspirin.
ACOG is in concordance with AHA guidelines.

Active space

Warfarin

00:08:59

Advantage : Very strong anticoagulant.
Disadvantage : Warfarin can cross the placental barrier and lead to embryopathy.
Conventionally, warfarin was contraindicated in the first trimester due to the incidence of warfarin embryopathy.

New guidelines for warfarin therapy :

- If the dose of Warfarin required is ≥ 5 mg/day the it should be replaced with LMWH (oral) >> UFH in first trimester.
- If the dose of Warfarin required is < 5 mg/day, it can be continued till 36 weeks.

Low molecular weight heparin :
Advantages : It cannot cross the placenta.
Its antagonist protamine is available.
Disadvantage : Weak anticoagulant.
Hence it is not the anticoagulant of choice.
Monitoring :
Anti X a levels : Done at 4-6 hours after the anticoagulant dose.

UFH :
Adv : Same as LMWH.

Disadv : Weak anticoagulant.
IV usage.
Monitoring : aPTT :
Aim : 2 times its normal value or Anti X a levels.

Alogorithm for anticoagulants in pregnancy :
Patient with mechanical valve replacement :
Baseline warfarin dose.
If < 5 mg/day : Continue warfarin.
Monitor INR.
Goal : INR between 2.5 to 3.

If dose >/= 5 mg/day :
First trimester : Change to LMWH.
Closely monitor anti Xa.
Peak levels : 4-6 hours after dose.
Goal anti Xa : 0.8 to 1.2 IU.
OR
Change to UFH.
Closley monitor anti-Xa or aPTT levels (mid dose).
Anti Xa : 0.35 to 0.7 U/ml.
aPTT : >/= 2 times normal.

2nd & 3rd trimester : Back to warfarin till 36 weeks.
At 36 weeks of gestation : Convert to LMWH >>>> UFH.
Because of increased chance of PPH & ICH in fetus with warfarin.

In case of vaginal delivery :
LWMH is stopped on the day of delivery.
UFH is stopped 4-6 hours before delivery.

In case of caeserean section :
Discontinue anticoagulation before surgery.

Postpartum : Reinitiate UFH (IV) plus warfarin, once INR is 2.5-3 stop UFH.

Newer recommendations : Anticoagulants are given,
After 6 hours of vaginal delivery.
After 6-12 hours of caeserean section.
Still in clinical practice, anticoagulants are reiniatiated 24 hours after C/S.

A pregnant woman on LMWH at the time of delivery :
- Stop LMWH.
- Allow vaginal delivery.

A pregnant woman on UFH at the time of delivery :
- Stop UFH (short duration of action).

Active space

- Continue the vaginal delivery.

If there is excessive bleeding/increased risk of bleeding : Protamine sulphate.

If due to obstetric reasons, LSCS needs to be done but epidural anesthesia can lead to hematoma formation. So it is advisable to give regional/general anesthesia in such scenario.

If a pregnant woman on warfarin at the time of delivery : Stop warfarin.

Caesarean section is indicated if the patient is on warfarin at the time of delivery or within 2 weeks of delivery.

Vaginal delivery in a patient on warfarin → Intracranial hemorrhage in the fetus.

If a pregnant woman on warfarin is already in active labor : Continue with vaginal delivery.

Stop warfarin.

- To mother : Vitamin K are administered to prevent PPH.
- To newborn : Vitamin K is administered to prevent intracranial bleeding.

Antiepileptics in pregnancy

00:14:43

All anti epileptics are teratogenic in pregnancy but the severity varies.

Risk of teratogenicity	Drug
most teratogenic (very)	Valproic acid
2nd most teratogenic	Phenytoin
3rd most teratogenic	Phenobarbitone Carbamazepine
Least teratogenic	Levetiracetam > Lamotrigine

Clinical case 1 : A pregnant woman detected with epilepsy in pregnancy for the first time.
Drug of choice (DOC) : Levetiracetam > Lamotrigine.

Clinical case 2 : A woman on antiepileptic drug conceives.
Seizure causes hypoxia which is detrimental to both the mother and fetus.
If epilepsy is well controlled with the antiepileptics, same treatment must be continued throughout the pregnancy.

Avoid switching antiepileptic medications except for valproic acid.

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Increased renal blood flow in pregnancy → Increased GFR → Faster drug clearance → Therapeutic drug monitoring (TDM).

The dosage of antiepileptics is kept at lowest because of incidence of neural tube defects, cleft lip, cleft palate in fetus.

Dose of folic acid in a pregnant woman on antiepileptics :

- Latest ACOG guidelines : 400 mcg/day and not higher. Earlier guidelines recommended 4 mg.
- Other guidelines : 1 mg/day.

Thyroid disorders in pregnancy 00:22:29

Physiological changes in thyroid gland during pregnancy :

- Size of the gland increases but any visible increase in size must be considered pathological.
- The alpha subunit of HCG has a similar structure as the alpha subunit of TSH. It stimulates thyroid gland.
  Total T3 and T4 is increased in pregnancy only if the gland is normal.
- All globulins increase in pregnancy including thyroid binding & sex hormone binding globulin because of increased estrogen.
- Free T3 and T4 levels remain normal and a pregnant

Active space

woman remains euthyroid.

- Thyroid stimulating hormone (TSH) levels are either normal or slightly decreased.
  Normal range : 0.1–4 mU/L.

Target TSH level in a pregnant woman with hypothyroidism : < 2.5 mU/L.
Target TSH level in a pregnant woman with hyperthyroidism : 0.1–0.2 mU/L.
Iodine requirement is increased to 250 mcg/day in pregnancy due to increased excretion of iodine.

Most common cause of hypothyroidism in pregnancy : Hashimoto's thyroiditis (to be marked if nothing specified).

- Developed countries (and overall) : Hashimoto's thyroiditis.
- Developing countries : Iodine deficiency.

The fetus depends on mother's thyroxine for its cognitive development.
Fetus starts producing thyroxine by 12 weeks but detectable levels are seen during 18–20 weeks.
Maternal T3 and T4 can cross the placenta but maternal TSH cannot.

Hypothyroidism in a pregnant female can lead to : 4 Ps.

- Pre eclampsia or gestational hypertension.
- Placental abruption.
- Preterm deliveries.
- Postpartum hemorrhage.

Hypothyroidism in fetus leads to :

- Low birth weight.
- Delayed cognitive development or neuropsychological impairment.

Screening for thyroid disorders in pregnancy is not universal.
Following are the indications for screening :

- Living in areas with moderate to severe iodine deficiency.

- Obese.
- ≥ 30 years.
- Family history of hypothyroidism.
- Head/neck irradiation.
- History of thyroid surgery.
- Goitre.
- Type I diabetes.
- History of recurrent miscarriages/preterm deliveries.

Clinical case 1 : A pregnant woman diagnosed with hypothyroidism for the first time during pregnancy.

- Overt/clinical : Increased TSH and decreased T3 and T4.
- Subclinical : Increased TSH and normal T3 and T4.

The drug of choice for both is thyroxine. It is started as soon as the diagnosis is made.

Clinical case 2 : A woman with h/o hypothyroidism conceives. The thyroid gland is not normal and does not produce T3 and T4. Alpha subunit of HCG does not stimulate hormone release. In such patients, the dose of thyroxine must be increased by 30–50 %.

60c6[illegible]

Hyperthyroidism in pregnancy

00:36:00

Hyperthyroidism can lead to :

- Pre eclampsia.
- Heart failure.
- Abortion.
- Preterm labor.
- Still birth.

There are 3 modalities for treating hyperthyroidism :

1. Drugs.
2. Surgery (thyroidectomy).
3. Radioactive iodine.

Antithyroid drugs are the treatment of choice in pregnancy.

Active space

Thyroidectomy in second trimester is indicated if :

- Patient develops liver toxicity/agranulocytosis due to antithyroid drugs.
- Non compliant to drug therapy.

Radioactive iodine is absolutely contraindicated in pregnancy.

Drug of choice : methimazole/carbimazole & propylthiouracil.

Advantages of methimazole include :

- Longer $t_{1/2}$.
- more potent.
- Less hepatotoxic in comparison to PTU.

Disadvantage of all anti-thyroid drugs :
They can cross the placenta (lead to fetal hypothyroidism) and cause birth defects (methimazole > propylthiouracil).

The fetal thyroid gland is more sensitive to antithyroid drugs than maternal thyroid gland.
This can lead to hypothyroidism in fetus.
Never overtreat hyperthyroidism.
TSH levels are maintained at low normal values.
TSH levels are generally < 0.05 in hyperthyroidism.
Target TSH levels : 0.1 – 0.2 mU/L.
TSH monitoring is done every 4 weeks to prevent overcorrection.

Birth defects (methimazole > propylthiouracil) :

- Aplasia cutis (typical of methimazole)
  Seen with 1st trimester ingestion.
  Absence of skin with or without underlying structures.
  MC site is the scalp.
- Tracheoesophageal fistula.
- Patent vitellointestinal duct.
- Omphalocele.

Aplasia cutis

Propylthiouracil 00:44:00

Advantage : Less commonly associated with birth defects.
Diadvantage : Liver toxicity (more common).

Liver function tests are done monthly to monitor toxicity.

It is the DOC for hyperthyroidism in pregnancy & 1st trimester.
DOC for hyperthyroidism in 2nd and 3rd trimesters :
methimazole.

DOC for thyroid storm in pregnancy is propylthiouracil.
Propranolol is used to treat tachycardia and tremors.

metoprolol can be used if propranolol is not available.
Atenolol is not used.
Propranolol or metoprolol if used for more than 6 weeks, can cause fetal growth restriction and hypoglycemia.

Hyperthyroidism is also seen in patients with gestational trophoblastic diseases (increased HCG).

Treat molar pregnancy → Hyperthyroidism gets corrected.
Propranolol is the DOC in molar pregnancy induced hyperthyroidism (with excessive symptoms like tachycardia, tremors) patient (faster action & symptomatic relief).

Anti thyroid drugs are not used to treat symptoms of molar pregnancy induced hyperthyroidism as they take around longer (3–6 weeks) to act.

In pregnancy, renal blood flow & GFR increases causing increased clearance of drugs.
Drug levels along with LFT & thyroid hormone levels need to be monitored every 4 weeks.

Prolactin 00:50:32

It is secreted by the lactotrophs present in the anterior

pituitary & also by the decidua in a pregnant female.

Maximum level of prolactin is seen during pregnancy (not during lactation).
Prolactin level falls by ~50% after delivery.

Prolactin is a galactopoietic hormone (synthesis of milk).

High prolactin levels → No milk synthesis in pregnancy → inhibitory effect of estrogen and progesterone on prolactin function.

1st stimulus for initiating breast feeding : Decreased estrogen and progesterone. The levels fall soon after the delivery of the placenta.

Milk ejection/galactokinesis hormone : Oxytocin.
It initiates uterine contractions as well.
Abdominal pain during breastfeeding is due to oxytocin.

Prolactinoma

00:56:05

Depending on the size, prolactinomas are classified into :

- Microadenoma : < 1 cm in size.
- Macroadenoma : ≥ 1 cm in size.

Indications to treat prolactinoma in non pregnant women :

- If the size of tumor is big → Leads to neurological or visual symptoms due to the pressure effects.
  Tumors causing neurological symptoms and tumors with high risk of causing neurological symptoms must be treated.
- Prolactinoma leading to hypogonadism.
  Hypothalamus → GnRH release in a pulsatile manner → Stimulates anterior pituitary → FSH and LH released → acts on the ovary → releases estrogen and progesterone → acts on the uterus → menstruation.

But excessive prolactin

↓

Negative feedback on GnRH → Decreases estrogen & progesterone.

↓

Decreases FSH and LH → Oligomenorrhea/amenorrhea.

↓

Prevents ovulation/anovulation → Infertility.

Decrease in progesterone levels can lead to abortion and is called luteal phase defect.
Progesterone is a smooth muscle relaxant → Prevents uterus from contracting during pregnancy.

- Prolactinoma leading to galactorrhea.
- Infertility : Patient wanting to conceive.

All prolactinomas respond to dopamine agonists : The first line drugs in treatment of all cases of increased prolactin levels.

Features	Cabergoline	Bromocriptine
Duration of action	Long	Short
Dosing	Given weekly / twice weekly	Given daily
Side effects	Less	more
Safe in pregnancy	Yes	Yes
Birth defects	No (not proven with studies)	No (proven with studies)
Nausea & vomiting in pregnancy	No increase	Increased

DOC for treatment of hyperprolactinemia in non pregnant females is cabergoline.
DOC for a non pregnant woman with hyperprolactinemia who is trying to conceive is bromocriptine.
DOC for hyperprolactinemia in pregnancy is bromocriptine.
If the pregnant woman has excessive nausea and vomiting, she is switched to cabergoline.

When a woman with hyperprolactinemia conceives :

- Size of the adenoma can increase due to increased estrogen.
- Birth defects may be seen due to dopamine agonists.

No human studies are done to prove absence of birth defects with bromocriptine.

Dopamine agonists are stopped when a woman with hyperprolactinemia conceives if she is asymptomatic.
Before conceiving, the prolactin levels must be normalized by taking drugs or trans sphenoidal surgery.

Management of prolactinoma in pregnancy 01:12:20

Asymptomatic : No treatment required.
The prolactin levels must be monitored atleast every 3 months and even more frequently in a case of macroadenoma.
Visual field testing must be done in macroadenoma.

If the prolactin levels are ≥ 400 ng/ml, treatment is initiated (bromocriptine) and MRI must be performed.
Treatment is initiated, if the patient develops neurological or visual symptoms.

Symptomatic :
Visual symptoms are seen.
Treatment is needed.

Treatment of hyperprolactinemia in a breastfeeding mother :

- Do not give any drug (dopamine agonists).
- Only exception is when the patient has visual symptoms.
  Cabergoline (preferred) or bromocriptine is initiated.
  Breastfeeding is stopped.

Antibiotics in pregnancy

01:17:10

Antibiotics that are absolutely contraindicated in pregnancy are :

Antibiotic	Contraindication	Leads to
Aminoglycosides like Amikacin, Streptomycin (ATT)	Throughout pregnancy.	Ototoxicity and nephrotoxicity
Tetracyclines. (Doxycycline may be given).	Throughout pregnancy	Affects fetal bone growth and teeth discoloration
Fluoroquinolones	Throughout pregnancy	Toxic to cartilage
Fluconazole	1st trimester	
Nitrofurantoin	1st trimester	
Trimethoprim + Sulfamethoxazole	1st trimester	Neural tube defect
	3rd trimester	Kernicterus in newborn

Antibiotics safe in pregnancy (mnemonic : CAMP).

- Cephalosporins.
- Amoxiclav.
- Metronidazole.
- Penicillin.

Drugs of choice for vaginal infections/PID in pregnancy :

Active space

Condition	DOC
Trichomonas Vaginitis	metronidazole 500 mg BD x 7 days
Bacterial vaginosis	metronidazole 500 mg BD x 7 days or oral clindamycin 300 mg BD x 7 days
Candidiasis	Topical imidazole (clotrimazole or mi[illegible]) x 7 days. Oral azoles : Risk >>> benefit.
Anaerobic infections	metronidazole
Chlamydia	Azithromycin 1 g single dose
Gonorrhea	Inj. ceftriaxone 500 mg IM single dose

Active space

OBSTRETICS - RADIOLOGY INTEGRATION PART I

First trimester scans 00:01:32

Indications :

- Fetal viability.
- Suspected ectopic pregnancy.
- Assessment of gestational age.
- Multifetal pregnancy : number of fetuses and chorionicity.
- Screening for aneuploidy → nuchal translucency.
- Diagnosing congenital anomalies (best time is 2nd trimester).
- To perform USG guided chorionic villi sampling.

Routine USG in pregnancy :

Safe in pregnancy.

Maximum radiation exposure that can be given to a pregnant female : 5 Rads.

During pregnancy : In Ist trimester, TVS is preferred.

All structures are visible early (1 week earlier) on TVS as compared to transabdominal scan.

Frequency of TVS probe = ≥ 5 MHz.

Frequency of TAS probe = 3-3.5 MHz.

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Modes of USG used in OBG :

- Brightness mode (B mode) : used for visualizing all intrauterine structures.

Structures appear :

1. Black : anechoic / hypoechoic.
   Fluids e.g., hydrocephalus, amniotic fluid
2. Grey : isoechoic.
3. White : hyperechoic
   E.g., bones & teeth.

- Motion mode (M mode) :

To detect cardiac activity.

Active space

Doppler is not indicated in early pregnancy to detect cardiac activity of intrauterine pregnancy due to its thermal effects (hyperthermia → teratogen).

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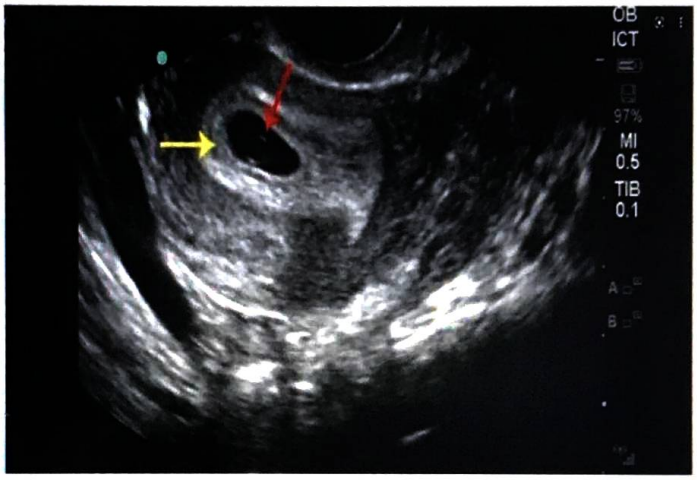
Intrauterine pregnancy

00:05:02

Ist structure seen on USG in pregnancy : Gestational sac.
Ist sign seen on USG in pregnancy : Intradecidual sign (gestational sac is deeply implanted inside endometrium).
Gestational sac appearance : Symmetrical fluid filled area with echogenic rim/ chorionic rim.



Gestational sac can be seen on TVS : 4.5 weeks (4 weeks + 3 days) to 5 weeks.
Gestational sac is not diagnostic of intrauterine pregnancy.
Intra- uterine pregnancy has true gestational sac.
Ectopic pregnancy has pseudo gestational sac.
If female with UPT positive with doubt of ectopic pregnancy / viability → TVS before 4 weeks 3 days is of no use for diagnosis.

Clinical scenario :
Q. A patient comes to your OPD with her last menstrual period 4 weeks back . She denies any symptoms like nausea, fatigue, urinary frequency or breast tenderness . She thinks she may be pregnant because she has not had her periods yet. She is very anxious to find out because she has a history of previous ectopic pregnancy. Which of the following is the

most appropriate action

A. Order a serum quantitative pregnancy test.

B. Listen to the fetal heart sounds by hand held Doppler.

C. Perform abdominal scan.

D. Do a urine pregnancy test.

Explanation :

Doppler can pick up fetal heart sounds by 10 weeks of pregnancy.

At < 4 weeks 3 days → to diffentiate between ectopic & intrauterine pregnancy → serial assessment of HCG (not diagnostic) → TVS to be done after 1 week.

Serial assessment is done.

Intrauterine pregnancies : HCG levels doubles in 48hours.

Ectopic pregnancy : HCG level rises but doesn't double.

Discriminatory score / critical value of HCG :

Value of HCG above which gestational sac should positively (100 % cases) be visible in case of intrauterine pregnancy.

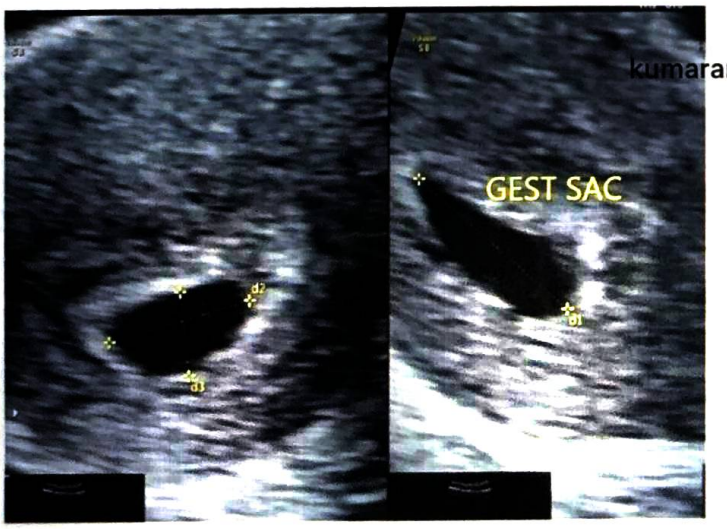
TVS = 2000 IU.

TAS = 6500 IU.

So if the value of HCG is >2000 & no sac is seen → suggestive of ectopic pregnancy.

mean sac diameter : mean of 3 perpendicular diameters of gestational sac.

Can be used to determine gestational age in very early pregnancy.



Appearance of gestational sac : Confirms pregnancy but not location.

- Gestational sac in uterus : True gestational sac of intrauterine pregnancy / pseudo gestational sac of ectopic pregnancy.
- Gestational sac in tube : Suggestive of ectopic pregnancy (not diagnostic).
- 2 gestational sac in uterus : Twin pregnancy (suggestive of dichorionicity).

Yolk sac :

Ist structure to appear inside a gestational sac.

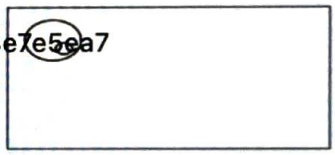
If yolk sac :

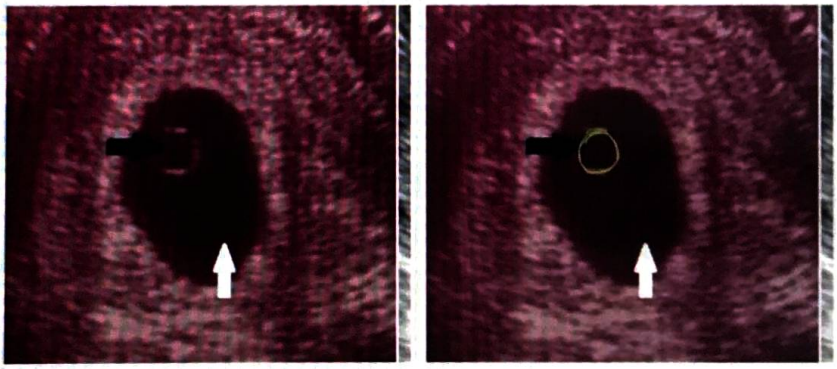
Appears inside intrauterine gestational sac : Confirms intrauterine pregnancy.

Appears inside extrauterine gestational sac (gestational sac in tubes) : Confirms ectopic pregnancy.

Seen on TVS at 5 weeks.

It appears like a single bleb like structure inside gestational sac.

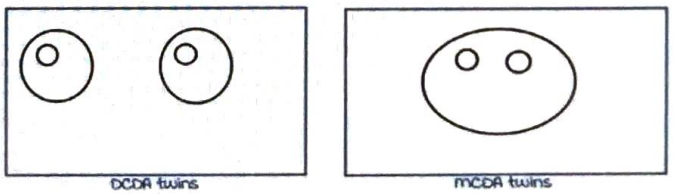




In twin pregnancy :

Gestational sac : marker of chorionicity.

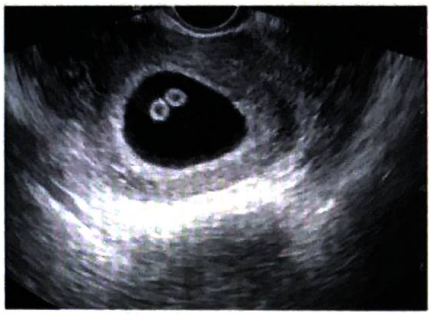
Yolk sac : marker of amnionicity.



Dichorionic diamniotic twins/DCDA : 2 gestational sacs & 2 yolk sacs.

Monochorionic diamniotic twins/MCDA : 1 gestational sac & 2 yolk sacs.

Best time to determine chorionicity : USG at 10-14 weeks.



MCDA

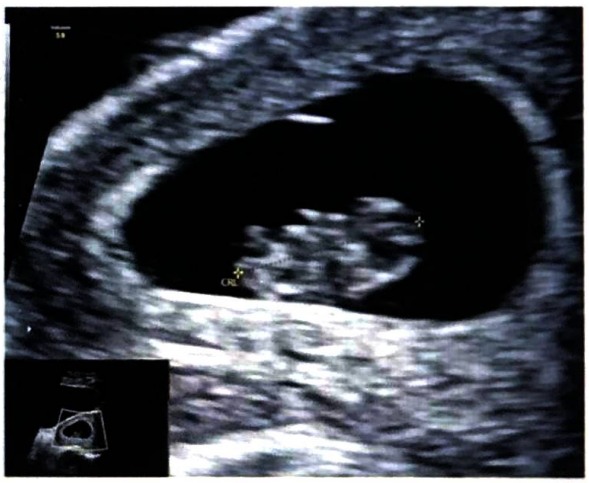
Fetal pole :

Seen on TVS between 5 weeks - 5.5 weeks (5 weeks 3 days).

When fetal pole is visible :

Crown rump length can be measured : Distance between cephalic pole & rump.

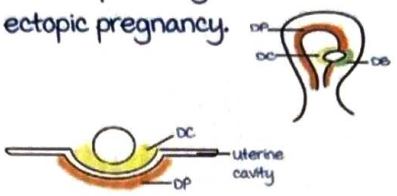
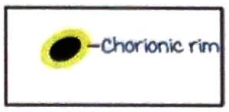
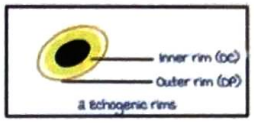
Significance : If fetal pole is seen in yolk sac in a gestational sac situated in the tube with/ without cardiac activity → confirms ectopic pregnancy.

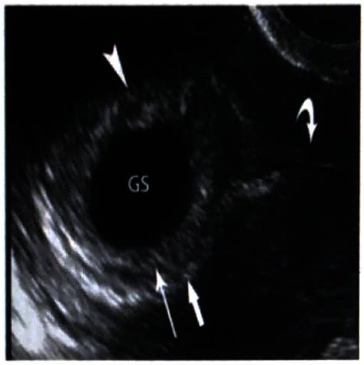


Critical cut off to visualize fetal pole / CRL is gestational sac diameter, which is 25mm → mean sac diameter (MSD).

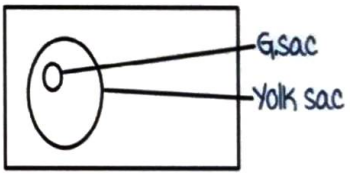
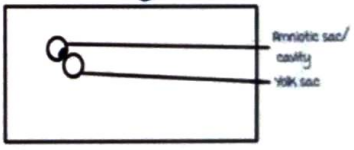
If MSD is >25mm & fetal pole is not seen → Anembryonic pregnancy / blighted ovum.

Active space

Structures seen in pregnancy	Signs of pregnancy on USG
1. Gestation sac seen. Gestation sac grows. Double decidual sac sign is not seen in pseudo gestational sac of ectopic pregnancy.  	Intradecidual sign (1st sign).  Double decidual sac sign. 

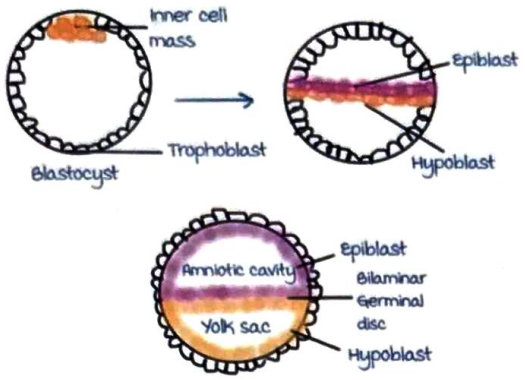


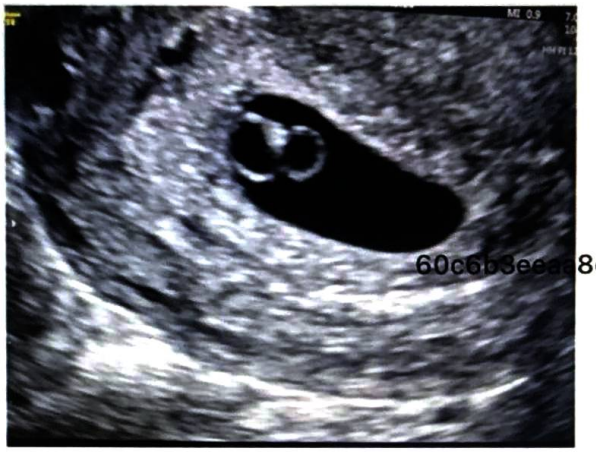
Double decidual sac sign : Seen on USG by 4.5 –5 weeks.
Presence of double decidual sac sign is diagnostic of intrauterine pregnancy.
But its absence is not diagnostic of ectopic pregnancy.

Structures seen in pregnancy	Signs of pregnancy on USG
2. Yolk sac seen. Visible by 5 weeks. Degrades by 10–12 weeks.	Appears like a bleb. 
3. Fetal pole seen.	Double bleb sign. 

Cavity surrounded by hypoblast : Yolk sac.
Cavity surrounded by epiblast : Amniotic cavity.

Active space





On USG :

Ist structure seen.

True gestational sac : Seen in intrauterine pregnancy.

Due to implantation of blastocyst.

Pseudo gestational sac : Seen in ectopic pregnancy.

Due to hormonal changes of pregnancy → decidua becomes thick & appears like a gestational sac.

	True gestational sac	Pseudo gestational sac
Location	Eccentric	Central
Growth	Grows by 1 mm/ day	No
Double decidual sac sign	Yes	No
Yolk sac	Yes	No
Double bleb sign	Yes	No

Assessment of viability of the pregnancy :

Cardiac activity : Can be seen on TVS between 5.5 to 6 weeks. Assessed by M mode.
Criteria for non viability :
mean sac diameter >25mm ; no fetal pole / embryo seen → blighted ovum / anembryonic pregnancy
If CRL > 7 mm with no cardiac activity → missed abortion.

Case # 1 :
Primi with UPT positive , beta HCG 500 IU.
On USG, gestational sac not seen.
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Next step → Check critical titre/ discriminatory score of beta HCG.
Repeat USG after 1 week.

Case # 2 :
Primi with UPT positive , beta HCG 2800 IU. Gestational sac is 13mm, yolk sac seen but CRL is not seen.
Next step → Repeat USG after 1 week.
Beta HCG can be repeated after 48 hours as in early pregnancy , beta HCG levels nearly double.
In cases of ectopic pregnancy , the increase will be less than intra uterine pregnancies.
In cases of non- viable pregnancy → the beta HCG will decrease.

Case # 3 :
Primi with 6 weeks ammenorrhea , comes with bleeding PV.
On USG → gestational sac is 18mm. No yolk sac. No embryo.
Next step → Repeat USG after 1 week, as gestational sac < 25mm.
No more cut off for the size of gestational sac for the assessment of yolk sac.

Active space

USG findings of ectopic pregnancy 00:42:06

Signs of ectopic pregnancy on USG :
Diagnostic of ectopic pregnancy :
Gestational sac with yolk sac / fetal pole +/- cardiac activity

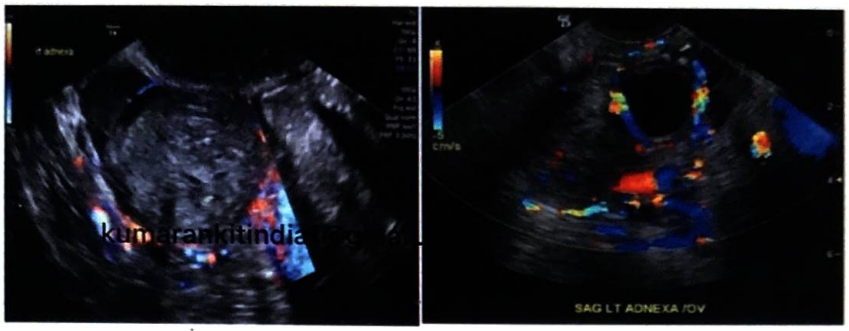
in fallopian tube.

Suggestive of ectopic pregnancy :

Empty uterus.

Complex adnexal mass.

Increased vascularity : Ring of fire appearance.



Gestational age estimation 00:45:11

Clinically estimated date of delivery (EDD) by adding 9 months to the first day of the last menstrual period (LMP).

Gestational age is calculated from the first day of LMP to the day of examination.

Clinical estimation not reliable in :

- History of OCP intake (pregnancy due to OCP failure).
- Patient was lactating.
- Irregular cycles.
- LMP is unknown.
- If uterine size on examination is different from predicted LMP.

Best investigation : USG, as clinical estimation not reliable.

Gestational age estimation by USG :

Trimester	Parameter used
T1	Crown rump lenghth
T2	Biparietal diameter.
T3	Combination of fetal biometic parameters (best). Femur length (2nd best).

The earlier the USG is performed in pregnancy, more accurate is the estimation of gestational age.

Active space

Best time to do USG to determine gestational age of fetus : T1.

Best parameter on USG to determine gestational age of fetus : CRL.

Special circumstances :

For twins, if there is a discrepancy between the twins in biometric measurements, then EDD should be calculated based on measurement of larger twin.

Suboptimally dated pregnancy : If no USG is done by 22weeks.

In such cases , no single USG can confirm EDD, serial USG done 3-4 weeks apart to rule out IUGR & confirm EDD.

In pregnancy with uncertain LMP & late first USG :

Ossification of distal femoral epiphysis suggests gestational age of 32 weeks.

Ossification of proximal tibial & humerus epiphysis suggests gestational age of 35 weeks.

Estimation of Gestational age :

1st trimester :

Best : CRL.

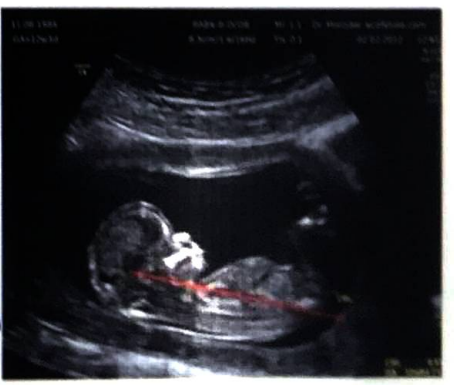
Used till 13weeks + 6days (CRL < 84 mm) → after which BPD should be measured for gestational age.

Smallest CRL which can be measured : 5mm.

CRL / Crown rump length : Longest straight measurement of embryo, measured from outer margin of cephalic pole to rump.

measured most accurately between 7-9 weeks (variation +/- 5 days).

At 9 -13 weeks +6 days the variation is +/- 7 days.



Gestational age in days = CRL (mm) + 42.

Other USG parameters used in TI for gestational age : mean sac diameter (uptil 7 weeks).
Gestational age in days = MSD (mm) + 30.
E.g. MSD is 5mm ; gestational age = 5+ 30 = 35 days/5 weeks.

Smallest gestational sac diameter which can be measured : 2-3 mm.
Gestational sac measurements are less accurate when fetal pole is seen.

Role of 1st trimester USG in multifetal pregnancies :

- Confirming number of fetuses.
- Determining gestational age.
- Determiing chorionicity.

In twin pregnancy , twins can be :

- Dizygotic : Always dichorionic and diamniotic (2 ova fertilized by 2 sperms).
  may be same/different sex.
- Monozygotic : may be monochorionic/dichorionic depending on when the division happens (1 ova fertilized by 1 sperm forming a zygote which splits into 2).
  Always have same sex.

OBSTETRICS - RADIOLOGY INTEGRATION : PART 2

USG in second trimester 00:00:30

- Best time to detect gross congenital anomalies
- For measuring cervical length (marker : preterm labour)
- For measuring amniotic fluid
- For fetal growth
- For gestational age (best time : first trimester)
- To assist amniocentesis
- For placental localization (best time : third trimester)

Second trimester USG for detecting Gross congenital anomalies :

- Best USG : Anomaly scan, level 2 scan , TIFFA (Targeted imaging for fetal anomaly)
- Best time : 18-20 weeks, Done in all females irrespective of age and disease condition.

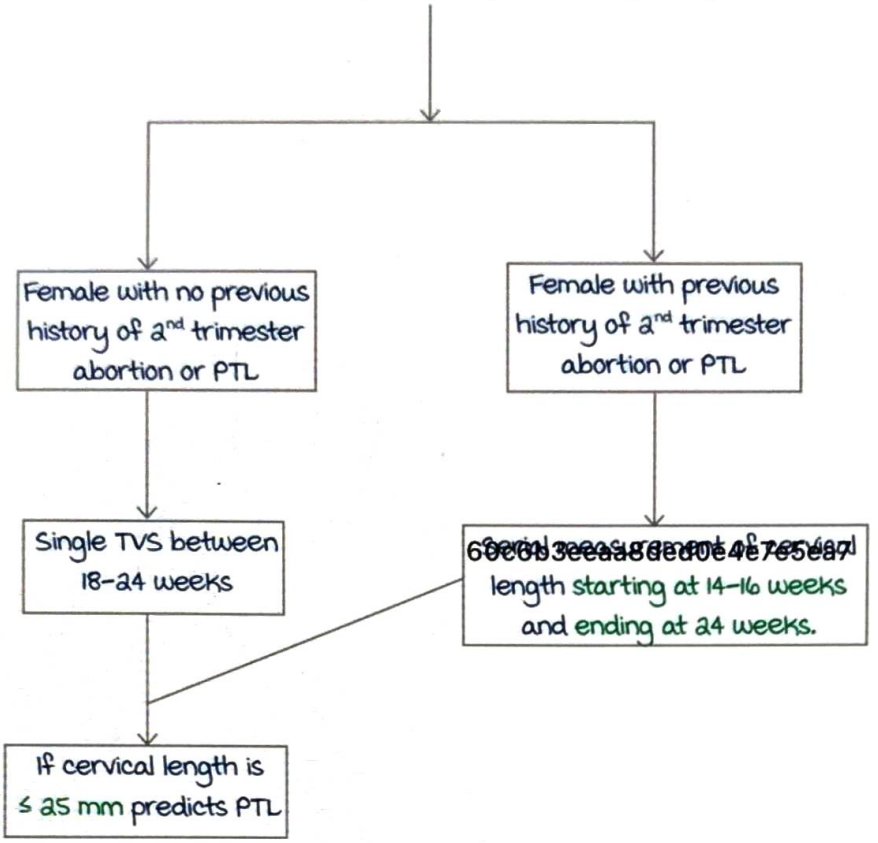
E.g. : In a pregnant female with gestational diabetes level 2 scan should be done, even though the risk of congenital anomalies are not there.

If only one USG is to be done in entire pregnancy, level 2 anomaly scan should be done between 18-20 weeks.

Second trimester USG for measuring cervical length 00:04:26

Principle as the cervix dilates the length of the cervix shortens.

Measuring cervical length is a method to predict pre term labor (PTL) done by transvaginal sonography/TVS



Second trimester USG For measuring amniotic fluid

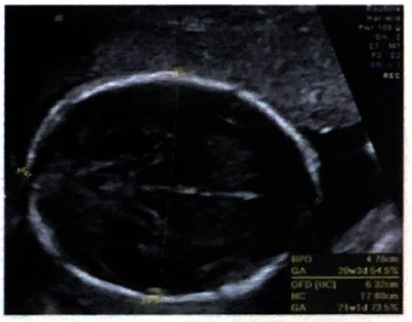
Two methods

- Amniotic fluid index.
- Single vertical pocket: most sensitive.
  (Please refer the amniotic fluid video for complete details)

Second trimester USG for measuring gestational age :

During Second trimester , the parameter used for measuring gestational age is Biparietal diameter(BPD)

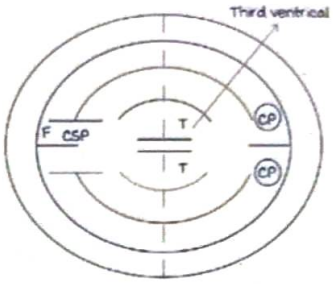
- BPD should be used for estimating the gestational age from 14 weeks onwards upto the second trimester or when the crown rump length is > 84 mm
- measured from outer table of one side to the inner table of the other side.
- It corresponds to the largest transverse diameter of the skull.



Active space

- If shape of skull is abnormal (ex brachycephaly) measure the Head circumference.

The plain in which BPD is measured should show the following structures :



CP choroid plecxus

F -falx cerebri

T- thalamus

CSP : cavum septum pellucidum

Second trimester USG for soft tissue markers of aneuploidy

If two or more than two are present then screening is positive for aneuploidy

- Nuchal skin fold thickness more than or equals 6 mms
- Absent nasal bone
- Shortened long bones
- Pyelectasis – anteroposterior diameter of renal pelvis > or equals 4 mm
- Echogenic intracardiac fold
- Echogenic bowel
- Choroid plexus cyst

One single marker which if present in isolation poses the highest risk of aneuploidy is Nuchal skin fold thickness (most sensitive marker) > short femur

One single marker which if present in isolation poses the least risk of aneuploidy is choroid plexus cyst (least sensitive marker)

USG in third trimester

00:12:54

It is the Best time for placental localization.

Estimating gestational age : A combination of all the fetal biometric parameters should be used but if a single best parameter is too be chosen it is femur length.

Short femur

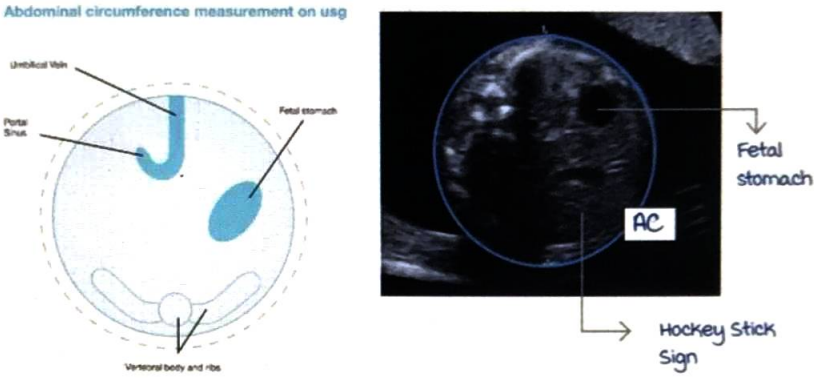
- Normal(constitutional delay/ shortening).
- marker of aneuploidy(trisomy 21).

Severely short femur (<5 percentile)

- Skeletal dysplasia.
- Early onset of fetal growth restriction.

For fetal growth assessment by USG
Single best parameter is Abdominal circumference of the fetus.

Abdominal circumference measurement on usg



AC is measured at the place of largest diameter of fetal liver denoted by union of right and left portal vein
AC should be measured when the transverse section through abdomen demonstrates

- Fetal stomach
- Umbilical vein
- Portal sinus

Following structures should not be visible

- Kidney
- Cord insertion

If AC > or equals 35 cms then it indicates macrosomia
For estimation of fetal weight
Clinically : Johnson formula used

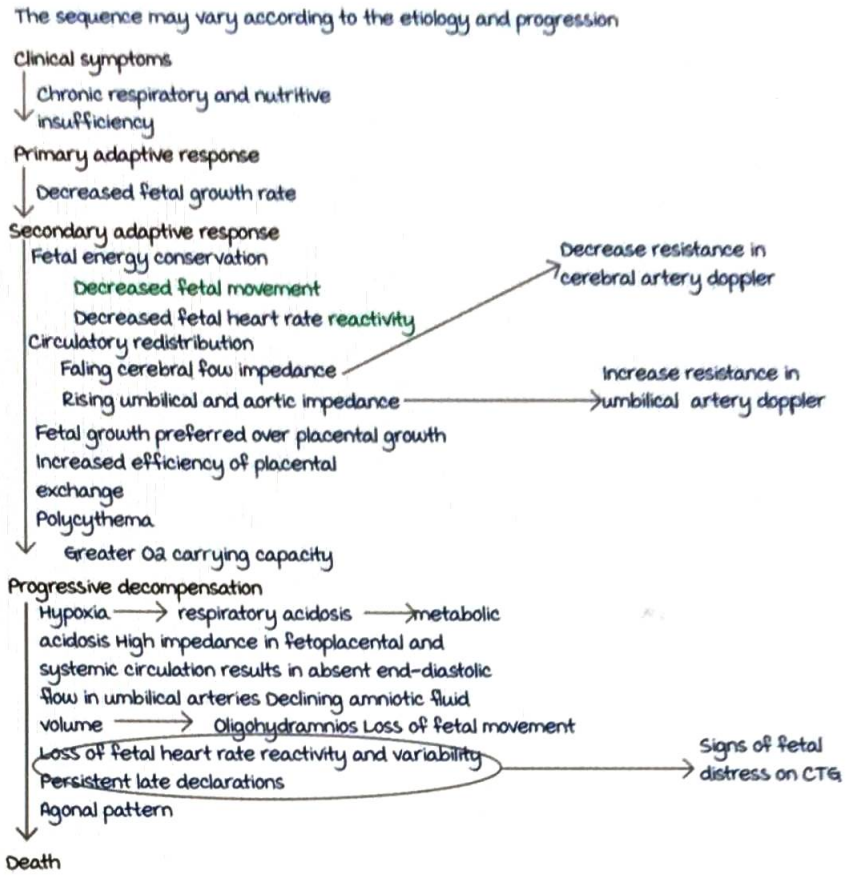
Head engaged : Estimated fetal weight in grams = (fundal height in centimeters − 11) X 155
Head not engaged : Estimated fetal weight in grams = (fundal height in centimeters − 12) X 155

On USG : best is a combination of HC,AC, FL,BPD using Hadlock formula and shephard formula

Fetal distress

00:21:04

Decreased fetal movements can be early marker of fetal distress.



Concepts regarding fetal stress and use of doppler

00:28:05

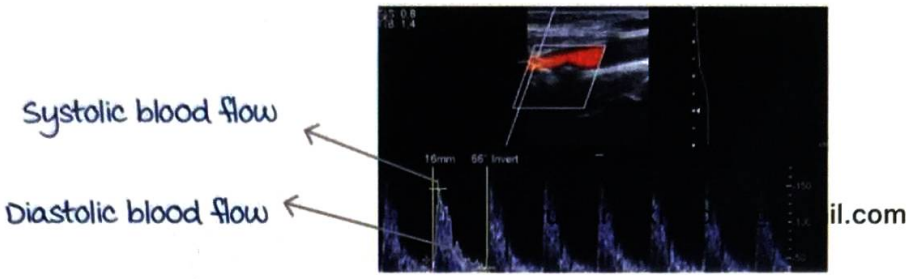
Concept 1 : During fetal distress / maternal stress fetus will regulate the blood flow by sending more blood to brain rather than systemic circulation so resistance in umbilical artery will increase and cerebral artery will decrease.

Concept 2 : As Umbilical artery is not innervated, it only responds to vasoactive substances present in circulation.
In PIH imbalance between vasoconstrictive substances and vasodilatory substances as vasoconstrictive substances increase , vasodilatory substances decreases.
Umbilical artery doppler is a better indicator of Uteroplacental insufficiency and pregnancy induced hypertension.

Concept 3 : When the resistance increases the blood flow during diastole is affected not during systole as systolic blood

flow depends on contraction of heart and not resistance of the vessel.

Normal waveform of umbilical artery doppler 00:34:46



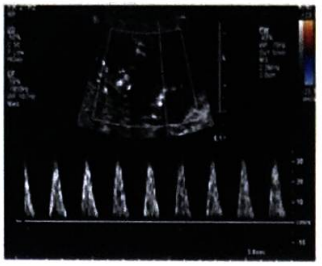
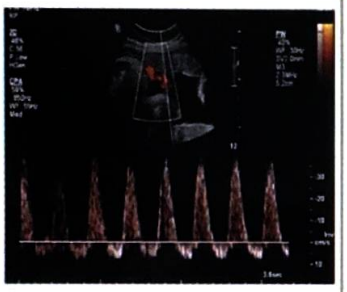
Normally pregnancy advances

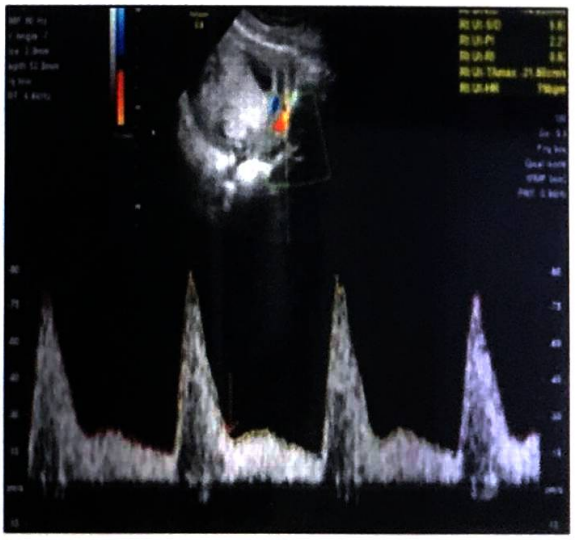
- Progesterone increases
- Vasodilation occurs
- Resistance in umbilical artery decreases
- Flow at systole : normal
  Flow at diastole : increases
- S/D ratio decreases in normal pregnancy

In females with PIH

- Increased vasoconstrictive substances
- Blood going to placenta is decreased
- Increased resistance of umbilical artery
- Blood flow during systole in umbilical artery: normal
  Blood flow during diastole : decreases
- S/D ratio: increases
  If S/D ratio >/= 3 at 28 weeks
- Indicates adverse outcome

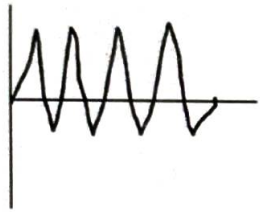
Active space

Waveform	called as	management
	Absent end diastolic flow	>34 weeks : termination of pregnancy < 34 weeks : corticosteroid, weekly doppler, non stress test (NST), Bio physical profile (BPP)
	Reversed end diastolic flow	>32 weeks : termination of pregnancy < 32 weeks : corticosteroid injections, weekly doppler, NST, BPP



Uterine artery Doppler with diastolic notch (arrow)

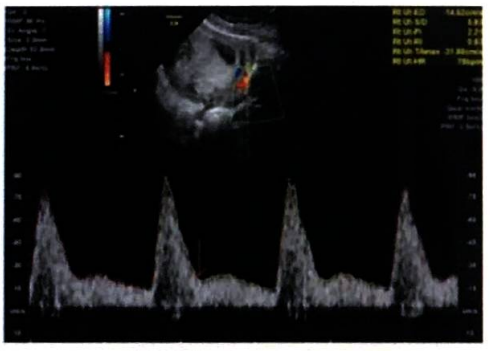
Umbilical artery waveform

Waveform	Called as	Management
 60c6b3eeaa8ded0e4e7e5ea7	Absent EDF	33 – 34 weeks : Deliver < 33 weeks : Consider hospitalisation, corticosteroids, NST 1 to 2 times daily, umbilical artery Doppler 2 to 3 times weekly, foetal growth every three weeks.
	Revered EDF	30 – 32 weeks : Deliver. < 32 weeks : Same as AEDF. Compulsory hospitalization.

Use of umbilical artery doppler 00:42:24

- Fetal surveillance in PIH
- Fetal surveillance in IUGR
- Fetal surveillance in discordant growth of twins
- Fetal surveillance in twin to twin transfusion syndrome

Uterine artery doppler :



Uterine artery Doppler with diastolic notch

Doppler USG that can predict that a pregnant female might have PIH in her pregnancy is Uterine artery doppler. Done between 22 to 24 weeks and it helps in identifying females destined to develop pre-eclampsia.

Active space

2 indicators :

1. Persistence of diastolic notch beyond 22 to 24 weeks.
2. Increased pulsatality index or increased resistance (>/= 95 percentile).

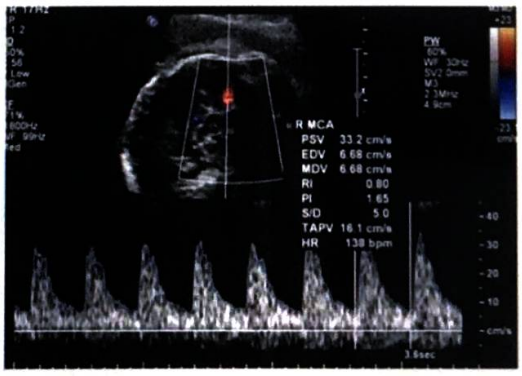
Normally in uterine artery doppler there is a diastolic notch but as pregnancy advances and resistance decreases , the diastolic notch disappears

Persistence of diastolic notch beyond 22-24 weeks of pregnancy/resistance index is high in uterine artery : It is associated with increased chances of PIH.

- Sensitivity of abnormal uterine artery doppler for predicting pre-eclampsia is 20 to 60%.
- Recently : Uterine artery Doppler is being done between 11 to 13 weeks : Helps to predict early pre-eclampsia.
- Uterine artery Doppler predicts severe pre-eclampsia, which might lead to intrauterine growth restriction.
- But it is not routinely used for predicting pre-eclampsia or intrauterine growth restriction.

Peak systolic velocity of middle cerebral artery :

- The best tool for assessing fetal anemia (eg., Rh Iso immunised pregnancy) Is middle cerebral artery Doppler.
- It is inversely proportional to the fetal hemoglobin levels.
- In cases where Peak systolic velocity of middle cerebral artery > Or equals 1.5 MOM indicates severe anemia



Peak systolic velocity of middle cerebral l artery

Polycythemis is indicated in middle cerebral artery if PSV < 0.8. Twin anemia polycythemia sequence : PSV of middle cerebral artery will be >/= 1.5 MOM one twin (anemic), the other will have <0.8 MOM (polycythemia).

OBSTETRICS AND MEDICINE INTEGRATION

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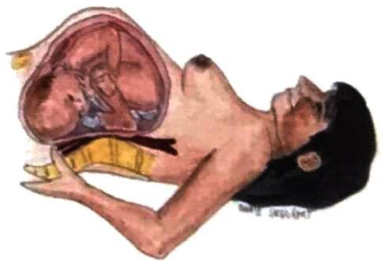
Cardiac disease in pregnancy

00:00:41

Increases	Decreases
1) Cardiac output : = stroke volume x heart rate. Cardiac output : • Starts to increase by 5 weeks. • Maximum increase in CO occurs by 30 weeks. • Overall maximum cardiac output/ maximum chances of heart failure in pregnancy : Immediate postpartum ↓ 2nd stage of labour ↓ Late 1st stage of labour ↓ 28-32 weeks of pregnancy	1) Peripheral vascular resistance : Mechanism : • Main hormone : Progesterone ↓ Smooth muscle relaxant ↓ Vasodilation ↓ Decreased PVR • Estrogen and progesterone cause resistance against vasopressors leading to vasodilation.

Active space

a) Femoral venous pressure : Gravid uterus presses on IVC. ↓ Venous return decreases. ↓ Pooling of blood in lower limbs. ↓ FVP increases from 8 mmHg to 24 mmHg ↓ 1) Varicose veins. 2) Vulval varicosities. 3) Haemorrhoids. 4) Stagnation of blood in lower extremities leading to increased risk of DVT & pulmonary embolism.	a) Blood pressure : Systolic BP. Diastolic BP. Maximum reduction in BP : • Diastolic BP • Maximum in 2nd trimester • In supine position. Supine hypotension syndrome In late 3rd trimester : Lie supine. ↓ Gravid uterus presses on IVC. ↓ Venous return decreases. ↓ Cardiac output decreases. Mother : Hypotension. Fetus : Fetal distress. Best position : Left lateral > Right lateral. 

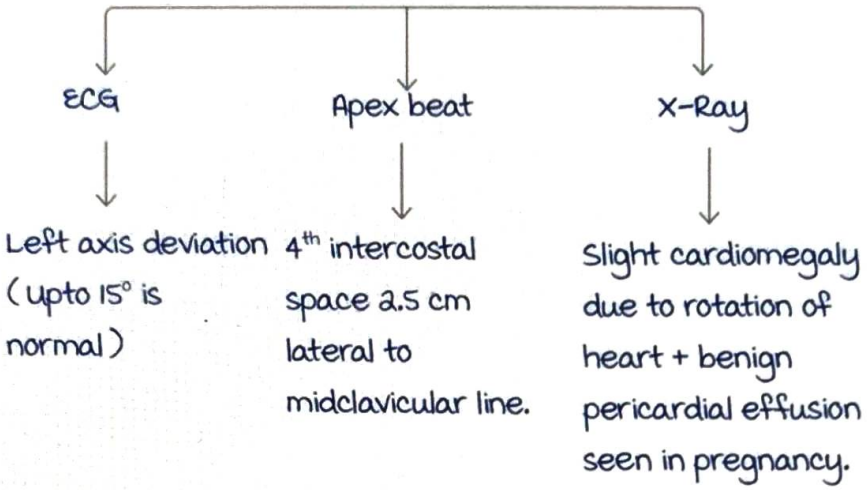
Parameters which remain unchanged during pregnancy :

- JVF
- Antecubital venous pressure.
- LV ejection fraction.

Changes in clinical indicators of heart during pregnancy :

Heart rotates upwards and outwards as it is pushed up by the diaphragm.

Patient experiences palpitations.



1. Pulse rate increases.
2. Blood pressure decreases.
3. Heart sounds :
   S_1 : Loud and prominent split.
   S_2 : Normal.
   S_3 : Easily heard.
4. Murmurs :
   - Ejection systolic murmur (< 3/ 6).
   - Continuous machinery murmur.
   - Diastolic murmur in 15–20%.

All cases of diastolic murmurs in pregnancy requires evaluation as it denotes heart disease in 80% of cases.

ECG	Chest XRAY
Left axis deviation	Apparent cardiomegaly
Non specific ST-T changes	Straightening of left heart border
ST depression	

Active space

Symptoms :

1. Chest pain.
2. Progressive dyspnea.
3. Orthopnoea/ PND.
4. Syncope.
5. Symptoms and signs of heart failure/ pulmonary edema.

Signs

1. Persistently engorged neck veins (increased JVP)
2. Clubbing.
3. Cyanosis.
4. Marked cardiomegaly on X Ray.
5. S_2 : Loud with prominent split.
6. S_4 : Audible.
7. Murmurs :

- Ejection systolic murmur >3/6 or thrill.
- Presence of diastolic murmur.

If criteria for pulmonary HTN is fulfilled or there is persistent tachcardia/ arrythmia -o- heart disease.

Most common heart diseases in pregnancy 00:12:20

- most common heart disease in pregnancy : Rheumatic heart disease - Mitral stenosis.
- 2nd most common heart disease in pregnant female : ASD.
- most common congenital heart disease in pregnancy : ASD.
- most common congenital valvular heart disease during pregnancy : Mitral valve prolapse.
- most common cyanotic heart disease during pregnancy : TOF.
- Heart disease with the highest risk of maternal mortality or the worst prognosis :

  Eisenmenger's syndrome : mortality rate : 30-50%.
  most common time of death is at the time of delivery or within 1 week of delivery.
  most common cause of death : RVF with cardiogenic shock.

According to ACOG, Eisenmenger's is absolute contraindication to pregnancy.

Eisenmenger's syndrome is secondary pulmonary

hypertension which arises from any cardiac lesion. The most common underlying defects are ASD, VSD or PDA.
Normal pulmonary arterial pressure = 12-16 mmHg.
Pulmonary hypertension : ≥ 25 mmHg.

Risk factors for heart disease in pregnancy :

According to ACOG, there are 4 maternal risk factors which are related to cardiovascular disease morbidity & mortality.

- Race/ ethnicity : Highest in African-American females.
- Age ≥ 40 years.
- Hypertension (all types).
- Obesity.

Scoring system for heart disease in pregnancy :
WHO classification (4 classes) :
Class I : Asscociated with least morbidity.
Class IV : Associated with highest morbidity & mortality.
All class IV diseases are absolute contraindications of pregnancy.
Preconceptional advice given not to conceive.
CARPREG score : For aqcuired cardiac disease.
ZAHARA score : For congenital heart diseases.

Heart diseases in which pregnancy is contraindicated :

1. Eisenmengers syndrome (secondary pulmonary hypertension) or
   Primary pulmonary hypertension
2. Severe aortic dilatation.
3. Severe aortic coarctation.
4. Severe left heart obstruction where ejection fraction < 30% :
5. History of peripartum cardiomyopathy with residual dysfunction.
6. Fanton's surgery done with residual defect.
7. NYHA class III (dyspnea with less than normal activity) or IV (dyspnea at rest).

Active space

Management of NYHA class I/II :
Routine ANC.
Review at 28-30 weeks of pregnancy.
Deliver at term.

Class III/IV :
In T1 : Advice MTP.
In T2 & T3 : Admit and treat cardiac failure and pulmonary edema.
Remain hospitalised and delivery at term.

Heart disease seen in following conditions :

Condition	MC heart disease
Turner's syndrome	Bicuspid aortic valve 2nd MC : Coarctation of aorta.
Down's syndrome	Endocardial cushion defect > ASD.
Rubella infection	PDA (congenital rubella syndrome).
Lithium intake by mother	Ebstein anomaly in fetus (Tricuspid regurgitation)
Pregestational diabetes	MC congenital anomaly : Cardiovascular anomaly. MC cardiovascular anomaly : VSD. most specific cardiovascular anomaly : TGA. most specific anomaly of fetus in pregestational diabetic mother : Sacral agenesis.

Management of heart disease in labor 00:24:01

- Preferred route : Vaginal delivery.
- Preferable if patient goes into spontaneous labour.
- Induction of labour is safe in heart disease.
- Cervical ripening by PGE_2.
- Induction of labour by oxytocin.
- Misoprost leads to vasospasm, hence not used.

- Position : Semirecumbent position with lateral tilt.
- Pain relief is important as tachycardia due to pain can precipitate heart failure, Epidural analgesia is given.
- monitor half hourly pulse, BP & auscultate lung bases for crepts.

- Restrict IV fluid to 75 ml/ hour.
- Infective endocarditis prophylaxis if indicated.
- Cut short 2nd stage of labour by outlet forceps > vacuum as forceps requires less maternal effect. Known as prophylactic use of forceps or vaccum.

Management of 3rd stage of labour in heart disease :

- Active management of third stage of labour (AMTSL). Uterotonic of choice : Oxytocin. It causes physiological on and off contractions of uterus which is necessary to maintain blood supply to fetus.
  Methyl ergometrine is contraindicated in heart disease patients as it causes tetanic contactions of uterus, where blood in uterus goes back to maternal circulation instead of fetal circulation causing volume overload.
- Give diuretics like IV Furosemide.

For PPH :
Oxytocin is given.
Carboprost can be given for management of PPH, except in patients with cardiac shunts and bronchial asthma, as it can lead to bronchospasm

Indications for cesarean section in heart disease :

1. Aortic aneurysm or dilated aorta > 4cm (e.g Marfan's syndrome).
2. Severe symptomatic aortic stenosis.
3. If there is history of recent MI.
4. Need for valve replacement immediately after delivery.
5. If pregnant female is on Warfarin at the time of delivery or within 2 weeks of delivery (time for fetal liver to metabolise warfarin).

Active space

Issues with warfarin :
Warfarin is strong anticoagulant and can cause PPH.
Warfarin can cross placenta and reach fetal circulation. During delivery, due to pressure on fetal head, it can cause intracranial bleed. This can be prevented by LSCS.

When shifting patient from warfarin to heparin at 36 weeks of gestation, either LMWH or UFH can be given.
If shifting to LMWH, it is advised to change to UFH 36 hours before delivery, because :
UFH has shorter duration of action.
Protamine is a stronger antidote for UFH compared to LMWH.
UFH is stopped 6-8 weeks before vaginal delivery and restarted 6 hours before vaginal delivery or 6-12 hours before LSCS.

In LSCS, preferred is epidural anaesthesia.
Indications of regional/ general anaesthesia :
IntraCardiac shunt (flow maybe reversible with exercise).
Severe Aortic Stenosis.
Pulmonary Hypertension (may lead to life threatening hypotension).
(mnemonic : CASH)

Management of intrapartum cardiac failure :
Indicators : HR >100 bpm or RR > 24 bpm with dyspnea.
most important precipitating factor :
1) Chronic hypertension with superimposed preeclampsia.
2) Obesity.
3) High BP.
Management : Aggresive diuresis, β blockers, digoxin.

Prophylaxis for infective endocarditis :
Antibiotics for prophylaxis against infective endocarditis is not given to all females with heart disease in labor as delivery is associated with low risk of bacteremia.
Indication for prophylaxis :

- LSCS : Antibiotics given prior to surgery is enough.

- Vaginal delivery : Given only when the female has
  1. Prosthetic valve or
     Any prosthetic material used in valve repair or
     If repair of heart disease is done with prosthetic material.
  2. H/o prior endocarditis.
  3. Case of congenital heart disease which is :
     - Unrepaired cyanotic heart disease.
     - Repaired within past 6 months.
     - Repaired but residual defects are left.
- DOC : Inj Ampicillin + Inj Gentamycin.
  If allergic to penicillin, Inj Vancomycin + Gentamycin.

Cardiac procedures in pregnancy 00:36:22

Elective cardiac surgery is avoided in pregnancy since cardiopulmonary bypass increases risk to fetus.
However in life threatening conditions, it maybe needed.
For example : mitral stenosis with
Recurrent or intractable pulonary edema.

Cardiac failure not responding to medical management
NYHA class III or IV in early pregnancy.
These are indications to do cardiac surgery during pregnancy.
Surgery : Balloon valvuloplasty.
Time : T2 but if pulmonary edema is intractable it can be done at any gestational age.
Valve replacement is not done in pregnancy.
AHA advises surgical correction in asymptomatic women with mitral valve area < 1.5 cm^2.
Fetal growth restriction can occur when mitral valva area is < 1cm^2.

Peripartum cardiomyopathy 00:38:04

Peripartum cardiomyopathy is characterised by cardiac

failure after 35 weeks of gestation or postpartum upto 5 months.

Conditions :

- Absence of identifiable cause for cardiac failure.
- Absence of recognisable heart disease prior to last mon th of pregnancy.

Coexisting with peripartum cardiomyopathy :

1) PIH.

2) SFLT levels are increased, which is also seen in PIH.

3) Triggering factor : 16 KDa prolactin fragment, also known as vasoinhibin. This fragment is associated with etiology of peripartum cardiomyopathy, hence Bromocriptine is useful for treatment of the disease.

Diagnosis :

Sudden onset of cardiac failure after 35 weeks of pregnancy or within 5 months of delivery.

No identifiable cause.

Echo : Ejection fraction <45% and LV dimensions increased.

Mortality : 5-10%

Recovery : 50% patients recover within 6 months of pregnancy.

Subsequent pregnancy :

Recurrence in next pregnancy : 20%.

Recurrence rate is more in females who did not recover completely.

Hence peripartum cardiomyopathy with residual defect is contraindication for pregnancy.

Renal disorders in pregnancy

00:43:17

Glycosuria is normal in pregnancy.

Occurs due to decreased renal tubular glucose absorption in pregnancy.

Studies have shown that females may develop GDM in future if glycosuria > +1.

Persistent glycosuria of +1 or one reading of ≥ +2 ⟶ OGTT to be done.

Proteinuria ≥ +2 or ≥ 300 mg /24 hours ⟶ Indicates preeclampsia.

Asymptomatic bacteriuria :

Definition : ≥ 10^5 bacteria/ml without symptoms.

MC cause : E.coli.

Risk factors : DM, sickle cell trait.

It can lead to preterm labor.

If untreated, 25% patients ca develop symptomatic infection ⟶ Pyelonephritis.

Screening for asymptomatic bacteriuria (done in 1st ante-natal visit) :

In areas with high prevalence of UTI : Urine culture and sensitivity.

In areas with low prevalence of UTI : Leucocyte esterase & nitrite dipstick (organisms causing UTI convert nitrates ⟶ nitrites).

Recurrence rate : 30% irrespective of treatment.

Treatment :

Single dose of Amoxicillin/ Ampicillin/ Cephalosporin OR Nitrofurantoin at bedtime for 10 days.

Treatment failure : Nitrofurantoin X 21 days.

For recurrence > 1 time : Nitrofurantoin 100 mg at bedtime for rest of pregnancy.

Acute pyelonephritis 00:47:20

It is the most common serious non obstetrical medical complication of pregnancy.

Leading cause of septic shock in pregnancy.

Maternal urinary infection is related to increased incidence of cerebral palsy in preterm newborns.

Most commonly seen in :

- 2nd half of pregnancy.
- Nulliparous female.

Active space

- Young female.
- U/L (Right > left).

Patient presents with fever, chills, pain in the lumbar area.

management :

- Hospitalise patient.
- Obtain blood/urine culture and all other necessary investigations including CBC, serum electrolytes and creatinine – Repeated after 48 hours.
- If dyspnea present : Chest xray.
- Monitor vital signs & urine output.
- IV fluid to maintain urine output at ≥ 50 ml/hr.
- IV antibiotics : Ampicillin + Gentamicin.
- Switch to oral antibiotics after patient becomes afebrile.
- 24 hours after patient becomes afebrile, discharge the patient on antibiotic therapy for 7 to 10 days (10–14 days according to some recommendations).
- Repeat urine culture 1–2 weeks after completing antibiotics.

Liver disorders in pregnancy 00:50:20

Acute fatty liver in pregnancy (AFLP) :
Also known as acute yellow atrophy.
MC cause of acute liver failure in pregnancy.
It is associated with fatty infiltration of hepatocytes without inflammation or necrosis.
Autosomal recessive disorder.

Etiology :
Two explanations given.
1) Deficiency of Long chain 3 hydroxylase CoA dehydrogenase (LCHAD) enzyme in the fetus :
LCHAD is needed for oxidation of long chain fatty acids in the fetus.
Also there is deficiency of MCHAD (medium chain hydroxy acyl dehydrogenase)/ CPT- 1 (carnitine palmitoyl

transferase I)

Due to these enzyme deficiencies, fatty acids accumulate in the fetal liver ⟶ Enters mother's circulation and gets deposited in maternal liver.

2) Maternal genetic mutation which affects mitochondrial fatty acid oxidation pathway. This causes accumulation of fatty acids in maternal liver.

Risk factors :

- Previous h/o AFLP

- Multiple gestations.
- Preeclampsia/ HELLP syndrome.
- Male fetus.

Features of AFLP :

- In liver : Deranged liver function can cause :

Jaundice, abdominal pain , nausea & vomiting, hypoglycemia. Hepatic encephalopathy can occur in 60% in patients.

- In Kidney : Acute renal failure in 60 % of patients.
- Coagulation failure ⟶ Raised PT, aPTT, TT.
- Raised LFT (5 to 10 times).
- S. bilirubin ≥ 5g/dl.
- S. creatinine : ≥ 1.7
- Hypoglycemia (< 92 g/dl).
- Increased serum ammonia levels.

Other complications : Pancreatitis & Central Diabetes Insipidus.

In AFLP, hypertension ± proteinuria may be present. Hence close DD is HELLP syndrome.

In AFLP, hypoglycemia, hyperammonemia, renal failure and clouding of consciousness seen which are not present in HELLP syndrome.

However, AFLP maybe associated with HELLP syndrome in 20-40% of patients.

Active space

Management :
Immediate termination of pregnancy irrespective of gestational age, by induction of labor.
C-section is reserved for obstetric reasons.

Intrahepatic cholestasis of pregnancy :
Reversible in nature.
Seen in 3rd trimester (as levels of estrogen is highest in 3rd trimester).

Etiology :
Increase in estrogen levels.
Also related to increase in progesterone. This is observed when patients treated with progesterone in preterm labour had an increased risk of develping this disease.
Genetic predisposition.
Multifetal pregnancy (increased estrogen + progesterone).

Pathology :
Bile acids are incompletely cleared ⟶ Accumulation of bile acids in plasma ⟶ Mildly deranged LFT.

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Symptoms :
Pruritis :
- Due to bile acids.
- Starts in late T2/T3.
- Predominantly seen on palms & soles.
- Worsens at night causing sleep disruption.

Jaundice :
- Seen in 10-15% patients.
- Starts 1-4 weeks ater pruritis develops.

Bile acids > 10 mmol/l/
Bilirubin is high, but < 6mg/dl.
AST, ALT increases (> 2 times normal).
Decreased absorption of vitamin K ⟶ Vitamin K deficiency.
Maternal prognosis is good.
Symptoms resolve after delivery.

Fetal outcome :

Fetal morbidity & mortality is increased.

- Increased chances of
- Still birth (bile acid > 100).
- Spontaneous/iatrogenic preterm labor.
- Meconium stained liquor.
- Respiratory distress syndrome (regardless of maturity).

Fetal monitoring also does not reliably predict sudden fetal death that occurs in this disease.

Termination of pregnancy is done ≥ 37 weeks.

Induction of labor ⟶ Vaginal delivery.

DOC for mother : Ursodeoxycholic acid.

Recurrence rate in next pregnancy : 45–70%.

Use of oral combined pills can also increase risk of recurrence⟶ Hence they are contraindicated.

Screening for HbsAg must be done in the first booking visit.

HbsAg + (Rate of vertical transmission 10–20%)

- Husband/partner screened for HbsAg and anti-HBs
  - HBsAg + : Immunisation with Hep B vaccine : 0,1,22 months. Use of condoms.
  - Anti HBs + : Husband immune to HBV
- Check for HBeAg at 36 weeks. If present, high rate of perinatal transmission
- Infant : To prevent perinatal infection, Hep B Ig at birth + Hep B vaccine (1st dose) within 12 h of birth. Repeat at 1 & 6 months. HBsAg & anti-HBs tested at 9 months & 18 months to confirm immunity.

Maternal HBV infection is not a contraindication to breastfeeding or vaginal delivery.

CDC recommends that all pregnant females with HBeAg +

and viral load ≥ 10^6–10^8 copies/ml, to prevent transmission, antiviral drug Tenofovir must be given.

Pregnant females who are HBeAg positive or high viral load will have 10% vertical transmission rate regardless of immunoprophylaxis.

ANEMIA IN PREGNANCY : PART I

Facts on anemia 60c6b3eeaa8ded0e4e7e5ea7 00:01:55

- most common indirect cause of maternal mortality in India.
- 50 % of females in India are anemic.
- Half of the global deaths are due to anemia.

Iron requirement during pregnancy :

Total iron required is 1000 mg.

1. One ml RBC needs 1.1 mg iron (as a part of maternal adaptation).
   RBC volume increases by 450 ml during pregnancy.
   Total iron needed for maternal RBC is 450 x 1.1 = 500 mg.

2. Fetus requires 300 mg (by active transport).

3. Iron lost via urine, stool, sweat : 250mg.

Average daily requirement of iron during pregnancy is 4–6 mg (1st trimester : 0.8 mg, 3rd trimester : 7.5 mg).

Iron demands :

Fetus gets iron from mother by active transport (against the concentration gradient).

Applied aspect : maternal anemia will not cause fetal anemia unless it is severe/very severe.

Dietary requirement of iron should be 40–60 mg/day, of which only 10% is absorbed to full daily iron requirement.

Disadvantage : Practical difficulty.

Iron supplementation is mandatory.

Anemia Mukt Bharat Programme/Integrated National Iron Plus Initiative (I-NIPI) :

- Started in 2018.
- Supplies free iron and folic acid tablets (IFA) to all

Active space

pregnant women across India (free of cost).

- Contains Iron as ferrous sulphate (60 mg elemental iron) + Folic acid (500 mcg : meets folic acid RDA in pregnancy).
- 6 beneficiaries (includes pregnant and non pregnant females in reproductive age), 6 interventions, 6 institutional methods.

Interventions under the programme

00:10:52

1. Digital hemoglobinometer (screen for anemia).
2. Iron and folic acid tablets : IFA pill is for prevention.
   Time to take pills : 2 hours after meals/calcium tablet (not to be taken with milk/tea).

Non pregnant females (20–49 years) are advised 1 pill/week

↓

If planning for pregnancy, stop pill and take only folic acid tablet

↓

If conceived, continue folic acid for 3 months

↓

From 4th month of pregnancy : IFA/red pill (to prevent anemia)

↓

1 tablet/day throughout pregnancy + 180 days (to replenish iron stores)

Only folic acid is given to prevent neural tube defects. Ideally, folic acid tablets are started 1 month before planning for pregnany.

3. Deworming (non pregnant females : 400 mg (1 tablet) albendazole twice a year, pregnant females : 400 mg albendazole in 2nd trimester). Also used for prevention.
4. Delayed cord clamping.
5. Food fortification.
6. Addressing other causes.

Anemia in pregnancy

00:18:23

	Physiological	Pathological
Hemoglobin	> 11 gm%	< 11 gm%
Principle	Hemodilution : Plasma volume increases by 40-50% and RBC volume increases by 20-30% (liquid > solid) Hence, hemoglobin concentration decreases (Hb mass increases).	Principle behind pathological conditions
Peripheral smear	Always normocytic normochromic.	Microcytic/macrocytic and hypochromic
Causes	Physiological anemia due to Hemodilution (most common cause of anemia in pregnancy).	Acquired : Nutritional deficiencies anemia (most common pathological cause of anemia in pregnancy : Iron deficiency anemia) • Hemolytic anemia. • Anemia of chronic disease. • Aplastic anemia. Inherited : • Thalassemia (western India) • Sickle cell anemia (central India) • Hemoglobinopathies • Inherited hemolytic anemia

Decrease in Hb concentration will be maximum around 2nd trimester.

Pathological anemia is common is low socio-economic status.

Case scenario 1 : Mrs.A with pre pregnancy Hb 12.6gm%. Her Hb around 11 weeks of pregnancy is 12gm%.

This is physiological anemia, as Hb is > 11gm%

Case scenario 2 : Mrs.B with pre pregnancy Hb 12.6gm%. Her Hb around 11 weeks of pregnancy is 10.6gm%.

This is pathological anemia, as Hb is < 11gm%

Active space

Definition of anemia

00:25:00

WHO (Hb < 11 gm/dl)	CDC
Followed in clinical practice in India. Mild : Hb 10–10.9 gm/dl Moderate : Hb 7–9.9 gm/dl Severe : Hb < 7 gm/dl Very severe (only by ICMR) : Hb < 4gm/dl	1st trimester Hb < 11 gm/dl 2nd trimester Hb < 10.5 gm/dl (hemodilution is highest) 3rd trimester Hb < 11 gm/dl

Effects of anemia on mother :

Directly affected by the pathology.

Placentomegaly : Due to poor oxygenation of fetus.

Antenatal	Intranatal	Postnatal
Maternal stress (release of maternal glucocorticoids → Increases placental CRH → Premature activation of fetal HPA axis → DHEA sulfate release → Placenta makes oestrogen → Pre term labour/PROM)	Uterine inertia (poor contraction due to less oxygen)	Postpartum hemorrhage (poor contraction)
Increased chance of infections : Pre term labour	Maternal exhaustion	Sub involution of uterus
Congestive heart failure : Severe anemia.		Increased chance of sepsis
PIH : Due to placentomegaly		Increased chance of Venous thromboembolism
Folic acid deficiency : Antepartum hemorrhage/ abruptio placenta.		Increased chance of Postpartum depression
		Poor wound healing
		CHF (most common time : Immediately after delivery due to maximum cardiac output)

Effect of anemia on fetus :

Indirectly affected by the pathology.

- Prematurity because of preterm labour (fetal stress).
- Low birth weight.

History taking in anemia of pregnancy 00:37:14

Any present H/O

1. Weakness, tiredness, lethargy, light headedness.
2. Dyspnea (in case of progressive dyspnea : Rule out heart diseases, CHF).
3. Palpitation.
4. Orthopnea.
5. Edema (physiological : Relieved by rest, rule out protein deficiency).
6. Loss of appetite.
7. Presence of helminthic worms in stool.
8. Bleeding tendency like hematemesis, hematuria.

Any past H/O :

- Chronic kidney, liver diseases, rheumatoid arthritis.
- PICA (flare up during pregnancy).
- Tuberculosis (rule out family history).
- Hyperemesis gravidarum.

Assess menstrual irregularities like previous menorrhagia (H/O number of sanitary pads used, quantity of blood loss).

Rule out parenteral iron therapy, blood transfusion, repeated abortions in previous pregnancy.

Physical examination 00:40:58

General :

Assess pallor in eyes, oral mucosa, nail bed, palmar crease, vaginal mucosa.

Assess shape of nails :

- Koilonychia : Distorted nails.
- Platynychia : Flat nails.
- Yellowish discoloration (Jaundice) + Pallor : suspect hemolytic anemia (heme breakdown product is bilirubin)

Rule out glossitis/cheilosis (folic acid deficiency).

JVP measured in semi reclined position at 45 degree from sternal end of clavicle ≥ 8cm of H_2O (indicates CHF).

If JVP is ~3cm from sternal end of clavicle, it is roughly 8cm of H_2O because right atrium is ~5cm from clavicle.
JVP remains normal during pregnancy.
Look for leg ulcers (to rule out sickle cell anemia).
Examine for lymphadenopathy (to rule out chronic diseases).

Laboratory diagnosis

00:46:14

Hb screening is done using digital hemoglobinometer.
As per International guidelines :
Check for Hb twice at 1st antenatal visit and during 28 weeks of gestation.
As per Indian guidelines (MOHFW) :
Check Hb 4 times in an antenatal woman (minimum 4 antenatal visits).

If Hb < 11 gm% upon screening, evaluate further :

- Complete blood count with reticulocyte count.
- Peripheral smear.
- Hb electrophoresis (suspected sickle cell anemia/thalassemia).

Use Mentzer index to differentiate between IDA and Thalassemia.
MCV (normal : 80–85 fl) / RBC count (normal : 75–100 million/microlitre).
< 13 : Thalassemia.
> 13 : IDA.

Range of MCV in pregnancy is 75–100fl
80–85fl is the average MCV in majority of pregnant women.

Microcytic anemia : MCV <75fl.
Macrocytic anemia : MCV >100fl.

Differential diagnoses using peripheral smear 00:52:30

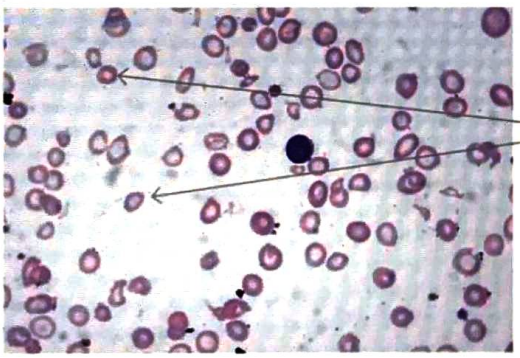
Microcytic anemia	Macrocytic anemia
IDA (MCHC < 30%)	Vit B_{12} deficiency
Thalassemia	Folic acid deficiency
Sideroblastic anemia (lead poisoning)	Anemia of liver disease
Anemia of chronic diseases (can be normocytic normochromic)	Thyrotoxicosis

Most sensitive RBC index for IDA : MCHC (Nomral values : 34 – 37%).

Earliest/best/most sensitive parameter to detect IDA : Serum ferritin levels (storage form). Seen in 1st stage of IDA.

Normal values of Iron study parameters :

S. Ferritin 20–200 mcg/dl (If > 100 : normal, IDA < 10). Stores of ferritin is depleted at a value <20mcg/dl.
S. Iron in IDA < 40 mcg/dl.
TIBC 325–400 mcg/dl (In IDA, TIBC > 410, also increased in anemia of chronic diseases).
S. Iron/TIBC : Transferrin saturation normally [illegible] (In IDA < 10%).



S. Hepticidin : Helps to differentiate IDA from anemia of chronic diseases.
Decreased in IDA.
Increased in anemia of chronic diseases.

Gold standard method to diagnose IDA : Bone marrow biopsy (absence of stainable iron). Not used as it is invasive. It is the last investigation to be done.

Active space

ANEMIA IN PREGNANCY : PART 2

Treatment of iron deficiency anemia in Pregnancy

00:00:12

By 3 different methods :

Oral iron therapy.

Parenteral iron therapy.

Blood transfusion.

Oral iron therapy :

2 IFA tablets/day.

Hb increases 3 weeks later at a rate of 0.7 gm/dl/week.

> Scenario : 22 week pregnant female had Hb 8gm%. She was given 2IFA tablets/day. Her Hb count 3 weeks later was 8.7gm% & 9.4gm% on 4th week.

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Hence, Hb levels can be checked every month (because of marginal rise in value every week).

Reticulocyte count is a better marker than Hb (increases within 7 days, maximum by 10 days).

If Hb increases < 1 gm% after 1 month : Inadequate response (most common cause is non-compliance).

To evaluate non-compliance : Ask for stool colour (dark color)

Alternative options in non-compliant patients :

- Change the salt of iron in affordable patients from ferrous sulphate in IFA to ferrous fumarate.
- Unaffordable patients : Parenteral therapy.

In compliant patients with adequate response :

Continue 2 tablets/day till Hb is 11 gm% followed by maintenance dose (1 tablet/day) throughout pregnancy and 180 days post delivery (to replenish stores).

Parenteral iron therapy

00:07:33

Indications :

- Non-compliant patient.
- Non tolerant patient (gastritis, nausea, vomiting with oral iron).
- Indications based on gestational age.

Calculating parenteral iron dosage in mg :
Using Ganzoni formula (as per MOHFW) :

[2.4 x weight in Kg x Hb deficit] + 500 mg

↓ (pre pregnancy) ↓ (11 – patient's Hb) ↓ (for storage)

> Scenario : Calculate dose of parenteral iron in a non-compliant pregnant female with pre-pregnancy weight of 45Kgs and recent Hb being 10gm%.
> Solution : 2.4 X 45 X 1 (11–10) + 500 = 608 mg.

Parenteral iron approved by Government of India :

- Iron dextran (1st generation): No more used (Z technique : Deep IM).
- Iron sucrose (2nd generation) : most commonly used.
- Ferric carboxy maltose (3rd generation) : Best but expensive.

One Vial contains 5 ml/100 mg iron sucrose (1 ml = 20 mg iron sucrose).
2 Vials (200mg) diluted with 100ml of normal saline = 2 mg/ml.
Infusion rate : 15–20 drops/min for initial 5 minutes (slow drop rate to check for anaphylactic reaction though rarely seen).

If no reaction is seen, increase drop rate to 80–90 drops/min.
Maximum Iron sucrose/day : 200 mg. Hence, only 2 vials.
Maximum Iron sucrose/week : 600 mg (3 injections given on alternate days).

Switch between oral and parenteral Iron therapy

00:15:48

Stop oral iron : 1 day before and for atleast 4 weeks after parenteral therapy.
(Flush IV line before and after the injection).

Adverse effects of parenteral iron therapy :
Headache, nausea, dizziness, constipation/diarrhoea, injection site reaction.

Contraindications for parenteral iron therapy :

- 1st trimester.
- Hemochromatosis.
- Thalassemia major (Nestroff test positive).

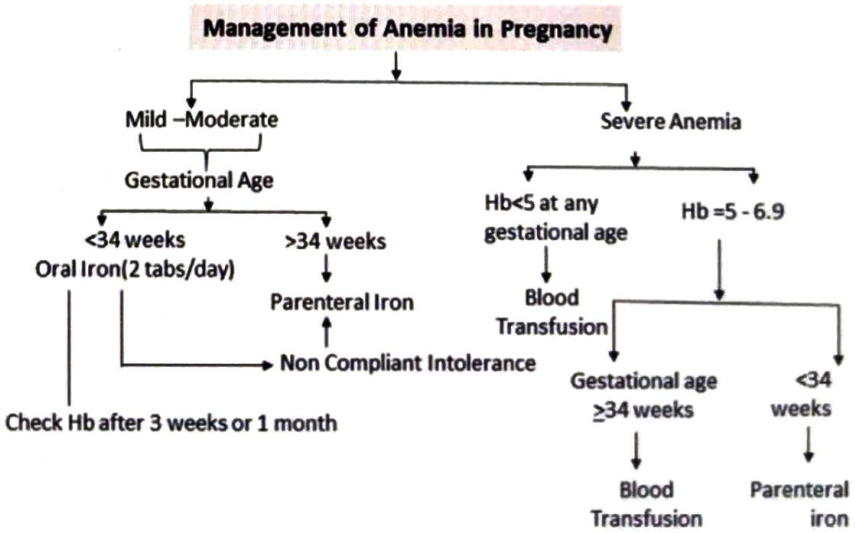
Hb increases at the same rate as that of oral iron
Increases at 3 weeks at 0.7–1 gm/dl/week.

Applied aspect : Mild/moderate anemia at ≤ 34 weeks of gestation : Oral iron 2IFA/day (as long as patient is compliant and tolerant). Check Hb after 3 weeks.
Mild/moderate anemia at > 34 weeks of gestation : Parenteral iron.

Parenteral iron is given only for the sake of non-compliance.

Management of severe anemia

00:23:01



Active space

Hb < 5 g% at any gestational age : Blood transfusion.

Other indications for blood transfusion :

- Thalassemia major.
- Anemia leading to heart failure.
- Acute hemorrhage leading to severe anemia. <5 at any gestation age, <5–6.9 at > 34 weeks of gestation
- Bone marrow failure.

1 packed cell transfusion/day is given except in patients with hemorrhage and congestive heart failure (> 1/day).
1 packed cell transfusion will increase Hb by 1 g%.

Case scenarios
Case 1 : Hb 4 gm% at 30 weeks : Blood transfusion.
Case 2 : Hb 6 gm% at 30 weeks : Parenteral iron.
Case 3 : Hb 6 gm% at 30 weeks with hemodynamic instability : Blood transfusion.
Case 4 : Hb 6.5 gm% at 36 weeks : Blood transfusion.

Q. A 30 year old primigravida at 10 weeks of pregnancy presents for routine antenatal examination . Her CVS examination is normal and on CBC her Hb is 6.4 gm . On PBS microcytic hypochromic anemia seen. Nestroff test is negative. Best line of management is

A. Oral iron therapy

B. Iron sucrose

C. Blood transfusion

D. No treatment

Answer : A. Oral iron therapy (as parenteral iron is contraindicated in 1st trimester)

Anemia in 1st trimester

00:32:07

Hb < 5 g% or presence of congestive heart failure signs :
Blood transfusion.
Hb ≥ 5 g% and absence of signs of congestive heart failure :
Oral iron therapy.

Case scenario :
A pregnant female with Hb 8.2 g% at 32 weeks of pregnancy.
Her MCV is 120 fl. LDH is raised.
Peripheral smear shows hypersegmented neutrophils.
Solution :
MCV of 120 fl indicates macrocytic anemia.
Hypersegmented neutrophils indicate folic acid deficiency.
Managed with folic acid 1 mg/day.
In patients with sickle cell anemia : Folic acid 5 mg/day.

DIABETES IN PREGNANCY : PART 1

Carbohydrate metabolism in pregnancy 00:01:28

- Fetus depends on mother for its glucose requirements. GLUT 1 and GLUT 3 receptors assist glucose reach the fetus via the placenta through facilitated diffusion.
- Pregnancy is a diabetogenic state.
- During pregnancy, insulin secretion increases, and insulin resistance is seen. HPL (main hormone), progesterone, placental growth hormone, CRH, cortisol are responsible for insulin resistance. HCG does not play a role in insulin resistance.
- HPL secretion increases continuously throughout pregnancy. So, insulin resistance increases as pregnancy progresses.
- Significant insulin resistance develops during 24–28 weeks of pregnancy. Few pregnant females in whom blood glucose levels were normal before pregnancy may develop diabetes due to insulin resistance : Gestational diabetes.
- Screening for gestational diabetes should be done between 24–28 weeks of pregnancy.
- Hyperglycemia is fetotoxic as it leads to formation of free radicals. Free radical injury causes congenital malformations. Congenital malformations are not seen in gestational diabetes as the period of organogenesis is over by the time gestational diabetes develops.
- In pregnancy, fasting hypoglycemia is seen as fetus is dependent on mother for its glucose requirements. But postprandial hyperglycemia is seen due to insulin resistance.
- Glycosuria is normal during pregnancy.

Diabetes in pregnancy 00:09:14

Known case of diabetes mellitus prior to pregnancy : Pre-gestational diabetes.
Normoglycemic female conceives and during pregnancy, she develops diabetes due to insulin resistance → Gestational diabetes.

	Pregestational diabetes	Gestational diabetes
Blood glucose levels	Increased from day 1 of pregnancy	Increase from 24 to 28 weeks of pregnancy
Free radicals	Formed from day 1 of pregnancy	Formed from 24 to 28 weeks of pregnancy
Congenital malformations	Seen	Not seen as organogenesis is complete by the time free radicals are formed

Pristella White classification :
Type A or class A : Gestational diabetes (GDM).
A 1 : GDM patients who are well controlled on diet only.
A 2 : GDM patients who are controlled by insulin or oral hypoglycemic agents.

Non type A or class non A : Pre gestational diabetes.
D : Diabetic pregnant female with benign retinopathy.
F : Diabetic pregnant female with nephropathy.
R : Diabetic pregnant female with proliferative retinopathy.
H : Diabetic pregnant female with heart disease.

Gestational diabetes mellitus (GDM) 00:17:52

International association of diabetes in pregnancy study group/American diabetes association (IADPSG/ADA) criteria :

- Test done between 24–28 weeks of pregnancy.
- 8 hours of fasting is required.
- Fasting blood sample (FBS) is taken first.

- 75 grams of oral glucose mixed in water is given after fasting blood sample.
- Blood sugar levels are checked after 1 hour and 2 hours.
- Total samples : 3.

	Upper normal glucose level (mg/dl)
Fasting blood sample	92
1 hour sample	180
2 hours sample	153

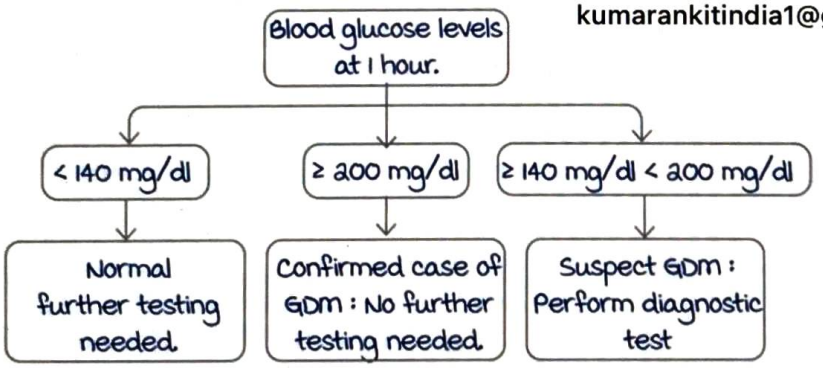
Diagnosis of GDM is made if ≥ 1 value is abnormal.

American college of obstetricians and gynaecologists (ACOG) criteria :

2 step approach :

1st step : Glucose challenge test GCT (screening test).

- Done between 24–28 weeks of pregnancy.
- Fasting is not needed.
- Irrespective of previous meals, 50 grams of oral glucose is given.
- After 1 hour, blood glucose levels are checked :



2nd step : Glucose tolerance test (100 gm 3 hour GTT) :

- Diagnostic test.
- 8 hours of fasting is needed.
- Fasting blood sample (FBS) is taken first.
- 100 grams of oral glucose is given after fasting blood sample.
- Blood sugar levels are checked after 1 hour, 2 hours and 3 hours.
- Total samples : 4.

	Upper limit of normal (mg/dl) (Carpenter and Couston criteria)
Fasting blood sample	95
1 hour sample	180
2 hours sample	155
3 hours sample	140

Diagnosis of GDM is made if ≥ 2 values are abnormal.

ACOG recommends :

- Early screening in high risk patients : 1st antenatal visit.
- Repeat at 24–28 weeks of pregnancy.

High risk for developing GDM :
BMI ≥ 25 (In Asian American females BMI ≥ 23) + any one of the following :

- Previous history of GDM.
- Family history of diabetes.
- Previous history of delivering fetus > 4 Kg.
- Previous history of still birth.
- Has hypertension.
- Has deranged lipid profile.
- Has PCOS.
- Age ≥ 40 years.
- Has HbAlc ≥ 5.7 but < 6.4 (HbAlc ≥ 6.5 : Diabetes/ Pre gestational diabetes).

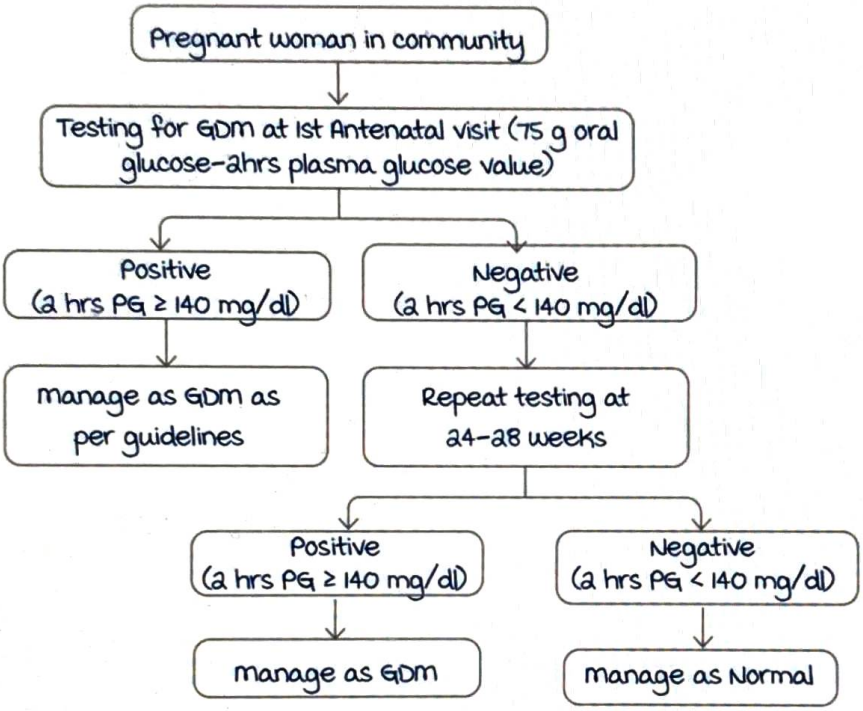
DIPSI guidelines

00:34:20

National guidelines is followed in India.

- Universal screening for GDM is performed.
- Time for screening : 1st antenatal visit + at 24 weeks of pregnancy.
- Fasting is not needed.
- Irrespective of previous meals, 75 grams of glucose in water is given.
- Blood glucose levels are checked after 2 hours :

- ≥ 140 but < 200 mg/dl : Gestational diabetes mellitus.
- ≥ 200 mg/dl : Pre-gestational diabetes.
- Quantity of water : 300 ml. Can mix ice or lemon.
- To be consumed within 5 minutes.
- If patient vomits after drinking glucose : Within 30 mins → Call her next day for repeat testing. After 30 mins → Continue with the test.
- Minimum time gap between 2 tests : 2 weeks.
- If patient's first antenatal visit is beyond 28 weeks → Only test should be done.



Antenatal care of GDM patient : National guidelines

00:42:26

- All pregnant diabetic patients whether pre-gestational/ gestational diabetes should undergo anomaly scan (level 2 scan) at 18-20 weeks.
- At least 2 growth scans at 28-30 weeks and 34-36 weeks. Minimum gap between 2 growth scans should be 3 weeks.
- In pregestational/gestational diabetes, fetus has macrosomia. So, growth scan should be done. Fetal biometry and amniotic fluid estimation should also be done during growth scans as there is risk of polyhydramnios.

Select the true statement :

A. GDM patients should undergo anomaly scan between 18-20 weeks : True. (True for all pregnant women also).
B. GDM patients should undergo fetal echo between 22-24 weeks : False (no risk of congenital malformation).
C. Pre-gestational diabetic patients should undergo fetal echo between 22-24 weeks : True.

Number of antenatal visits

00:50:26

GDM patient with well controlled blood sugar and no complications → Follow regular antenatal visits.
GDM patient without well controlled blood sugar or complications like high BP → 2nd trimester (Twice weekly visits) and 3rd trimester (28 weeks onwards : weekly visits).

- At each visit, check BP (increased risk of pregnancy induced hypertension), check for proteinuria and polyhydramnios.
- Diabetes is also a risk factor for infections like UTI, vaginal candidiasis and asymptomatic bacteriuria are common. In each trimester, do urine routine microscopy. Also check for fetal growth.

Start fetal monitoring from 32 weeks (increased risk of intrauterine death and still birth).

- Daily fetal movement count by the mother : Advise the patient to lie in her left lateral position after meals and keep a count of fetal movements. Report if < 10 counts in 2 hours.
- Non-stress test weekly.
- Biophysical profile weekly.

Doppler assessment of fetal umbilical artery is not done as it is significant only in conditions with uteroplacental insufficiency such as pregnancy induced hypertension (PIH) and intra uterine growth restriction (IUGR).

Management of GDM

00:59:36

Key principle : To maintain good glycemic control.

Metabolic goals : Fasting blood glucose < 95 mg/dl.

1 hour post prandial value < 140 mg/dl.

2 hours post prandial value < 120 mg/dl.

HbA1c < 6 (< 6.5 is also okay).

Average capillary blood glucose levels < 100 mg/dl.

1st step :

Diet modification : Medical nutrition therapy (MNT) and moderate exercise.

Total calories : As per pre-pregnancy weight :

Pre-pregnancy weight	BMI (kg/m^2)	Total weight gain range (kg)
Normal weight	18.5 to 24.9	11.5 to 16 kg
Under weight	Less than 18.5	12.5 to 18 kg
Over weight	25 to 29.9	7 to 11.5 kg
Obese (include all classes namely grade I, II, and III)	Equal/more than 30	5 to 9 kg

Total calories should be divided as follows :

- Carbohydrates : 40%.
- Fats : 40% (saturated fats <6[illegible]7e5ea7 mg/day).
- Proteins : 20%.

Calories are divided in 3 major meals and 2-3 snacks.

MNT should be continued for 2 weeks.

- If 2 hour PPPG < 120 mg/dl, continue MNT and repeat 2 hour PPPG test every 2 weeks in second trimester and every week in third trimester.
- If 2 hour PPPG ≥ 120 mg/dl, medical management (insulin therapy) to be started as per guidelines along with continuation of MNT. Repeat 2 hour PPPG test every 3rd day till blood glucose levels come to normal.

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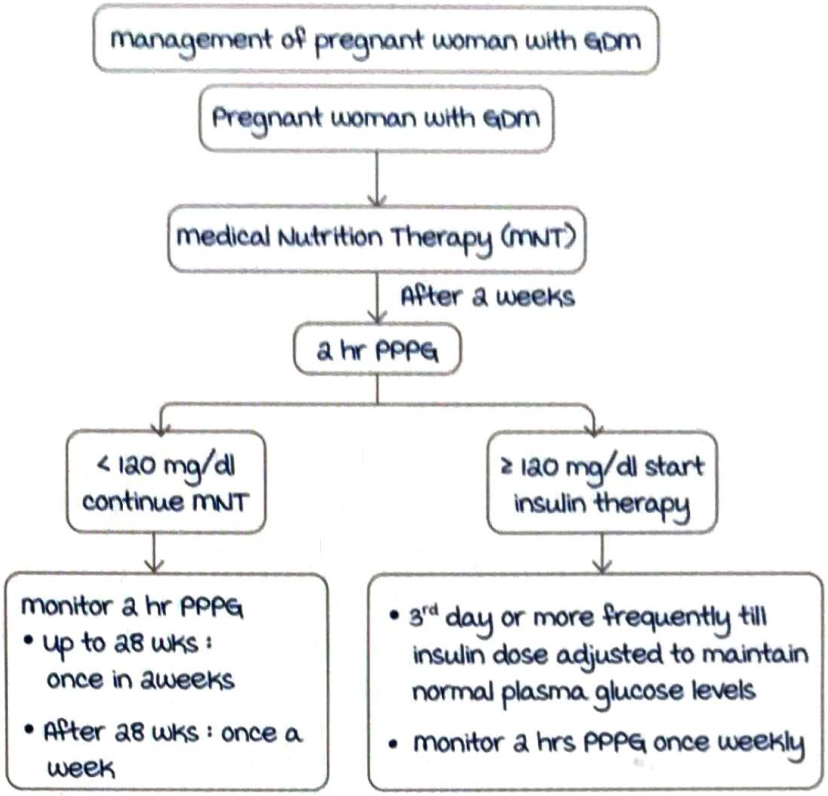

Insulin therapy

01:10:33

Drug of choice for treating diabetes in pregnancy is insulin.

Indications for starting insulin :

- GDM patients : If after 2 weeks of medical nutrition therapy, 2 hour post prandial (PP) value ≥ 120 mg/dl.
- Pre-gestational diabetic patients : From day 1 of pregnancy.
- 2 hour PP value ≥ 200 mg/dl in a pregnant female.

Case scenario :

Pregnant female at 20 weeks of pregnancy undergoes 75 gm glucose test. Her blood sugar levels after 2 hours is 200 mg/dl. What is the next step in management?

Answer : Start 8 U of insulin + MNT.

International guidelines :

Additional indications for starting insulin therapy :

In GDM patients even if metabolic goals are met but estimated fetal weight is ≥ 90% for gestational age or

abdominal circumference is ≥ 75% for gestational age, insulin therapy should be started.

Insulin injection :

- Subcutaneous route.
- 40 IU/ml vial, Human premix insulin (30 : 70) and insulin syringe (1 ml/40 IU) are used.
- One syringe can be used for a maximum of 14 times.
- Insulin should be stored in a refrigerator between 4–8 degree C (not in freezer).

Dose of insulin

01:18:48

Starting dose is calculated as per the 2 hour post prandial blood glucose level.

Blood glucose level (2-hour PP)	Dose of insulin
120 – 160	4 U
160 – 200	6 U
≥ 200	8 U

- Insulin injection to be given 30 minutes before breakfast.
- Every 3rd day, fasting blood glucose level (FBS) and 2 hour PP values are checked.
- If FBS > 95 mg/dl on the 3rd day → Add 2U dose before breakfast.
- If 2 hour PP value > 120 mg/dl → Add 2U dose before breakfast.
- If both are deranged → Add 4 U dose.
- Again on 3rd day, measure FBS and 2 hour PP values.
- Keep titrating dose till metabolic goals are met.
- Once metabolic goals are met → Continue same dose of insulin + MNT.
- Measure FBS and 2 hour postprandial blood sugar every 2 weeks till 30 weeks of pregnancy and every week after 30 weeks of pregnancy (If gestational age is not mentioned, best answer is

weekly checking of FBS and 2 hour postprandial blood sugar).

Oral hypoglycemic agents :
Oral hypoglycemic agents are not used during pregnancy as they are less potent and cross placenta causing hypoglycemia in the fetus.
However, metformin and glyburide can be used in pregnancy.

Indication :
Pregnant female with GDM refuses to take insulin.
metformin and glyburide cannot be used in pregestational diabetes patients.

metformin :
Starting dose : 500 mg/day at bedtime. Monitor blood glucose levels and increase dose by 500 mg every week.
Maximum dose is 2500 mg/day.
Most common side effect is GI side effects.

Glyburide :
Starting dose : 2.5 mg- 5 mg OD. Monitor blood glucose levels and increase dose weekly by 2.5- 5 mg. Maximum dose is 20 mg/day.
Less well tolerated compared to metformin.
Most common side effect is maternal hypoglycemia.

Obstetrical management 01:27:00

- Termination of pregnancy :
- A1 GDM : ≥ 39 weeks (or up to 41 weeks + 0 days).
- A2 GDM well controlled : ≥ 39 weeks (or up to 40 weeks).
- A2 poorly controlled : 37-38 weeks + 6 days.
- Pre-gestational diabetes well controlled : ≥ 39 weeks.
- Pre-gestational diabetes not well controlled : Depends on complication.

Mode of delivery : Vaginal delivery.
Induction of labor is done as timing of delivery is important.

Timing of delivery is important because of the following reasons :

- Risk of intrauterine death and still birth increases towards the end of pregnancy.
- Increased risk of respiratory distress syndrome and macrosomia if delivery is not planned.

Caesarean section is done for obstetrical reasons (fetal distress/contracted pelvis) or estimated fetal weight is ≥ 4.5 Kg in a diabetic patients.

Macrosomia is defined as estimated fetal weight ≥ 4 Kg.
In non-diabetic patients, caesarean section is done if estimated fetal weight is ≥ 5 Kg.

Intrapartum insulin requirement :

- During labor, insulin requirement decreases.
- Patient with GDM on insulin require plasma glucose monitoring during labor by a glucometer.
- The morning dose of insulin is withheld on the day of induction of labor and the patient should be started on a hourly monitoring of plasma glucose.
- IV infusion with normal saline (NS) to be started and regular insulin to be added according to blood glucose levels.

Blood glucose level	Amount of Insulin added in 500 ml NS	Blood glucose level
90–120 mg/dl	0	100 ml/hr (16 drops/min)
120–140 mg/dl	4 U	100 ml/hr (16 drops/min)
140–180 mg/dl	6 U	100 ml/hr (16 drops/min)
>180 mg/dl	8 U	100 ml/hr (16 drops/min)

Post-delivery follow up of patients with GDM :

- Immediate postpartum care : Women with GDM is not different from women without GDM, but these women are at high risk of developing type 2 diabetes mellitus in future.
- maternal glucose levels usually return to normal after delivery.
  Nevertheless, a fasting plasma glucose and 2-hour PPPG is performed on the 3rd day of delivery at the place of delivery. For this reason, GDM cases are not discharged after 48 hours unlike other normal PNC cases.
- Subsequently, ANM to perform 75 g GTT at 6 weeks postpartum to evaluate glycemic status of woman.

  Cut offs for normal blood glucose values are :
  Fasting plasma glucose : ≥ 126 mg/dl.

  75 g OGTT 2 hour plasma glucose :
  Normal : < 140 mg/dl.
  Impaired glucose tolerance : 140-199 mg/dl.
  Diabetes : ≥ 200 mg/dl.

As per ACOG guidelines, 75 g GTT is done between 4-12 weeks.

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DIABETES IN PREGNANCY : PART 2

Pre gestational diabetes 00:00:43

It means when a female with diabetes mellitus conceives.
Hyperglycemia from day 1 of pregnancy (free radical formation from day 1).
Free radicals are fetotoxic → cross placenta → congenital malformation in fetus.

Diagnosis of pre gestational/overt diabetes :
FBS : ≥ 126 mg/dl.
2hr PPBS (or) RBS : ≥ 200 mg/dl.
HbA1C : ≥ 6.5.

Risk assessment tool to predict congenital malformations :

HbA1C

- HbA1C < 6.5 (No risk of congenital malformation)
- HbA1C = 6.5 (3% risk)
- HbA1C = 9 (15 – 20% risk)

In babies of diabetic mother, there is an increased risk of structural anomalies.
No risk of genetic/chromosomal anomalies (Downs syndrome or any aneuploidy).

Risk reduction 00:05:50

- Tight glucose control : HbA1C < 6.5.
  Drug of choice : Insulin.
  Ideally started on insulin before conception, when planned.
  If pregnancy was unplanned, then immediately after detection of pregnancy.

- Folic acid supplementation : 400 mcg/day (same as non diabetic).

Investigations :

- Best investigation to detect congenital malformation in fetus of diabetic mother : Anomaly scan.
  Level 2 scan at 18 - 20 weeks (to see structural abnormalities).

Case :

K/C/O diabetes. UPT positive, HbA1C at 10 weeks is 8. What should be the next step?

A. USG at 11- 13 weeks.

B. Anomaly scan at 18- 20 weeks.

The next step here is USG at 11- 13 weeks, as neural tube defects can be assessed by the scan. The best investigation is the level 2 USG at 12- 20 weeks.

- All pregnant females with overt diabetes should undergo fetal ECHO at 22 - 24 weeks (most common congenital malformations involve the cardiovascular system).
- Fetal monitoring :
  High chance of IUD & still birth. To reduce this, fetal monitoring is done.
  Done from 32 weeks of pregnancy.
  methods :
  1. DFMC (Daily Fetal movement Count).
  2. NST weekly.
  3. Biophysical profile weekly.

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- Investigation not done is Doppler.
  Indication : in the presence of PIH/vasculopathy in diabetic mother.
- Others : 2 growth scans at 30 - 32 weeks and 36 - 38 weeks to assess fetal weight.

Management of pre gestational diabetes :

- Give Insulin + MNT (Medical Nutrition Therapy) together.
  No role of MNT alone.
  No role of oral hypoglycemic drugs (like metformin, Glyburide).

MNT principles same as gestational diabetes :
Calculate the total calories needed. Divide the calorie requirement into 40%, 40% and 20%.
Divide it into 3 major meals and 2- 3 snacks.

Metabolic goals same as gestational diabetes :

FBS : < 95.
1 hour PP : < 140.
2hr PP : < 120.
Average capillary glucose : < 100.
HbA1C : < 6.

- Obstetric management :
  1. Termination of pregnancy :
     Overt diabetic, well controlled, no complications : Upto 39 weeks.
     Overt diabetic, not well controlled, with complications : 37 - 38 weeks + 6 days.
  2. Mode of delivery : Vaginal delivery.
     If Estimated Fetal Weight (EFW) ≥ 4.5 kg : C - section

Complications of diabetes (pregestational & gestational)

00:18:28

Maternal complications :

1. Polyhydramnios :
   - Due to polyuria by fetus.
   - Most commonly seen is polyhydramnios.
   - Rarely, oligohydramnios is seen in diabetes with PIH, diabetes with vasculopathy.
2. Placentomegaly :
   - Increased risk of pre eclampsia/PIH (15%).
   - In overt diabetic : low dose Aspirin to prevent PIH.
3. Infections :
   - Asymptomatic bacteriuria.
   - UTI.
   - Vaginal candidiasis.

   In a diabetic pregnant female, urine routine & microscopy should be done in all trimesters.

4. Preterm labour, premature rupture of membranes, abruptio placenta (due to polyhydramnios).
5. Due to increase in size of placenta : placental previa.
6. Birth trauma/increase chance of operative delivery due to macrosomia.
7. PPH due to overdistension of uterus.
8. 50% patients with GDM develop Type 2 diabetes mellitus, later on in life.
   The blood sugar levels of the mother should be tested 6 weeks after delivery with 75gm GTT according to national guidelines.
   According to the international guidelines, the 75gm GTT must be done between 4- 12 weeks after delivery.

Fetal complications of diabetes :

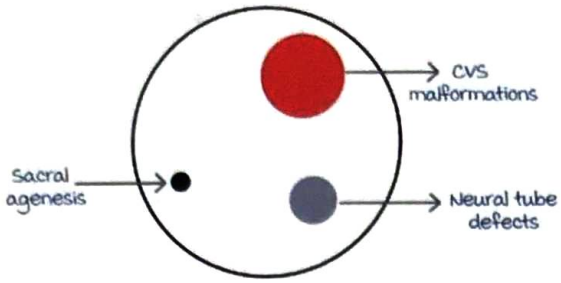
1. Congenital malformations (25%) :
   Seen in overt diabetic mothers.
   Not in gestational diabetic mothers.

2. Hyperglycemia :
   High insulin production (hyperinsulinemia) is seen and leads to high IGF.
3. Macrosomia(45%) :
   Most common complication.
   Due to high IGF (Insulin like Growth Factor).
4. Delayed lung maturity :
   Leads to respiratory distress syndrome.
   Insulin delays lung maturity by decreasing surfactant production.
5. Necrotising enterocolitis (NEC).
6. Abortion, IUD, stillbirth.

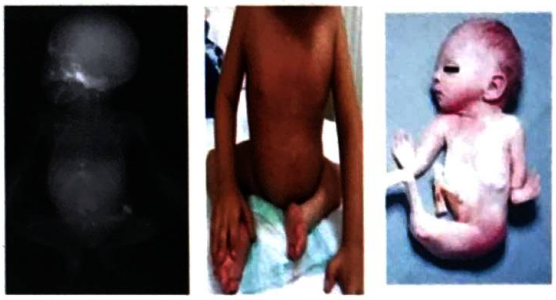
Congenital malformations in fetus 00:26:46

Incidence in pre gestational diabetes is 25%.

1. Most common system involved : CVS > CNS.
2. Most common CVS anomaly : VSD.
3. Most common anomaly overall : VSD > NTD (Neural tube defects).
4. Most specific anomaly overall : Sacral agenesis/ caudal regression syndrome.



5. Most specific CVS anomaly : TGA.
6. Most common CVS finding (reversible) : Hypertrophic cardiomyopathy.



Caudal regression syndrome/sacral agenesis

Caudal regression syndrome is associated with diabetes (most common) and single umbilical artery type 2.

Other fetal effects of diabetes (gestational/pre gestational) :
Most common fetal complication of diabetes : Macrosomia (seen in 45% cases).

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Macrosomia cause :
Maternal hyperglycemia → Fetal pancreas produce more insulin (hyperinsulinemia in fetus) → Increase growth of fetus & hormone responsible for growth : IGF (Insulin like Growth Factor).

This is called Pederson hypothesis.
Increased insulin inhibits lipolysis : high fat deposition on shoulder and abdomen → shoulder dystosia in vaginal delivery.
Definition of macrosomia : Weight ≥ 4 Kg.
Risk factors :

- Diabetes mother.

Active space

- Male fetus.
- Obese mother.
- Post term pregnancy.

Best USG parameter to see macrosomia : Abdominal circumference of fetus (≥ 35 cm).

Problems with macrosomia :

Fetus	mother
• If increased oxygen requirement is not fulfilled, leads to episodes of hypoxia. • Stillbirth/sudden IUD (maximum in 3rd trimester). • Shoulder dystocia.	• Protracted or arrested labour. • Assisted vaginal birth. • Cesarean section. • Genital tract lacerations. • PPH. • Uterine rupture.

Macrosomic baby

Shoulder dystocia 00:38:55

It is an obstetric emergency.
Diagnosed if there is delay in delivery of shoulder (≥ 1 min) after the delivery of the head.
Sign : Turtle sign (head of the baby recedes back towards perineum).

Algorithm for management of shoulder dystocia :
(mnemonic : HELPERR)
H : Call for help.

E : Empty bladder.

Generous Episiotomy

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L : First manoeuvre : Legs manoeuvre (mc. Roberts manoeuvre).

Before starting the manouevre, remove any pillows present.

Empty the bladder.

Requires one assistant at each leg (2 assistants needed).

Sudden flexion (as much as possible, such that the knees are near the breast) of thighs over mother's abdomen & abduction

↓

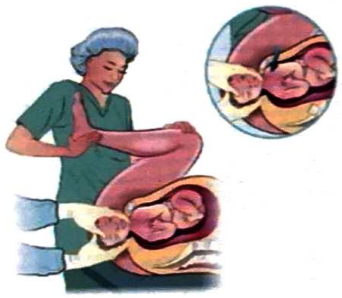
moves the pubic symphysis in cephalad direction

↓

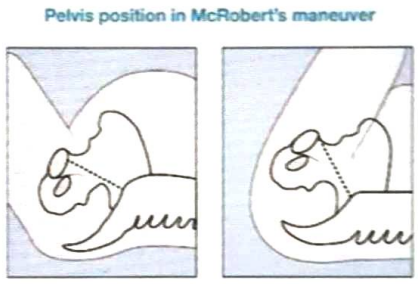
Straightening of sacrum.

↓

Available space increases.



mc. Robert's manoeuvre



Pelvis position in mc. Robert's manoeuvre

In 90% patients, shoulder delivers by this.

Done for 30 seconds.

Each manoeuvre has to be tried for 30 seconds. In case it fails, move to the next manoeuvre.

mc Roberts manoeuvre does not increase pelvic diameter.

most common nerve injured : Lateral cutaneous nerve of thigh.

Syndrome associated with the lateral cutaneous nerve of thigh injury : Myalgia paresthetica.

Patient complaints of numbness, tingling over the lateral aspect of thigh.

P : Suprapubic pressure.

Active space

Locate the anterior shoulder.

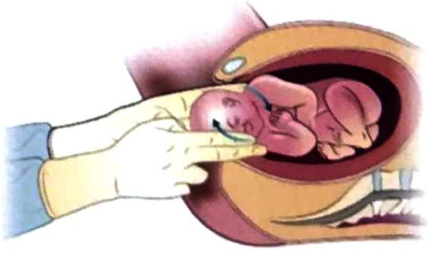
↓

With thrusting movements, give suprapubic pressure.
mother should be in McRobert's position only.
This is called Rubin I manoeuvre.
This helps in pushing out anterior shoulder below the pubic symphysis.
Pressure can be intermittently applies (like CPR) or sustained application.
Fundal pressure is contraindicated.

E : Enter into the pelvis.
Take your hand above the anterior shoulder and try to bring it below pubic symphysis.
It is called Rubin II manoeuvre.
This should be done along with Rubin I (by assistant).

Wood corkscrew manoeuvre :
2 fingers anterior to posterior shoulder, 2 fingers posterior to anterior shoulder. Rotate the shoulder of the baby in clockwise direction.

The anterior shoulder moves posteriorly and the posterior shoulder moves anteriorly.
Repeated in anticlockwise direction if the baby is not delivered by the clockwise roatation.



Wood corkscrew manoeuvre

R : Removal of posterior arm manually.
Known as Jacquemier manoeuvre.
Deliver the posterior arm → rotate the baby → deliver the anterior arm.

R : Rollover manoeuvre/Gaskin all 4 limbs manoeuvre.
Roll over the mother on all 4 limbs.

Gaskin all 4 manoeuvre

Last manoeuvre : Zavanelli manoeuvre.
Push head back into the uterus & do C-section.
Traumatic for the mother and the baby.

Destructive procedures.
Theoretically, can be done.

1. Cleidotomy : Fracture clavicle of baby.
2. Symphysiotomy : Divide pubic symphysis of mother.

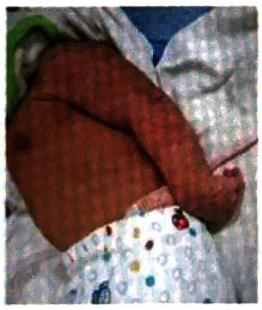
Most common fetal complication of shoulder dystocia : Brachial plexus injury leading to Erb's palsy.

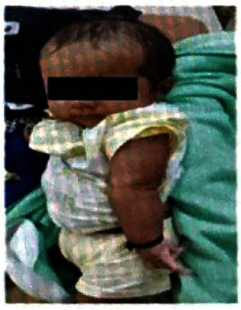
Arm : Internally rotated, adducted & pronated.
Policeman tip hand.

Nerve roots : $C_5 - C_6$.

Most common maternal complication of shoulder dystocia : PPH.

Erb's palsy
Arm : Internally rotated, adducted & pronated





Other fetal complications of diabetes 01:02:34

1. Prematurity.
   Spontaneous : due to polyhydramnios.
   Iatrogenic : premature induction of labour.
2. Abortion (11%) : uncontrolled diabetes.
3. IUD & stillbirth : due to episodes of hypoxia.

4. IUGR.
   In diabetes with PIH/ diabetes with vasculopathy.

Neonatal complications :

1. Increased neonatal mortality.
   - Due to prematurity.
   - Delayed lung maturity (respiratory distress syndrome).
     Due to decreased surfactant as insulin is increased.
2. Hypoglycemia (blood sugar < 40mg/dl) :
   - Because fetus is hyperglycemic & increased insulin.
   - As soon as baby is born source of hyperglycemia is gone.
   - Increased insulin : Leads to hypoglycemia.
3. Hyperbilirubinemia : Due to hypoxia → increased erythropoiesis → increased fetal RBC with short lifespan → increased bilirubin.
4. Polycythemia (due to increased erythropoiesis) :
   Hyperbilirubinemia + polycythemia : Hyperviscosity syndrome.
5. Hypercoagulability due to polycythemia.
6. Hypokalemia, hypocalcemia, hypomagnesemia : due to prematurity.
7. Hypertrophic cardiomyopathy : reversible and gradually improves.

Complication not seen in babies of diabetic mother : anemia.

Best lung maturity test in diabetic female : phosphatidyl glycerol in amniotic fluid.

When the neonate born to diabetic mother grows up :

- Poor memory.
- Delayed cognitive development.
- Delayed language development.
- Autistic.
- Type I diabetes : 3 to 5%.
  Type II diabetes : 40%.
- Not mentally retarded.

Updates from Williams obstetrics 25th edition 01:11:46

Chances of macrosomia increase if mean maternal blood glucose levels > 130mg/dl.

Affect of pregnancy on diabetes :

- Pregnancy does not lead to increase in chances of vasculopathy in patients of pregestational diabetes.
- But, if there is pre- existing vasculopathy, it is worsened during pregnancy, especially diabetic retinopathy (not neuropathy).
- Increased chances of PIH in pregnancy.

  All patients with pregestational diabetes should be given low dose aspirin starting from 12- 28 weeks of gestation, till delivery.

Insulin management during labor induction / scheduled caesarean section (Table 60- 10 Pg: 1078)

1. Give evening dose of insulin.
2. Withhold the morning dose of insulin.
3. IV NS at 100- 125ml/hour.
4. If glucose levels > 100mg/dl, start insulin infusion at 1- 1.25 units/hour.
5. Measure glucose hourly.
6. With active labor or if glucose levels >70gm/dl, change to 5% dextrose at 100- 150ml/hour.

Target glucose level : 100mg/dl.

During puerperium, many pregestational diabetic patients do not require any insulin for the first 24hours after delivery.
The patient is shifted to OHA on post op day 1.

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ACOG recommends self monitoring of glucose levels 4 times daily in diabetic patients, during pregnancy.
One fasting level and three assessments after the meals.
National guidelines recommend self monitoring 2 times in a day.

All pregnant female with pregestational diabetes should be admitted in early pregnancy to :

- Initiate glucose control programme.
- To assess vasculopathy.
- Investigations : 24hour urine protein levels, serum creatinine levels, retinal examination, ECHO if the patient has hypertension as well.

Post partum evaluation of gestational diabetes :

ACOG :

4- 12 weeks after delivery → 75gm 2hour OGTT.

Fifth international workshop on diabetes :

Post delivery : within 1- 3days of delivery FBS or RBS is done.

6- 12 weeks after delivery : 75 gm 2hour OGTT.

1 year after delivery : 75gm 2hour OGTT.

Annual fasting glucose levels assessed (risk of pregestational diabetes patients to develop type 2 diabetes mellites).

Long term risk of gestational diabetes to the mother :

- Increased risk of dyslipidemia.
- Increased risk of hypertension.
- Increased chances of abdominal obesity.
- metabolic syndrome +/-.
- Increased chance of recurrence of gestational diabetes. Chances of this can be reduced by reducing the weight.
- Increased chance for developing type 2 diabetes mellites.

HYPERTENSION IN PREGNANCY : PART 1

Definition of hypertension in pregnancy 00:01:02

BP more than or equal to 140/90 mmHg on two occasions atleast 4 hours apart.

It could be that only if either :

- SPB more than or equal to 140 mmHg or
- DBP more than or equal to 90 mmHg or
- Both.

BP more than or equal to 160/110 mmHg on 2 occasions within 15 minutes apart.

It is to facilitate early administration of antihypertensive (within 30-60 mins).

In this case we do not wait for 4 hours.

Assessment of BP :

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No tea or coffee within 30 minutes of assessment.

After 5 minutes of rest.

Correct position :

- Sitting or semi reclining with back support .
- Feet on ground, legs not crossed, arm supported at heart level.

measure BP in left arm.

If patient cannot sit measure in left lateral position.

Use appropriate size of handcuff :

In adults with upper arm circumference 35 to 44cm use arm cuff. If it is more than 45 to 52 cm (obese) use thigh cuff.

Appropriately placed cuff :

Width of cuff should cover 40% of arms circumference.

Cover 80% of area between elbow to shoulder.

Gold standard equipment used is sphygmomanometer.

- Nowadays can use automated devices also.
  - SBP : Kortokoff sound 1 (sound appears first).
  - DBP : Kortokoff sound 5 (disappearance of sound).

Active space

Earlier, if the SBP was increased by 30 mmHg and DBP was increased by 15 mmHg at midpregancy level (because of max physiological decrease in BP) : PIH.
This criteria is no longer used. However surviellance is required for chances of eclamptic seizures.

Delta HTN : MAP rises suddenly in a pregnant women, although being at normal levels.

ACOG classification :
Cat I : Pre eclampsia-Eclampsia syndrome.
Cat II : Gestational HTN.
Cat III : Chronic HTN in pregnancy.
Cat IV : Chronic HTN with superimposed pre eclampsia.

Screening of hypertension :
In all pregnant women.
Done in each antenatal visit.
Done by two methods : BP measuring.

By measuring BP : If BP >/= 140/90 on 2 occassions 4 hours apart : HTN (always check for proteinuria).

Chronic hypertension : < 20 weeks of gestation.
Her BP will not come back to normal even after 12 weeks post delivery.

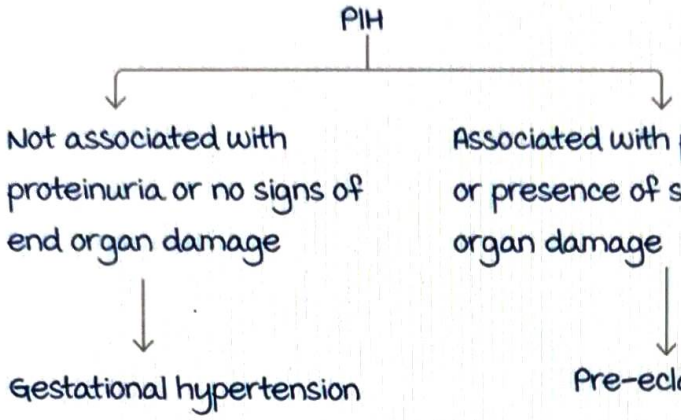
If POG > 20 weeks : PIH.
Check for proteinuria.
If proteinuria >/= +1 : Do 24 hour protein excretion.
If 24 hour protein excretion is >/= 300 mg or
urine protein : creatitinine ratio >/= 0.3 : Pre eclampsia.

If proteinuria is traces or negative : Look for signs of end organ damage.
If end organ damage is present : Preeclampsia.
If end organ damage is absent : Gestational HTN.

PIH :

Increase in BP after 20 weeks of gestation and BP falls back to normal within 12 weeks of delivery.

Before pregnancy BP is normal.



Proteinuria :

Screening test used for it : Dipstick method.

If more than or equal to + 1, then do one of the following :

- Urine protein creatinine ratio more than or equal to 0.3.
- Gold standard : 24 hours urinary protein

excretion more than or equal to 0.3 gm or 300mg.

Type : Non selective proteinuria.

Not associated with red casts or nephritis or nephrotic syndrome.

Only granular casts are seen (fine or coarse).

If red cell casts or nephrotic syndrome : Chronic HTN with underlying renal disease present.

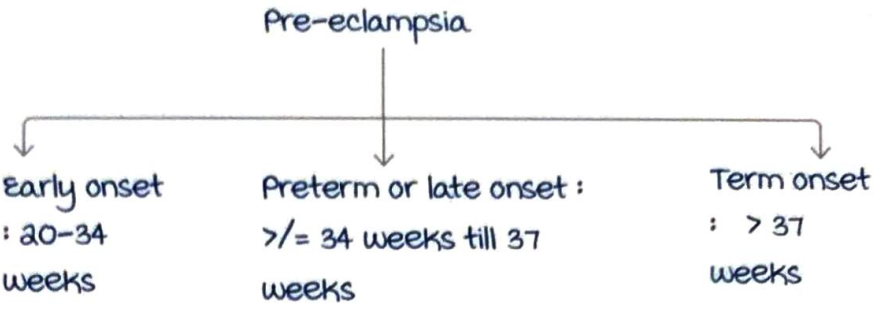
Signs of end organ damage : Any one of the following.

- Platelet count < 1 lakh.
- Liver enzymes raised to 2 times its normal value + epigastric pain.
- Serum creatinine more than or equal to 1.1 mg/dl or doubling of baseline.
- Pulmonary edema.
- Visual symptoms/headache.

Active space

Pre-eclampsia classification

00:22:50



Based on the severity :
Without severe features : Mild preeclampsia.
With severe features : Severe preeclampsia.

	PE without severe feature	PE with severe feature
BP	> 140/90	> 160/90
Headache (not relieved by analgesics)		Indicate impending eclampsia
Epigastric pain	Not present	
Visual symptoms		
Convulsions		GTCS (eclampsia)
Signs of end organ damage		Present

Important concepts :
ACOG has removed 3 criteria for diagnosis of PE with severe features

1. Oliguria.
2. IUGR.
3. Proteinuria quantification

These can be findings but not diagnostic

If pregnant woman with gestational hypertension (G. HTN) develops proteinuria : Dx : Pre-eclampsia.

If pregnant women with G. HTN develops BP > or = 160/110 but no proteinuria and with any other severe features
Dx : Treated as PE with severe features.

G. HTN is a provisional diagnosis and this Dx is revised after delivery.
Although the pathological changes which are seen with PE are not seen in G.HTN. bUT 25-50% of these patients progress to PE. Hence maternal and fetal monitoring is mandatory.

Eclampsia (E) : Occurence of new onset generalised tonic clonic seizures or coma in a patient with pre-eclampsia.
It is the m/severe form of PE spectrum.
It can be antepartum (m/c & best prognosis), intrapartum or postpartum (within 48 hours after delivery).
Postpartum seizures (> 48 hours after delivery) : First rule other causes of seizures.

Chronic hypertension :
A female with hypertension has conceived.
Increase in BP seen even in < 20 weeks of pregnancy and does not return back to normal by 12 weeks of delivery.

Chronic hypertension with superimposed PE :
A female with chronic hypertension conceives, suddenly at 20 weeks of gestation develops any of the following :

1. BP becomes uncontrollable.
2. New onset proteinuria.
3. Signs of EOD.

After 12 weeks of delivery

BP still increased. Revised diagnosis to c/c HTN.	BP resolves. Revise diagnosis to transient HTN of pregnancy.

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00:35:26

Pathogenesis of PIH/PE

In normal pregnancy : Vascular remodelling occurs.
maternal spiral artery opens into the intervillous space (IVS).

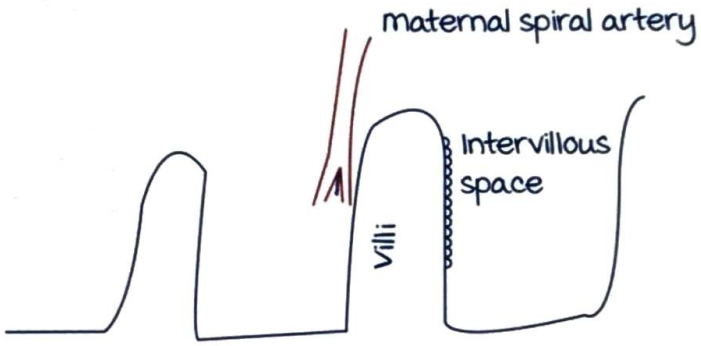
The extravillous cytotrophoblast specifically the endovascular trophoblast (EVT) replaces lining of maternal spiral artery converts from high resistance to low resistance vessels.

Pressure is inversely proportional to volume.

So in low resistance vessels ⟶ pressure decreases ⟶ volume of blood reaching IVS increases ⟶ maintains uteroplacental flow ⟶ ensures proper blood supply to foetus.

In PIH : there is abnormal vascular remodelling and abnormal placentation.

Vessels remain narrow ⟶ increased resistance. ⟶ decrease in volume ⟶ decreased utero-placental flow ⟶ fetal blood supply decreased.



Vascular remodelling (VR) occurs in :

- 1st phase : Completed by 12 weeks.
- 2nd phase : Completed by 18 to 20 weeks.

In PIH, 2nd phase does not occur so incomplete cytotrophoblastic invasion/incomplete VR.

Pseudo Vasculogenesis : During VR, EVT's molecular expression changed from epithelial to endothelial cells.

Cells regulating VR : maternal Natural Killer Cells.

Stages in PIH/ PE

00:39:48

1. Placental syndrome (stage I) : Abnormal vascular remodelling.

Incomplete cytotrophoblastic (CT) invasion :

The CT cells infiltrate the decidual part of spiral artery but fails to penetrate myometrial segment

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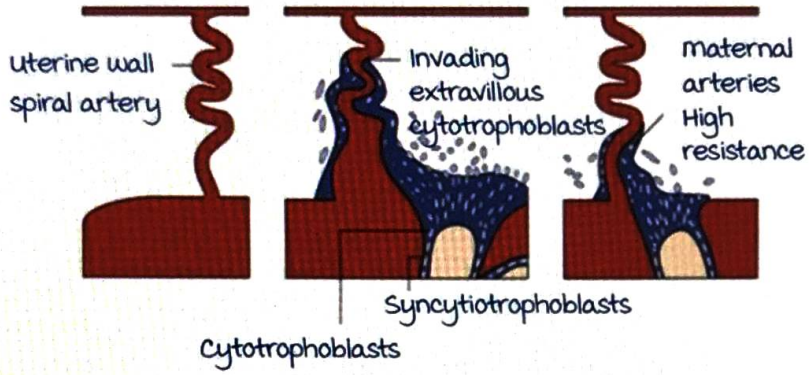
↓

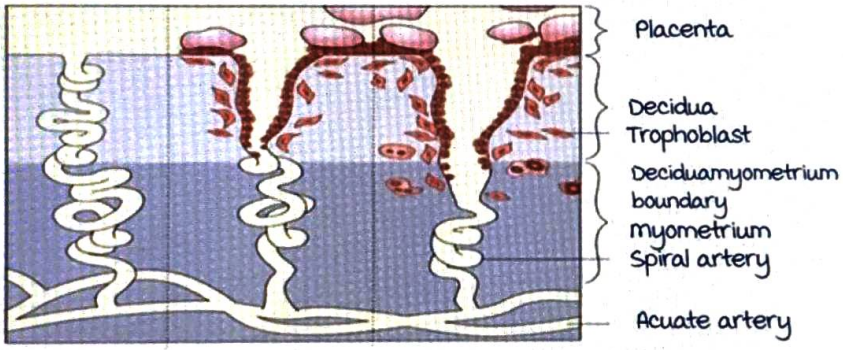
Spiral artery fails to develop into large tortous vascular channels and remains narrow

↓

Placental hypoperfusion and ischemia



Normal pregnancy Normal pregnancy PIH



Non pregnant pre-eclampsia Normal pregnancy

MCQ :

A pregnant female with no other comorbid conditions develops preeclampsia. She asks as to why she has developed the condition and the doctor explains that it is due to

A. Failure of invasion of spiral artery by villous trophoblasts.

B. Failure of invasion of radial artery by cytotrophoblasts.

C. Failure of invasion of spiral artery by extravillous trophoblasts.

D. Failure of invasion of arcuate artery by extravillous trophoblasts.

Active space

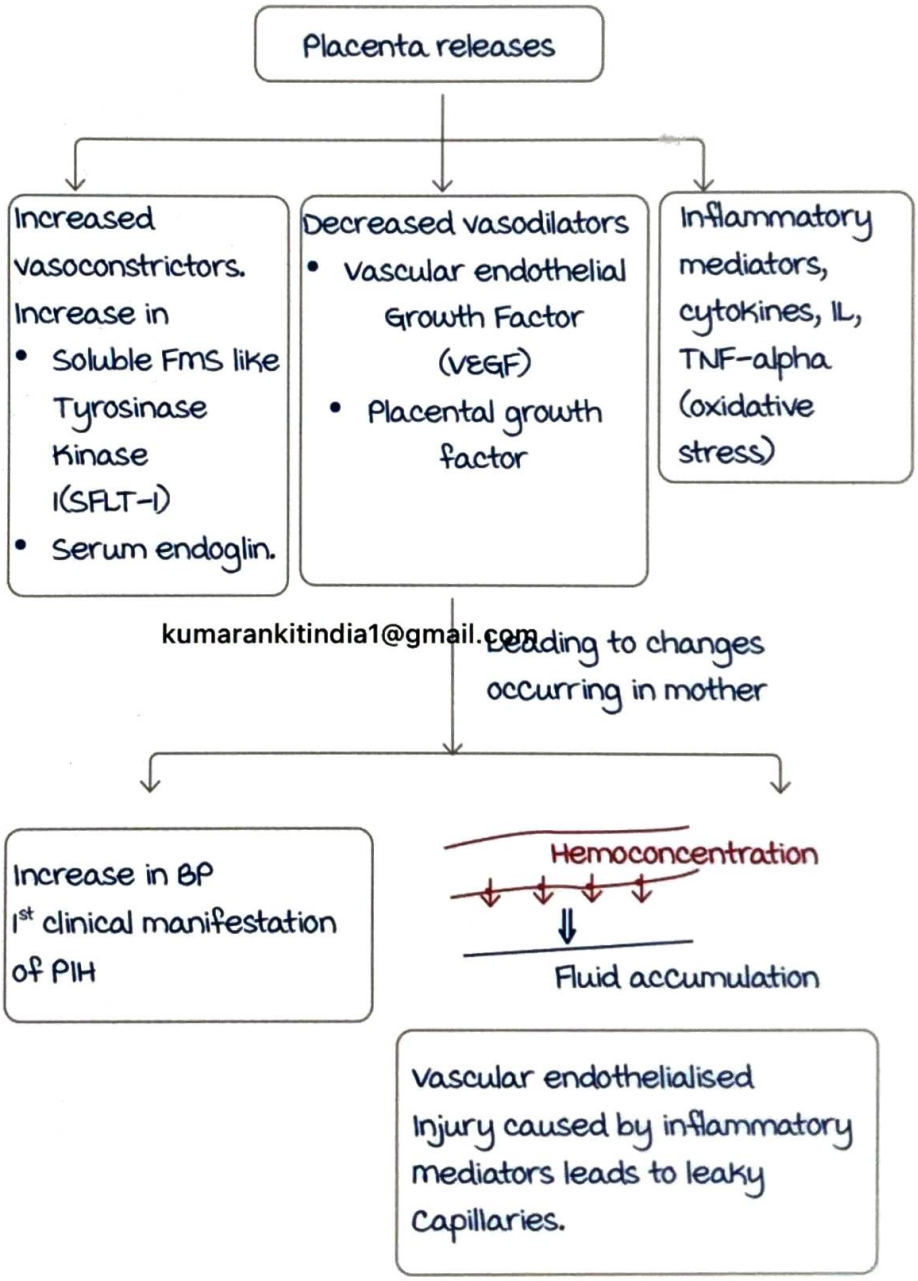
Abnormal placentation.

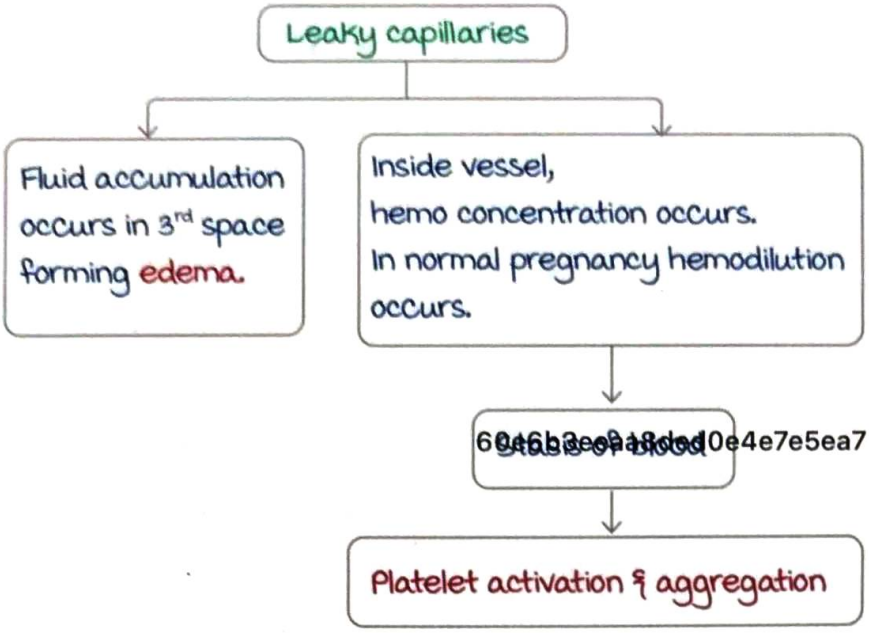
Impaired trophoblastic differentiation/impaired pseudo vasculogenesis : mainly due to a semaphorin 3 protein that is increased in PIH females.

All the above three factors lead to placental hypoperfusion/ hypoxia/ischemia. Leads to stage 2 (maternal syndrome).

Placental ischemia affects :

1. Placenta : Small sized.
2. Fetus : Decreased
   blood flow → IUGR
   decreased renal blood flow → Oliguria, Oligohydraminos
3. Mother : Affects maternal circulation.





Endothelial injury+ stasis + hypercoagulability = virchows triad → increased chances of thrombosis → multiple organ disorder.

First hematological complication is thrombocytopenia.

Multiorgan disorder in PIH 00:56:00

Maternal Kidney :

First or m/c organ involved.

Due to vasoconstruction → decreased renal blood flow → decreased GFR → Oliguria.

Oliguria → increased serum creatinine.
→ increased serum urea.
→ increased serum uric acid.

Characteristic histopathological finding is glomeruloendotheliosis in pre-eclampsia patients.

Hematological changes : Thrombocytopenia, microangiopathic hemolysis, intravascular coagulation, increased LDH levels.

Liver : Stretching of glissons capsule (epigastric/right upper quadrant pain), periportal hemorrhage, vasospasm (raised enzymes, nausea & vomiting).

Retina : Vasospasm (first), visual changes (first is scoto-

Active space

ma), HTN retinopathy (Keith Wagner classification), retinal detachment (blindness).

CNS changes like headache, vision disturbances, seizures (due to thrombosis in cerebral blood flow).

Hemolysis.

Abnormal placental tissue is responsible for PIH (not fetal tissue).

Definitive management : Termination of pregnancy (induction of labour).

PIH is also seen in molar pregnancy.

Factors of absent/defective VR 01:02:35

1. Immunological factors :

Foetus have 50% genes from mother and 50% from father.

In pregnancy with PIH it is seen that there is increased immune response against paternal genes hence VR does not happen.

This theory is supported by :

- Primigravida female : First exposure to paternal genes.
- Female who has been pregnant with new partner : Exposure to new paternal genes.
- Long interpregnancy interval.
- In females who were using barrier contraceptives.
- In females who conceived through ART.
- In molar pregnancy due to increased paternal genes.

2. Genetic factors :

In female with family history of pre-eclampsia in mother or sister.

Female with previous history of PE in early pregnancy have 7 times more chances of PE in next pregnancy.

Most important gene leading to PE is chromosome 13 that codes for SFLT1 (HELLP syndrome : chromosome 12).

So in female with fetus having trisomy 13 → increased chance of PIH .

3. Environmental factors :
   - Decrease in calcium intake.
   - High BMI : Implies increased chances of PE.
   - IVF especially with donor's eggs.

Risk factors for PE/PIH :

Increased risk :

- Nulliparous/primigravida.
- New paternity.
- Long interpregnancy interval (>/= 10 years, if earlier pregnancy was normotensive, short interval if earlier pregnancy was HTN).
- Molar pregnancy.
- H/o PE in mother/sister or woman herself was SGA.
- Obese women (BMI>30).
- Age of female <18 yrs or >40 years .
- Use of barrier contraceptive before pregnancy.
- Hydrops foetalis.
- Pregnancy due to IVF.

High risk :

- Previous history of PE.
- Female with chronic HTN
- Multiple pregnancy (both have paternal genes, increased exposure to the genes).
- Diabetic mother (Type 1,Type 2).
- Female with kidney disorder.
- Female with immune disorder like APLA syndrome.
  ACOG advises to start on low dose aspirin to prevent PIH in female with high risk factors.

Low dose aspirin : ACOG recommends with any one of these high risk factors are present.
Dose : 75–150 mg/day.

Available as :

- 75-150 mg tablet.
- Started at < 16 weeks (12-16) of pregnancy.

Best to be stopped at the 36 weeks.

Aspirin supplementation may be considered in a pregnant female with >/= 2 of the following moderate risk factors like :

- Nulliparous/primigravida.
- Age > 35 years.
- Obese.
- Prior history of LBW or IUGR.
- Family h/o PE.
- Vulnerable sociodemographic factor.

Prevention of PIH :

Proven role :

- Low-dose aspirin.
- Calcium supplementation, if female has low calcium .
- Weight loss prior to pregnancy in obese patients .
- There is no role for :
  - Low salt diet.
  - Absolute bedrest.
  - Antioxidants.
  - Fish oil.

Predictors of PIH :

Theoretically used but practically insignificant.

- Increased SFLT1
- Increased S. endoglin
- Decreased VEGF
- Decreased placental growth factor
  Best is ratio of SFLT1 to PLGF
- Uterine artery doppler :
  For surveillances in PIH patients or for uteroplacental insufficiency umbilical artery doppler used.
  Doppler USG that can predict that the female may have PIH in her pregnancy is Uterine Artery Doppler.

Predictors no longer used theoretically and practically ;

- Roll over test.
- Angiotensin II challenge test :

In female with PIH ⟶ Increased sensitivity to angiotensin II

↓

Angiotensin II binds to angiotensin receptor

↓

PIH and vascular injury

- Serum uric acid level.

Reasons for convulsion in eclampsia :

Normally cerebral autoregulation helps to maintain cerebral blood flow despite alterations in cerebral perfusion.

Even when the MAP is increased to 160 mmHg, there is no cerebral hyperperfusion.

In females with PE, this autoregulation is lost.

It is seen that in pregnant females with severe PE, autoregulation is lost leading to :

1. Increased cerebral blood flow → Hyper perfusion → Endothelial cell injury → leaky vessels and perivascular edema.
2. Segmental vasoconstriction → Ischaemia.

HYPERTENSION IN PREGNANCY : PART 2

Pregnant female with B.P ≥ 140/90 -> Repeat B.P after 4 hours -> If persistently raised B.P -> Admit the patient for further evaluation.

Further evaluation for raised BP 00:00:59

Tests to assess the nature of the disease :

1. Proteinuria : On spot urine dipstick ≥ +1 -> 24 hours urine protein excretion (gold standard investigation) or Urine protein/creatinine ratio is done.
   - 24 hours urine protein excretion ≥ 300 mg/24 hrs.
   - Urine protein/creatinine ratio ≥ 0.3.

2. Urine microscopy : To check the presence of :
   - Red casts : case of chronic hypertension with underlying renal pathology.
   - Granular casts : seen in Pre-eclampsia.

Test to detect severity of disease :

1. Platelet count.
2. Liver enzymes.
3. Serum Creatinine.
4. LDH.
5. Peripheral smear for schistocytes.

Note : LDH and peripheral smear for schistocytes are done to rule out HELLP syndrome.

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Tests to assess fetal well being :

1. NST.
2. BPS.
3. USG : To asses for fetal growth, AFI and Doppler studies. (umbilical artery Doppler)

Note :

- If the disease is without severe features : NST and BPS are repeated twice weekly. USG is done once in every 4 weeks.
- If the disease is with severe features : NST and BPS are done daily. USG is done once in 2 weeks.

In admitted patients :

1. Detailed history should be taken daily for headaches, visual symptoms, epigastric pain.
2. Daily weight measurement : Rapid weight gain points out to PIH.
3. B.P every 4 hourly.
4. Quantification of proteinuria.
5. Restricted physical activity.
6. Fundus examination :
   - most common finding seen with severe Pre-eclampsia is Segmental vasospasm and increase in vein to artery ratio.
   - In Mild Pre-eclampsia : no changes.
   - Papilledema is not a common finding in Pre-eclampsia. If present rule out brain tumor.
   - most common visual symptom in severe Pre-eclampsia is scotoma.
   - Patient may also compliant of blurring of vision, diplopia and complete blindness (reversible).
   - Reversible complete blindness is due to occipital edema and is known as Amarousis. It can be secondary to retinal ischemia called as Purtscher's retinopathy or due to retinal detachment.

Management of non-severe pre-eclampsia :
After initial evaluation manage them on OPD basis : Visits twice weekly.

Advice :

1. About severe symptoms like unusual headache, epigastric pain and visual symptoms.
2. Limited physical activity.
3. Daily fetal movement count.

Active space

4. Daily measuring B.P twice a day.

No role of :

- Bed rest.
- Low salt diet
- Anti-hypertensive medications.
- Low dose aspirin.

At each visit check for:

1. B.P
2. Proteinuria.
3. Platelets.
4. Liver enzymes.
5. Serum creatinine.

Note : Anti-hypertensive given for mild-moderate hypertension - Studies have shown frequency of growth restricted neonates doubled in women given labetalol.

NICE guidelines : Anti-hypertensive should be given if B.P ≥ 150/100 mm of Hg.

Definitive management : Termination of pregnancy.

- In case of PIH without severe features : Deliver at ≥ 37 weeks.
- mode of delivery : Vaginal delivery.

Management of PIH

00:10:50

- Definitive treatment : Removal of placenta/ termination of pregnancy via induction of labour.
- Preferred mode of delivery in PIH : Vaginal delivery.
- Cesarean section is reserved only for obstetrical reasons like fetal distress, abruption.
- Preferred mode of anesthesia during PIH is neuraxial anesthesia > Epidural anesthesia.

When is termination of pregnancy (TOP) done ?

Pregnancy condition	TOP done at
Pre-eclampsia without severe features	≥37 weeks of pregnancy.
Pre-eclampsia with severe features	≥34 weeks
On umbilical artery doppler : S/D ratio increased ≥ 3	≥37 weeks
On umbilical artery doppler : Absent end diastolic flow	33-34 weeks
On umbilical artery doppler : Reversal of end diastolic flow	30-32 weeks
On ductus venosus doppler : Absent A wave seen	at 30 weeks
Eclampsia or impending eclampsia	Immediate termination of pregnancy irrespective of gestational age.
HELLP Syndrome	Immediate termination of pregnancy. Do not wait.

Fetal distress/ abruption of placenta/ uncontrolled hypertension/ progressive organ damage	Immediate termination of pregnancy irrespective of gestational age.
Chronic hypertension but controlled.	37-38 weeks + 6/7 days
Chronic hypertension with superimposed PE	37 weeks, do not wait till 38 weeks.

In cases of absent or reversal of end diastolic flow : C-section is the mode of delivery.

Patients with severe preeclampsia :

Management :

- Admit the patient.
- measure blood pressure every half hourly, measure urine output hourly, measure proteinurea by dipstick every 4th hourly.

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- Evaluate for signs of impending eclampsia.
- Do all the lab investigations.
- Assess fetal well-being.
- Antihypertensives must be started immediately within 30 to 60 minutes.

According to ACOG 2020,
First line drugs to treat severe hypertension :

1. Hydralazine IV.
2. Labetalol IV.
3. Nifedipine oral.

At BP >/= 160/100 -> Risk of ICH.

Also, start seizure prophylaxis.
In females with severe pre-eclampsia, there is a higher risk of eclampsia.
Symptoms of impending eclampsia :

1. Severe headache.
2. Epigastric pain.
3. Visual disturbances.

Give magnesium sulphate to prevent seizures.
Note : Occurrence of clonus also the notes impending eclampsia.

Corticosteroids should be given if gestational age is between 28 to 34 weeks, to accelerate lung maturity of fetus.
After initial stabilisation of mother, re-evaluation needs to be done.
Self management with TOP at 34 weeks.

Further management depends on gestational age :

1. >/= 34 weeks : Immediate delivery.
2. < 28 weeks : Immediate delivery.
3. 28-34 weeks :
   - Delivery after first dose of corticosteroids and immediate TOP, if severe pre-eclampsia with any of the complications like :
     1. Impending eclampsia.
     2. Placental abruption.

3. HELLP syndrome.
4. DIC.
5. Pulmonary edema.
6. Stroke.
7. MI.
8. Uncontrolled severe hypertension.
9. Fetal compromise/death.

- Delivery after 48 hours so that corticosteroids can act, in patients with :

  Mnemonic : PROM - PROM/PTL, Renal dysfunction/fetal growth restriction, Oligohydramnios, umbilical doppler - reversed diastolic flow (30-32 weeks).
- Expectant management till 34 weeks.

Expectant management

00:25:20

Till 34 weeks.

It is taken only in tertiary care centres.

Female should remain hospitalised :

- BP monitor every 4 to 6 hourly.
- Proteinuria by dipstick every day.
- Maintain urine input/output charts.
- Lab investigations twice weekly.
- Tests for fetal well-being daily.
- Ultrasound every two weeks.

After the course of corticosteroids is complete, stop magnesium sulphate.

Continue oral antihypertensives. The goal is to maintain systolic BP 140 to 155 mmhg and diastolic BP 90-105 mmhg.

Mode of delivery is vaginal delivery.

- Cut short the second stage with prophylactic forceps or vacuum.
- In third stage : methylergometrine is contraindicated.

Indication of cesaerean section (with neuraxial anesthesia) : If cervix is infavourable and gestational age is less than 34 weeks or is there is fetal distress.

HELLP Syndrome

00:28:11

Acronym used for :

- Microangiopathic Hemolysis.
- Elevated Liver enzymes.
- Low Platelet count.

HELLP syndrome may occur as a complication of severe pre eclampsia in 85% cases (↑ BP seen in these patients).
In 15-20% of patients, it does not appear as a complication of severe pre eclampsia (normal BP seen).

Pre eclampsia is common in nulliparous females.
HELLP syndrome is more common in multiparous females.

Pathophysiology of HELLP syndrome :
Microangiopathy + activation of intravascular coagulation.

Presentation of HELLP syndrome patients :
Most common symptom : Sudden onset of pain in abdomen at mid epigastrium or right upper quadrant.
This pain is colicky in nature, may/may not be associated with tenderness, nausea & vomiting. This pain appears in the third trimester.

Other signs and symptoms :

- BP increased in 85% cases (not a diagnostic criteria).
- Proteinuria.

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Diagnostic criteria for HELP syndrome : TENESSE Criteria.
H : Hemolysis present if any two of the following are seen :

- Schistocytes or helmet cells or burr cells should be seen in peripheral blood smear.
- ↑ in indirect bilirubin (≥1.2)
- ↑ LDH (>2 times of normal) & ↓ haptoglobin (<25mg/dL).
- Severe anemia unrelated to blood loss.

EL : Elevated liver enzymes (>2 times the normal value).
LP : Low platelet count (< 1 lakh).

Management of HELLP syndrome :

1. In 85% of cases, it occurs as complication of severe pre eclampsia. Therefore to prevent seizures :

Active space

Magnesium sulphate is given.

2. To control BP : Anti hypertensives
3. First dose of corticosteroids of pregnancy is less than 34 weeks.
4. Definitive treatment : TOP.
   Termination should be done after stabilizing the patient, irrespective of the period of gestation without waiting for the effect of corticosteroids to come.

D/D for HELLP syndrome : Acute fatty liver of pregnancy.

Management of pre-eclampsia 00:33:58

Definitive management : TOP.
TOP decreases disease progression and also reverses the disease pathology.

Symptomatic management :

- Antihypertensive drugs.
- $MgSO_4$

These do not decrease the disease progression but improves morbidity and mortality.

Antihypertensives :

- Help to decrease BP : Prevent cerebrovascular accidents/intra-cranial bleeds.
- Drugs should be started if :
  1. BP ≥ 150/100 mmHg persistently (repeated after 4 hours).
  2. BP ≥ 160/110 mmHg on 2 readings within 15 mins apart (this is known as hypertensive crisis).

Q. Primigravida at 32 weeks has BP : 162/110 mmHg, next step?
Ans. Not antihypertensives straightaway, but recheck BP after 15 mins and if still high BP then administer anti hypertensives.

Active space

First line drugs to treat severe hypertension :

1. Hydralazine IV.
2. Labetalol IV.
3. Nifedipine oral.

1. IV Hydralazine :
   - Starting dose : 5 mg IV/IM.
   - 10 mg every 15-20 mins.
   - Intervel for 3 doses.
   - Maximum dose : 30 mg.
   - Side effects : Tachycardia, headache, hypotension and palpitations.

2. IV labetatol :
   - 10 mg IV -> 20 mg -> 80 mg IV.
   - Maximum : 220 mg.
   - Side effects : Bradycardia, hypotension, asthma.

3. Nifedipine oral
   - 10 mg oral (not sub-lingual). -> after 20 mins -> 20 mg - 2 doses.
   - Side effects : Tachycardia, headache.

Other drugs which can be used for treating high blood pressure in pre-eclampsia but are not commonly used.

- Veropamine.
- Nitroglycerin.
- Nitroprusside.
- Nicardipine.
- Nimodipine.
- Ketanserine.

DOC for refractory HTN : Sodium Nitroprusside, S/E it can lead to cyanide poisoning.

Antihypertensives for chronic hypertension in pregnancy :

1. Initiation of therapy : BP is >/= 160/100 mm hg or co-morbidities present at lower BP.
2. Target BP : To keep BP <150/100 mm hg generally or BP < 140/90 mm Hg if end organ damage like LVH or renal insufficiency present.

3. First line drugs are :
   - Labetalol oral.
   - Nifedipine oral.
   - methyldopa oral.

ntihypertensives for chronic hypertension in pregnancy :

- Beta blockers : Propronalol, metaprolol.
- Alpha/beta blockers : Labetalol.
- Alpha agonist : methyldopa (slow onset of action – 6-8 hours).
- Calcium channel blockers.
- Diuretics :
  1. Hydrochlorothiazide can be used for managing chronic hypertension.
  2. It should be used at less than 20 weeks.
  3. Not first line drug.
  4. Diuretics decrease intravenous volume and in pregnancy induced hypertension (pre-eclampsia) already intravenous volume is low, hence diuretics are not used for pregnancy induced hypertension.
  5. Diuretics can be used for managing chronic heart failure with pulmonary edema during pregnancy.
- Hydralazine oral : Generally not used for chronic hypertension because oral hydralazine has weak antihypertensive action and leads to tachycardia.

Atenolol is not recommended as it leads to growth restriction.

Antihypertensives absolutely contraindicated in pregnancy :

- ACE inhibitors.
- Angiotensin receptor blockers like Losartan.
- Diazoxide.

DOC for chronic hypertension in pregnancy : Labetalol.

MgSO4

00:42:08

Drug of choice for prevention and treatment of seizures in females with PIH. This is not an antihypertensive/antiepileptic drug.

Mechanism of action :

- Centrally acting drug.
- Blocks NMDA receptors in brain.
- Membrane stabilization as it is a CCB.
- ↓Release of Acetylcholine.
- Brings about cerebral vasodilation (no hypoxia & seizures are controlled).
- At higher doses, peripheral calcium channels are blocked.
  Therefore, it should be used with caution with other CCBs.

Pritchard's Regime :

- Used to deliver MgSO4.
- Loading dose given and after every 4 hours maintenance dose given till 24 hrs after delivery or 24 hrs after last seizure, whichever is later.

Loading Dose :

- Given irrespective of Kidney function.
- Loading dose consists of IM and IV dose :

IM	IV
10 gm, 50% solution (5g in each buttock).	4g, 20% solution, rate should not exceed 1g/hour.
10 ampules used.	4 ampules + 12 mL Normal Saline to create 20% solution.

In the labor room, MgSO4 available as : 2 mL ampule (50%) containing 1 gm.

When large IV loading dose is given, maternal HR needs to be monitored.
IV dose given slowly over 10–15 mins or at least in 4 mins.
Therefore, maximum IV dose is 1 g/min.

If convulsions still persist after 15 minutes : Next step is to give upto 2g in 20% solution IV slowly.
If patient is obese, maximum up to 4 g can be given.

Note : Magnesium is clear almost completely by renal excretion.

Loading dose is given irrespective of renal function.

Maintenance dose :
Im : 5 gm (50% solution) every 4 hourly in alternate buttock.

$MgSO_4$ has a low therapeutic range.
i.e., 4–7 mEq/L = 2–3.5 mmol/L = 4.8–8.4 mg/dL.
Therefore before giving maintenance dose, Mg levels in the patient should be taken into consideration to avoid toxicity.

Before giving maintenance dose :

1. Knee jerk or patellar reflex should be present.
2. Urine output should be ≥ 100 ml in 4 hours.
3. Respiratory rate should be ≥ 12 breaths/min.

Only then maintenance dose should be given.

If the above criteria are not met, then send sample for serum Mg levels. If Mg levels are high, then antidote for $MgSO_4$ toxicity is given.

First sign of $MgSO_4$ toxicity : Absence of Knee jerk (occurs when MgSO4 levels are more than 10 mEq/L).
Other signs are :

- Diaphoresis.
- Flushing.
- Slurring of speech.

@ 12 mEq/L : Respiratory paralysis is seen.
@ 15 mEq/L : Cardiac conduction defects.
@ ≥ 24 mEq/L : Cardiac arrest.

Oliguria is not a symptom of $MgSO_4$ toxicity but can cause toxicity as MgSO4 is excreted majorly by Kidney.

Active space

ACOG recommends IV dosage of $MgSO_4$:

- Loading : 4 to 6 gm diluted in 100 ml IV fluid given over 15-20 mins.
- Maintenance : 1-2 gm/hr, in 100 ml IV infusion.

Monitor for toxicity :

Assess deep tendon reflexes periodically.

If oliguria is seen, do serum creatinine levels (to ascertain decreased glomerular filteration rate).

ACOG 2020 recommends :

S creatinine levels >/= 1/0 mg/dL -> measure S. magnesium levels to decide on infusion rate.

Antidote : Calcium gluconate given as 1 gm IV. Alternatively, Calcium chloride can also be given.

Routine levels of plasma levels of serum magnesium not recommended.

Role of MgSO4 in obstetrics :

- DOC for neuroprotection (in preterm labour) - if delivery < 32 weeks.
- Tocolysis (not used because 8.-10 mEq mg is needed for tocolytic action).
- Prevention of seizures in :
  1. Impending eclampsia.
  2. HELLP Syndrome.
- Management of seizures in eclampsia.

Magnesium sulphate can cross placenta and lead to some effects on fetal heart rate such as :

- MC : Decrease beat to beat variability.
- Decrease fetal heart rate (transient bradycardia).
- Prolonged deceleration.

Management of eclampsia

00:59:38

Ist step : Airway management, prevent her from falling.

2nd step : MgSO4.

Antihypertensives : IV Labetalol or IV hydralazine.

After stabilization of patient : TOP irrespective of gestational age.

mode of delivery : Vaginal delivery.
If delivery does not occur within 24 hrs in patients of eclampsia : C-section done.
Preferred anesthesia : Neuraxial anesthesia.

Initial response of fetus to seizures : Transient bradycardia.
But if persistent bradycardia is seen in a patient of eclampsia or preeclampsia , then suspect abruptio placenta.

Long term consequences 01:02:18

Future pregnancies :

1. Recurrence of pre-eclampsia, even if in next pregnancy BP is normal.
2. Increased risk of preterm labour.
3. Increased risk of intrauterine growth restriction.
4. Increased risk of placental abruption.
5. Increased risk of HELLP syndrome.

Overall :

1. Increased cardiovascular morbidity because of increased blood pressure.
2. Increase renal dysfunction (15%).
3. Increased CNS sequelae, in case of eclampsia and severe pre-eclampsia : white matter changes persist.

IUGR

Intrauterine growth restriction/fetal growth restriction (FGR) :
Definition : Estimated fetal weight is less than 10 percentile or abdominal circumference on USG is less than 10 percentile.

- Mild IUGR : Around 10 percentile.
- Moderate IUGR : EFW between 3-10 percentile.
- Severe IUGR : EFW less than 3 percentile.

IUGR can be a result of fetal /maternal /placental problems.

Causes of IUGR

00:01:54

1. Fetal causes	2. Maternal causes	3. Placental cause
A. Fetal intrauterine infection	A. Medical / obstetric causes	A. uteroplacental insufficency
B. Congenital anomalies	B. Teratogenic exposure to mother	B. Anti phospholipid antibody syndrome
C. Chromosomal/ genetic abnormalities	C. Low BMI/poor weight gain in pregnancy	C. Placenta / cord anomlies - SUA, velamentous insertion, circumvallate placenta.
D. Multifetal pregnancy	D. High altitude	
	E. Short inter pregnancy interval	
	F. Increased maternal age	

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Congenital anomalies : Abdominal wall defects (omphalocele/ gastroschisis), skeletal dysplasia, diaphragmatic hernia.
Common chromosomal anomalies : Triploidy, trisomy 18 (IUGR + polyhydramnios).
Note : IUGR is usually connected with oligohydraminos.
Note : Fetal causes lead to symmetric iugr - early onset (< 32 weeks) and placental and maternal causes lead to asymmetric iugr - late onset iugr (>32 weeks).

Active space

Symmetrical IUGR 00:05:52

Asymmetrical > symmetrical IUGR.
Represent 20 to 30 percent of FGR cases.
These infants have reductions in all organ systems with the body, head, and length proportionally affected.
Symmetric FGR begins early in gestation and usually

is caused by intrinsic fetal factors such as congenital infections or chromosomal abnormalities or congenital anomalies.
Any kind of problem (chromosomal abnormalities/congenital anomalies etc) → Fetal nutrient supply decreases → All organs symmetrically affected → Symmetrical IUGR.
Investigations :

1. Chromosomal anomalies : Karyotyping.
2. Congenital anomalies : Targeted scan (level 2 scan).
3. Infections : TORCH test.

Asymmetrical IUGR 00:08:08

Later onset (>/= 32 weeks).
Asymmetrical IUGR → Decreased blood flow → Fetus collects blood from all organs and sends to brain → Brain sparing affect → Head size more.
Infants with asymmetric FGR (70 to 80 percent of FGR cases) have disproportionate growth restriction.
Their head circumference is preserved, length is somewhat affected, and weight is compromised to a greater degree.
As a result, the normal-sized head appears relatively large compared with the size of the trunk and extremities.
Abnormal growth typically begins in the late second or third trimesters and results from reductions in fetal nutrients that limit glycogen and fat storage, yet allow continued brain growth – brain sparing effect.

Indications of Karyotyping in IUGR :

1. Very Early onset severe iugr < 24 weeks.
2. If polyhydramnios is present : (normally in IUGR we get oligohydramnios).

Active space

3. If fetal malformations are seen.
4. If on usg : Soft tissue markers of aneuploidy seen.

Constitutionally small babies 00:13:39

IUGR : weight is <10 percentile , associated oligohydramnios or abnormal doppler studies.
Constitutionally small babies have weight between 5 to 10 percentile , no oligohydramnios , no doppler abnormalities.
In constitutionally small babies : abdominal circumference may be > 10 percentile and their mothers may also be small.

Screening for IUGR 00:15:35

1. Measure symphysiofundal height → Normally corresponds to weeks of gestation (cm).
- Discrepancy of 3 weeks (SFH < 3 cm of gestational age) → Ultrasound → Check estimated fetal weight and amniotic fluid.
- IUGR : Check other biometric ratios.

2. HC/AC (head circumference : Abdominal circumference).
- Assymetrical IUGR - HC normal, AC decreased → Ratio increases.
- > 2 S.D : IUGR.
- Also seen in macrosomia/increased intracranial pressure.

3. FL/AC (femur length : abdominal circumference).
- Increased ratio.

Investigations in late onset IUGR :

1. Doppler studies : To detect UPI.
- Most important vessel/1st vessel to show changes in UPI : Umbilical artery.
- Normally, S/D ratio of umbilical artery <3. If S/D ratio >/=3 → UPI.
- In UPI (asymmetrical IUGR) : Decreased blood supply to fetus → Redistributes blood to brain → Brain sparing effect.
- In early UPI : Middle cerebral artery doppler - Normal (due to the brain sparing effect).

- As UPI progresses → Resistance in MCA decreases → So, in late UPI, S/D ratio decreases.
- The last vessel to show reversal of end diastolic flow : Ductus venosus (indicates impending death).

Management of IUGR 00:26:40

Fetal monitering :

1. USG : Every 3 weeks.
2. Weekly evaluation of amniotic fluid.
3. Weekly evaluation of umbilical artery doppler.

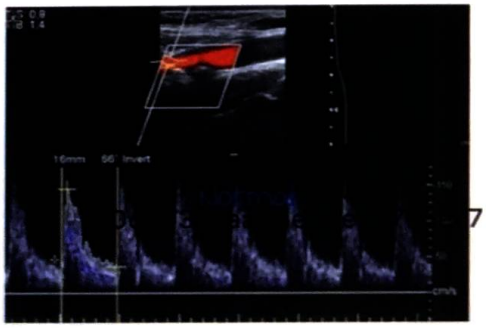
If IUGR is suspected :

1. Detailed USG.
2. Umbilical artery doppler.
3. Offer genetic testing for :
   - Early onset FGR.
   - Anatomic abnormality.
   - Polyhydramnios.
4. Maternal serum or amniotic fluid testing for TORCH infections.

Follow up for IUGR 00:08:08

1. Serial USG scans for fetal growth assessments (every 3 weeks).
2. Umbilical artery doppler (weekly).
3. Amniotic fluid assessment (weekly)
4. Fetal surveillance with NST or BPS.

Results :



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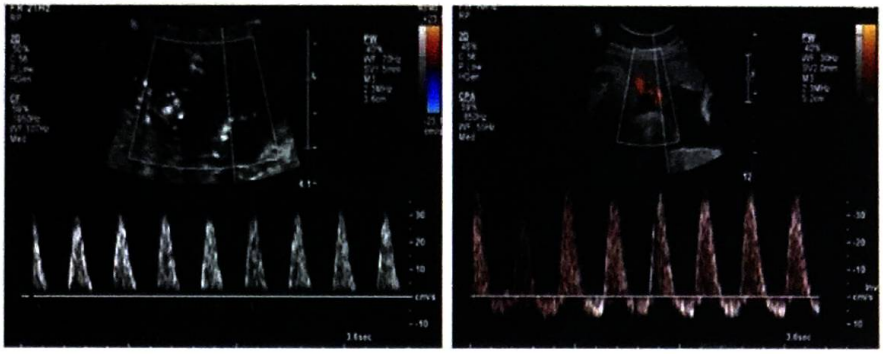

Absent end diastolic flow Reversed end diastolic flow

Normal umbilical artery doppler + IUGR :

- Umbilical artery doppler – weekly.
- NST/BPS – weekly.
- Fetal growth assessment – 3 weekly.

Delivery plan based on expected fetal weight :

1. EFW – 3–9 percentile : Deliver at 38–39 weeks.
2. EFW <3 percentile : Deliver at 37 weeks.

Note : Oigohydramnios present : Deliver at 36–37 weeks.

Mode of delivery : As long as fetal heart rate is normal : Vaginal delivery.

During labor, some fetuses cant tolerate well, so prepare for casaeran section as well.

Umbilical artery doppler showing absent end diastolic flow :

1. Consider hospitalisation.
2. Corticosteroids for fetal lung maturity.
3. NST 1–2 times/day if hospitalised.
   NST 1–2 times/week if outpatient.
4. UA doppler : 2–3 times/week.
5. Fetal growth assessments every 3 weeks.

Delivery at 33–34 weeks.

Umbilical artery doppler showing reversed end diastolic flow :

1. Compulsory hospitalisation.
2. Corticosteroids for fetal lung maturity.
3. NST 1–2 times/day if hospitalised.
4. UA doppler : 2–3 times/week.
5. Fetal growth assessments every 3 weeks.

Delivery at 30–32 weeks.

Note - There is no role of :

- Nutrient supplementation.
- Aspirin.
- Heparin.
- Oxygen therapy.
- Anti-hypertensives.

Risk of IUGR to neonates 00:34:08

Neonatal hypoxia.
MAS (meconium aspiration syndrome).
Hypoglycemia.
Polycythemia.
Hyperviscocity.

Risk of IUGR to adults 00:35:58

Barker's hypothesis : Adult mortality or morbidity maybe affected. Especially cardiac dysfunctions can be seen in the adults.
Also affects other organs development.
This can lead to hypertension, atherosclerosis, type 2 diabetes in adult life.

Infections leading to IUGR 00:37:08

- Rubella
- CMV
- TB
- Syphilis
- Toxoplasma gondii
- Congenital malaria.

Pondoral index 00:37:28

Weight parameters at birth are not sensitive measures to detect IUGR.
The ponderal index (PI) is a useful tool to detect FGR, particularly in infants with asymmetric FGR.
PI is a ratio of body weight to length

Active space

$$PI = \frac{\text{Weight (in grams)} \times 100}{(\text{length in cms})^3}$$

With normal growth, the PI increases gradually from 30 to 37 weeks gestation and then remains constant.

PI of less than the 10th percentile reflects fetal malnutrition;

PI of less than the 3rd percentile indicates severe wasting.

HIV IN PREGNANCY

Introduction 00:01:42

HIV in pregnancy :
Caused by HIV 1.
may be caused by HIV 2.

Screening test :
All pregnant females are offered HIV screening test in their 1st antenatal visit.
The female can choose to opt out : Opt out approach.
In case she chooses to opt out, counsel her regarding the hazards of HIV to her and the fetus.
Testing and counselling is offered in all subsequent visits.

Process of screening antenatal women (NACO 2018) :
Screening test for HIV and Syphilis is done by ANM at the village/ subcenter level using whole blood finger prick test.
If the screening is HIV positive, refer to ICTC for confirmation of HIV by rapid tests.
If the screening is positive for syphilis, RPR testing is done for confirmation.

HIV and TB correlation :
Tuberculosis (TB) is responsible for about 25% of all deaths in among HIV infected individuals.
HIV infected pregnant females have a 10 times higher risk of getting infected with TB.
Active TB in HIV infected pregnant females increases risk of maternal mortality, prematurity, low birth weight and perinatal tuberculosis.
Also increases chances of vertical transmission by 2.5 times.

Management of HIV positive pregnant females 00:09:18

Case 1 : A known HIV positive patient conceives and is already on ART.

Continue same regimen (irrespective of the drug) throughout pregnancy, labour, breast feeding and thereafter life long if stabilized and responding to it adequately.

If on EFV (Efavirenz) based regimen, no need to substitute.
Earlier guideline : Substitue efavirenz with nevirapine.

Case 2 : Newly diagnosed case of HIV in a pregnant female.
Start ART immediately without any delay irrespective of :

- Gestational age.
- CD4 count.
- WHO clinical staging.

Continue for lifelong regardless of WHO clinical staging or CD4 counts.
ART shall be initiated only at the ART centre.
Recommended first line regimen for HIV infected pregnant women is : Tenofovir (TDF) 300mg + Lamivudine (3TC) 300mg + Efavirenz (EFV) 600mg, if there is no prior exposure to NNRTIs (NVP/EFV) at any gestational age.

Case 3 : Pregnant female with HIV positive with previous exposure to Nevirapine/Efavirenz in previous pregnancy.
In such a female, repeating EFV may not be effective, so start on Tenofovir (1 tab/ day) + Lamivudine (1 tab/ day) + Lopinavir 200mg/ Ritonavir 50mg (2 tabs/ twice daily).

	Name of ARV	Dose	Major side effects
1	Tenofovir Disoproxil Fumarate (TDF)	300mg once daily	Nephrotoxicity, Hypophosphatemia.
2	Lamivudine (3TC)	300mg once daily	Very few side effects : Hypersensitivity, rarely pancreatitis.
3	Efavirenz (EFV)	600 mg once daily	Neuropsychiatric symptoms like hallucinations, suicidal ideations, nightmares, vivid dreams etc.
4	Lopinavir/Ritonavir (LPV/ r)	400/100 mg twice daily (dose of FDC tablet : LPV(200mg)/ r(50mg) given 2 tabs BD)	Gastrointestinal disturbances, glucose intolerance, lipodystrophy and hyperlipidemia.

Additional drugs : Cotrimoxazole prophylaxis 00:19:28

It helps to reduce morbidity and mortality by preventing opportunistic infections such as Pneumocystis jiroveci pneumonia (PCP), toxoplasmosis, diarrhoea & other bacterial infections.

Prophylaxis in HIV infected pregnant females, is same as non pregnant females.

Criteria for CPT prophylaxis in non pregnant females/ normal person :

- CD4 counts < 350 cells/cu. mm.
- WHO clinical stage 3 and 4.

Regimen :

1 double strength tablet of Cotrimoxazole (Sulfamethoxazole/ Trimethoprim : 800mg/ 160mg) OD.

Alternative regimen : Dapsone 100mg once daily.

CPT prophylaxis for pregnant or breastfeeding females :

Females, who fulfill the criteria for CPT, should continue it throughout pregnancy.

If a female requires CPT during pregnancy, it should be started regardless of stage of gestational age.

Breastfeeding women should continue CPT where indicated.

Breastfeeding should not be stopped.

Case 4 : Pregnant female in labour with unknown HIV status (unbooked case).

NACO recommends :

Routine screening test with opt out option.

If female opts out, take universal precautions during delivery.

Screening to be done by whole blood finger prick test.

If screening is positive :

- Initiate 3 drug ART immediately.
- Send 3 rapid antibody tests for confirmation (to ICTC center) along with CD4 count test next day.
- Continue ART during postpartum if antibody tests come positive.

Active space

Maternal status	Intrapartum	Postpartum
Presenting in active labour, no prior ART.	Initiate TDF (300 mg) + 3TC (300 mg) + EFV (600 mg).	Continue TDF(300 mg) + 3TC(300 mg) + EFV(600 mg).

If ART started at the time of labour, patient is about to initiate breastfeeding, Nevirapine prophylaxis should be given to the baby for 12 weeks.
All infants born to HIV positive mothers should receive Nevirapine prophylaxis for at least 6 weeks :

- Irrespective of ART taken by mother
- Irrespective of breastfeeding/ supplement feed.

HIV 2 in a pregnant female

00:29:08

more common in western India.
HIV 2 also progresses to AIDS but at a much slower rate.
Known to be less transmissible from mother to child.
NNRTI drugs like NVP, EFV are not effective against HIV 2.
Regimen for HIV 2 infection or HIV 1 and HIV 2 coinfection :
Tenofovir (300mg) + Lamivudine (300mg) + Lopinavir 800mg/ Ritonavir 200mg. Same as non pregnant female.
Zidovudine (AZT) to be given to the infant for 6 weeks.
mode of delivery :
Always opt for vaginal delivery irrespective of CD4 counts/ viral load unless obstetric indication for cesarean is present.
ART can reduce risk of PTCT (parent to child transmission) better and with lesser risk than a C - section.

PPTCT : Interventions during labour and delivery :

- Minimize vaginal examinations.
- Avoid prolonged labour, consider oxytocin to shorten labour.
- Avoid artificial rupture of membranes.
- Early cord clamping (< 1 min) after it stops pulsating and after giving the mother oxytocin.
  (Delayed cord clamping (1 - 3 min) in international guidelines).

- Use non invasive foetal monitoring.
  Avoid invasive procedures (scalp electrodes).
  Avoid routine episiotomy/ support perineum.
  Minimise the use of forceps or vacuum extractors.

Management of newborn 00:37:50

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Breastfeeding is not contraindicated in HIV positive females.
Do not give mixed feeds (either exclusive breast feeding/ exclusive supplementary feeding, not both).
Nevirapine prophylaxis should be given to all newborns of HIV 1 positive (Zidovudine to HIV 2 positive) mothers irrespective of :

- mother breastfeeds/ supplement feeds to the baby.
- mother received ART or not.

Duration : 6 weeks.
6 weeks to be increased to 12 weeks if mother decides to breastfeed and ART is started to the mother,

- In late pregnancy.
- During or after delivery.
- Or has not been on ART for an adequate period of 4 weeks to be effective for optimum viral suppression.

Case A :
Pregnant female started on ART during labour/ late pregnancy or ART taken for <4 weeks decides to breastfeed : NVP to be given for 12 weeks.

Case B :
Pregnant female started on ART during labour/ late pregnancy or ART taken for < 4weeks decides to exclusively formula feed the baby : NVP to be given for 6 weeks.

Infants of women with prior exposure to NVP should get syrup Zidovudine instead of NVP.
Zidovudine prophylaxis is given when :
Female infected with HIV 2/ coinfection with HIV 1 & 2.
Female with HIV 1 infection & prior exposure to NVP/EVZ.

Active space

Vertical transmission of HIV 00:37:50

Most common time of transmission of HIV : Last few weeks before delivery (50%) > intrapartum period.

Transmission rates depend on viral load :

<50/ml : Risk is almost nil.

>30,000/ml : 23%.

Transmission rates with intra abdominal invasive procedures like CVS (Chorionic villus sampling), amniocentesis :

If patient is on ART : No increased risk of transmission.

If patient is not on ART : Transmission rate doubles.

ARV intervention	Risk of HIV transmission from mother to child
No ARV ; breastfeeding	30 – 45%
No ARV ; No breastfeeding	20 – 25%
Short course with one ARV ; breastfeeding	15 – 25%
Short course with one ARV ; No breastfeeding	5 – 15%
Short course with two ARVs; breastfeeding	5%
3 ARVs (ART) with breastfeeding	2%
3 ARVs (ART) with no breastfeeding	1%

Vaccination in a pregnant HIV positive female 00:54:27

All vaccines as in a normal pregnant female should be given :

- Td vaccination at 1st antenatal visit, repeated at 4 weeks.
- Influenza vaccine : H1N1.
- COVID – 19 vaccine (if not taken earlier).

Additional vaccines (International guidelines) :

- Pneumococcal vaccine.
- Hep A and Hep B vaccines, if not infected in past.

RH NEGATIVE PREGNANCY

Rh antigens 00:00:38

Rh antigens are : C, C, D, E, e.

Present on the short arm of chromosome 1.

D present : Rh positive.

D absent : Rh negative.

Rh antigens appear as early as 38 days of gestational age on the RBCs.

If an Rh negative individual is exposed to the RBCs of an Rh positive individual

↓

The Rh antigen, being a foreign antigen, causes the immune system of the Rh negative individual to react

↓

The body of the Rh negative individual produces antibodies against the Rh antigen

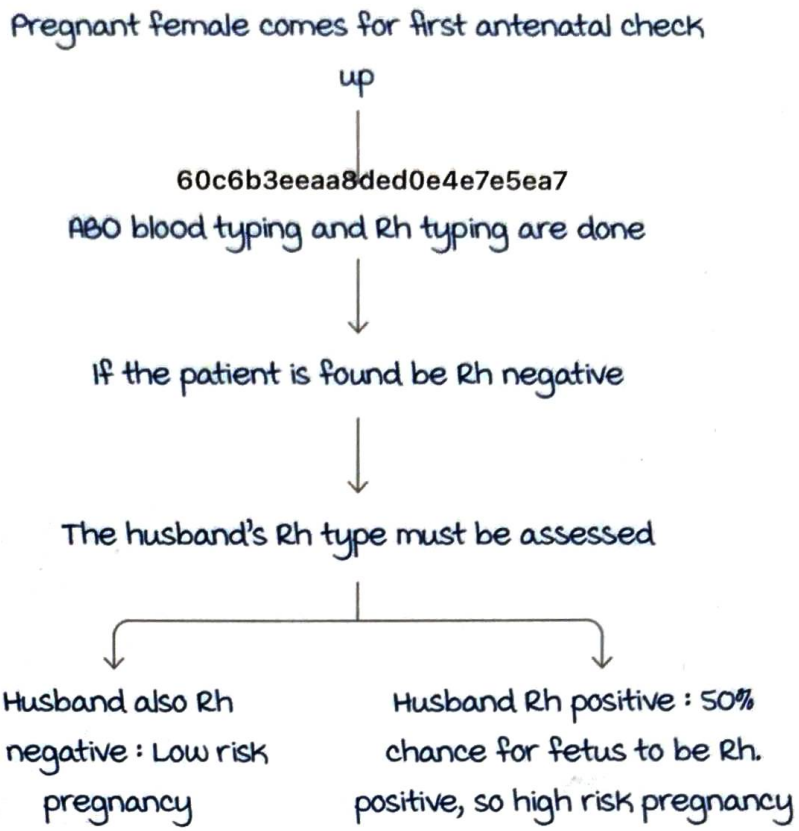
Rh negative pregnancy 00:03:29

Occurs when the mother is Rh negative and fetus is Rh positive.

Only if father is Rh positive.

If father is Rh positive : 50% chance for fetus to be Rh positive (high-risk pregnancy).

If father is also Rh negative : Fetus will also be Rh negative (not a high-risk pregnancy).



In an Rh negative mother and Rh positive fetus :
There can be mixing of blood if fetomaternal hemorrhage occurs.

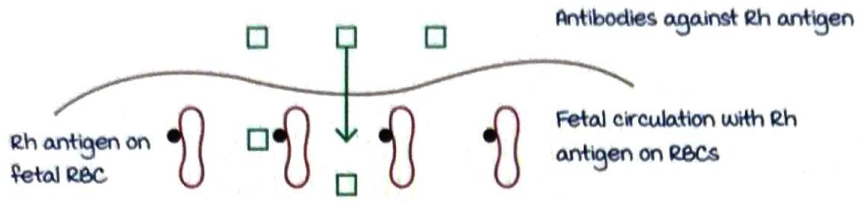
- Due to bleeding.
- Due to invasive procedures.
- Due to versions.

This causes the fetal blood with Rh antigen to come into the maternal circulation.
Rh antigen stimulates the maternal immune system → antibodies against Rh antigen produced → initially it is IgM antibodies, that do not cross the placenta.
By the time IgG antibodies are formed, the patient would have delivered → 1st pregnancy is safe in Rh negative mothers.

In subsequent pregnancies :
If the fetus is Rh positive and feto-maternal hemorrhage occurs, the fetal RBCs enter the mother's circulation.
mother's immune system is stimulated → IgM and IgG antibodies are formed quickly (as antibodies were once formed after exposure to Rh antigen).
IgG antibodies can cross the placenta if they are produced in

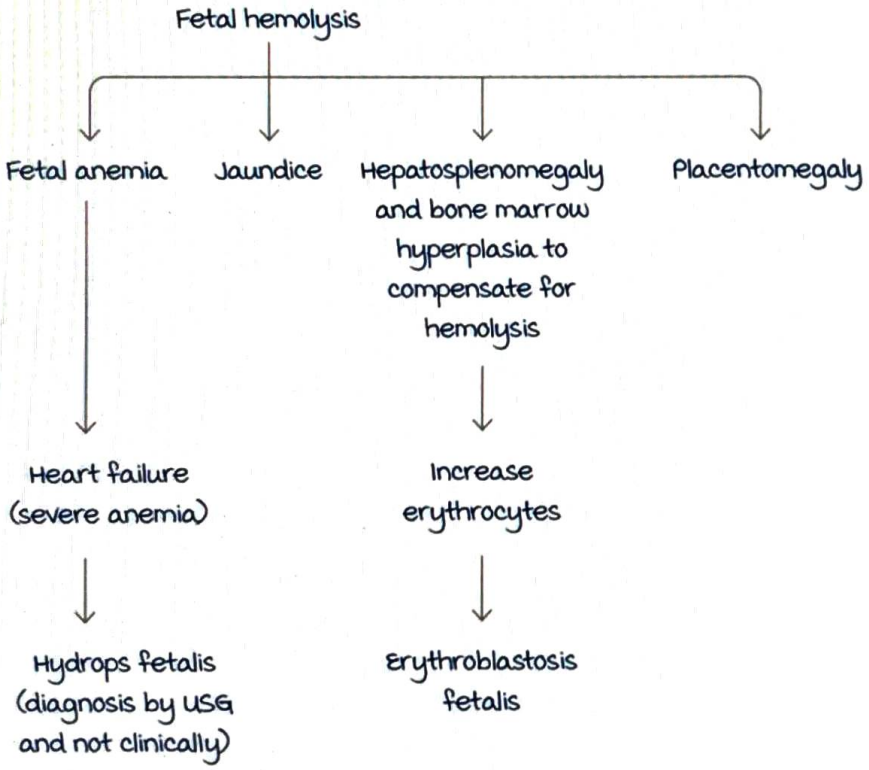
Active space

significant amounts.
Hemolysis in the fetus occurs.



Anemia in fetus can be detected by :

- CTG/ NST.
  Sinusoidal heart wave pattern : Indicates anemia.
  Can be due to any reason → Rh isoimmunised pregnancy, vasa previa, twin to twin transfusion syndrome.
- Doppler of middle cerebral artery will show increased peak systolic velocity → ≥ 1.5 mom.



Rh negative pregnancy poses a higher risk to the fetus → fetal morbidity and mortality.

maternal complications :

PIH : Due to placentomegaly.
Polyhydramnios : Due to placentomegaly.

Prevention of fetal complications 00:19:10

All fetal complications can be prevented if the mother's blood has anti-D present before the fetal blood enters the maternal circulation.

Anti- D present before fetal blood enters the maternal circulation → neutralizes the Rh-positive fetal RBC before it can stimulate the maternal immune system to produce excessive anti-D.
Anti-D is given in low concentration : 300µg.
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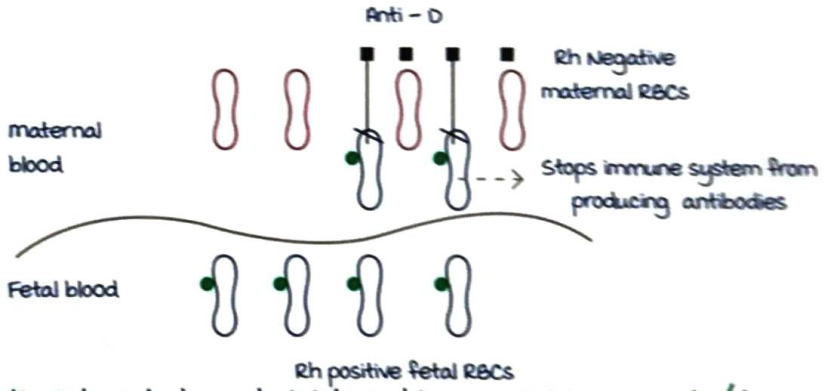
300µg neutralizes 30mL of feto-maternal hemorrhage/ 15mL of fetal RBC.
If the administered anti- D crosses the placenta → cannot cause hemolytic symptoms in fetus due to the low concentration.



Anti- D has to be administered in excessive amounts/ be produced by maternal immune system to cross the placenta → severe hemolysis of the fetus.

Anti- D is beneficial only if given before fetal RBCs enter maternal circulation and before the stimulation of maternal immune system → only in Rh negative unsensitized pregnancies.

Indirect Coombs test (ICT) 00:29:32

Done to assess if the female has been Rh sensitized or not.
Done on maternal blood.
Done at the first antenatal visit → repeated at 28 weeks of pregnancy.
Indirect Coombs test negative : Rh unsensitized female.
Indirect Coombs test positive : Rh sensitized female.

If ICT remains negative → 300µg/ 1500IU of anti-D given at 28 weeks of pregnancy to the Rh negative unsensitized pregnant female → Antepartum prophylaxis.

Unsensitized Rh negative females :
Anti- D given to protect the pregnancy.
Delivery at 39- 40weeks.
Mode of delivery : Vaginal delivery.
Early cord clamping → To prevent sensitization during delivery.

The Rh status of newborn is assessed → if the newborn is Rh positive.

- Direct Coombs test done on the newborn's blood.
- If negative → 300µg of anti- D given to mother → post-partum prophylaxis.

If newborn is Rh negative, post-partum prophylaxis need not be given.

Post- partum prophylaxis :
Aims to protect the next pregnancy.
Ideal time is within 72 hours of vaginal delivery/ caesarean section.

- Can be given up till 28 days after delivery.

Anti-D should be given even if the female opts for post-partum sterilization.

If indirect Coombs test at 28 weeks is positive → Rh negative sensitized pregnancy.
No role for giving anti-D.

Active space

Management of Rh-negative sensitized pregnancy

00:39:16

Antibody titers are assessed → check if the antibodies in the maternal circulation are at significant amount (to cross the placenta).

Critical titer is 1 : 16.

The mother's blood is subjected to serial dilution.

If antibodies are present at 1 : 16 dilution or more → significant.

Maternal antibody titer is < 1 : 16 (1:2, 1:4, 1:8) :

Significant number of antibodies not present to cross the placenta.

The titers are repeated every 4 weeks.

If titers start increasing, repeated every 2 weeks.

Fetal monitoring started at 32 weeks of pregnancy.

Delivery at 37–38 weeks of pregnancy.

Maternal antibody titer is ≥ 1 : 16 (1:16, 1:32, 1:64) :

The titer is critical titer → Significant antibodies are present to cross placenta.

Hemolysis occurs → Fetal anemia.

Fetal anemia

00:47:27

Best non- invasive investigation to assess fetal anemia :

Doppler of middle cerebral artery.

- Peak systolic velocity (PSV) is assessed.
- Screening test for fetal anemia → indicates if anemia is present or not.
- If PSV is ≥ 1.5 mom → fetal anemia is present.

PSV of middle cerebral artery is assessed if antibody titer is ≥ 1 : 16.

If PSV is <1.5 mom.

Repeat PSV of middle cerebral artery every 1–2 weeks.

Do antepartum fetal surveillance from 32 weeks of pregnancy → by NST and biophysical profile (BPP) every week.

Delivery at 37– 38 weeks.

If PSV is ≥ 1.5 mom.

Fetal anemia is present.

Fetal Hb and hematocrit should be assessed →

cordocentesis (blood from umbilical cord) → only indication.

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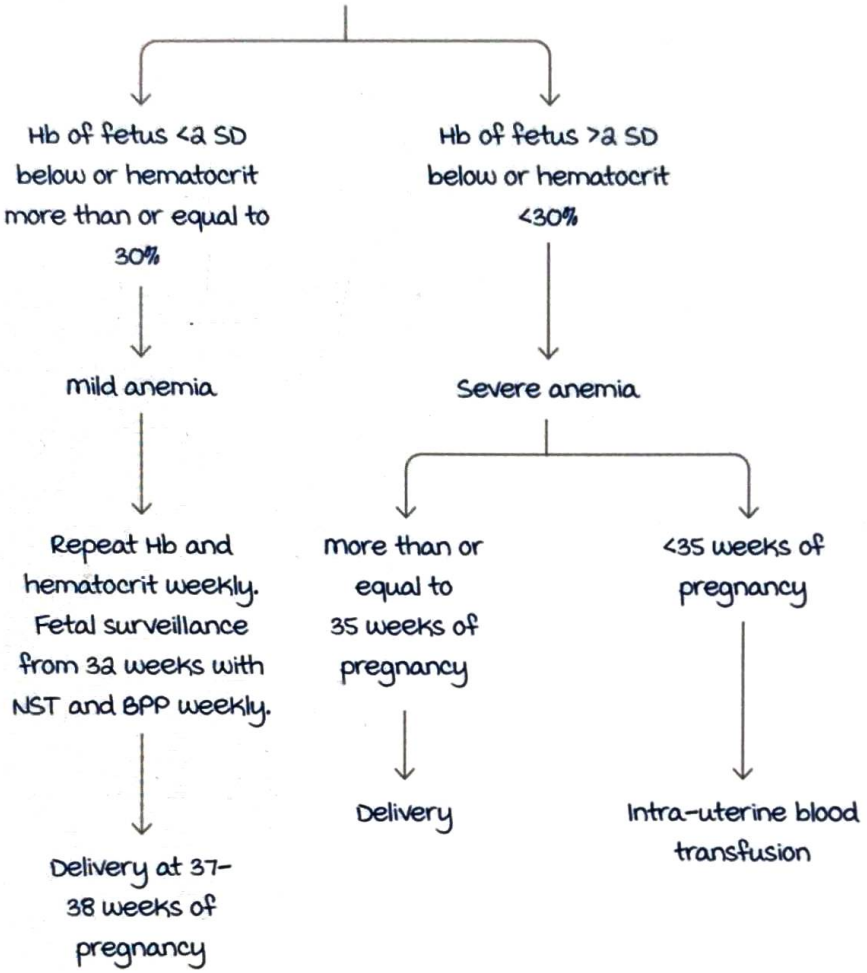


Delivery in sensitized Rh negative female : Vaginal delivery.
Delayed cord clamping → as the mother is already sensitized.

Rh negative pregnancy : Early cord clamping.
Rh negative pregnancy with ICT negative : Early cord clamping.
Rh negative pregnancy with ICT positive : Delayed cord clamping.

Active space

Feto- maternal hemorrhage and anti- D

00:57:23

Normal feto-maternal hemorrhage after delivery is usually <4mL.

The anti-D of 300µg/ 1500IU is sufficient → can neutralize upto 30mL of feto-maternal hemorrhage/ 15mL of fetal RBC.

Increased feto-maternal hemorrhage is seen in :

- History of abdominal trauma in patient.
- Instrumental delivery.
- Twin pregnancy.
- Intrauterine death of fetus.
- Manual removal of placenta.

Screening test for feto- maternal hemorrhage : Rosette test.

It assesses if feto- maternal hemorrhage is more or less.

Rosette's test positive → feto-maternal hemorrhage is more.

Rosette's test negative → feto-maternal hemorrhage is less.

To know the exact volume of feto-maternal hemorrhage → Kleihauer Betke test.

If Rosette test is not available, Kleihauer Betke test can be done.

Kleihauer Betke test :

Should be done within 2 hours of delivery.

It is a quantitative test → gives the volume of feto-maternal hemorrhage.

Based on the volume of feto-maternal hemorrhage, the dose of anti-D is calculated.

300µg of anti- D can neutralize 30mL of feto- maternal hemorrhage/ 15mL of fetal RBC.

For every 1ml of extra fetal blood entering maternal circulation → 10µg of anti-D is given additionally.

Singer's alkali denaturation test :

Also helps in assessing feto- maternal hemorrhage.

Used to differentiate vasa previa from placenta previa.

Qualitative test.

Other indications for anti- D

01:02:47

In first trimester	In second/ third trimester
After abortion. After ectopic pregnancy. After molar pregnancy. After chorionic villi sampling.	After amniocentesis. After external cephalic version/ internal podalic version. Unexplained bleeding. Antepartum hemorrhage. Fetal death. Abdominal trauma.
Dose in <12 weeks : According to ACOG : 50µg IM. According to RCOG : 300µg IM.	Dose >12 weeks : 300µg IM.

Anti- D is not given following cordocentesis.
Cordocentesis is done only in an Rh-negative mother who has been sensitized and has PSV ≥ 1.5 MoM → no role for anti-D in a sensitized patient.

If a pregnant female has delivered within 3 weeks of receiving anti-D injection → anti-D is not given after delivery, as the t ½ of anti- D is 28 days.

Minor antigens on RBC

01:08:01

Risk of sensitization seen in :

- Kell.
- Kidd.
- Duffy- A.

No risk of sensitization seen in :

- Lewis.
- I- antigen.
- Duffy- B.

Most common minor antigen that leads to sensitization : Kell antigen → after mismatched blood transfusion.
Most common non-D alloimmunization : Anti- E immunization.
Most severe non-D alloimmunization : Anti- c immunization.

Mirror syndrome / Ballantyne syndrome :

Both mother and fetus mimic each other as mirror images.

Seen in :

- Anti- D isoimmunization.
- Twin to twin transfusion syndrome.
- Cystic hygromas.
- Placental chorioangiomas.

Both mother and child would have edema.

Hydrops fetalis

01:12:28

It is an USG diagnosis.

Presence of ≥ 2 indicates hydrops fetalis :

1. Pericardial effusion.
2. Ascites.
3. Pleural effusion.
4. Subcutaneous edema.

Placentomegaly and polyhydramnios are seen in hydrops fetalis, but are not included in the diagnostic criteria.

Occurs due to severe anemia leading to heart failure.

1st sign in USG → scalp edema/ subcutaneous edema → Buddha sign.

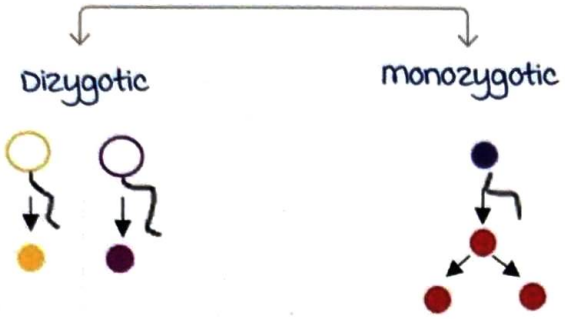
Types of hydrops fetalis :

Immune hydrops fetalis	Non- immune hydrops fetalis
Seen in Rh- negative pregnancy. Occurs if fetal hemoglobin <5gm% and hematocrit <15%.	more common. Causes : CVS anomaly → most common. Chromosomal anomalies. Infection → Parvovirus infection, TORCH infections. Anemia.

Active space

TWIN PREGNANCY : PART 1

There are two types of twins :



- When the 2 ova are fertilized by 2 different sperms to form 2 zygotes, it is called dizygotic twin.
- more common
- Fraternal twins
- may have same sex/ different sex.

Incidence :

Maximum in Nigeria where it is 1 in 20 pregnancies.
Least in Japan, 1 in 200.
Whereas in India it is 1 in 80.

- If a single ova gets fertilized by a single sperm to form a single zygote which then divides into 2, it is called monozygotic twin.
- Less common
- Identical twins
- Same sex, blood group, HLA typing, phenotype.
- Only their fingerprints are different.

Incidence :

Remains same throughout the world that is 1 in 250 pregnancies.

Hellins rule :

If incidence of twins is 1 in 80,
then in the same country, incidence of triplets will be 1 in 80^2.
Incidence of quadruplets will be 1 in 80^3.

Dizygotic twins

In this case both the ova are released at the same time.

1. In some cases one ova is released earlier which gets fertilised and with an ongoing pregnancy the second is released and that also get fertilised in the same cycle.
   Example : One twin is 10 days older than the other.
   This is called superfecundation.

Active space

It means that both the ova are released in the same cycle but at different times and get fertilised due to 2 different acts of coitus.
This is rare (can be seen in humans).

2. In an ongoing pregnancy, an ova gets fertilised in the next cycle.

Here the two different ova are being released in two different cycles and getting fertilised in two different cycles.
Example : One twin is 1 month older than the other.
This is called as superfetation.
Not seen in humans.
Theoretically it can be seen till the uterine cavity is not obliterated (14–16 weeks).

Risk factors for dizygotic twin :

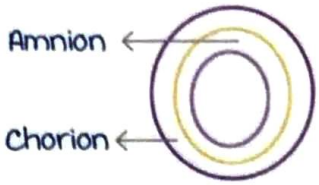
- Geographical distribution.
- Maternal age.
- Parity increases.
- Use of fertility drugs like ovulation induction drugs (Clomiphene citrate and HMG).
- Family history of twin (mother).
- Procedures like IVF (risk factor for mono and dizygotic twin).

Risk factors for monozygotic twin :

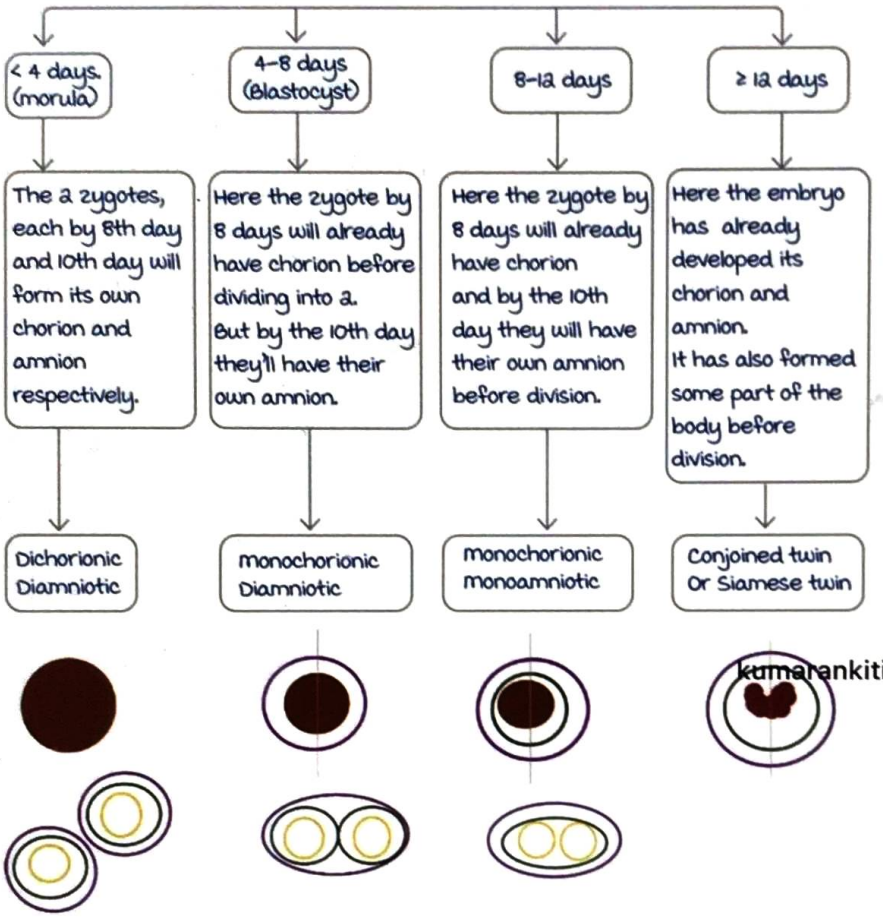
- IVF

Zygosity refers to the type of conception, if there were 2 ova or one ova that was involved in the process of fertilisation.
Chorionicity refers to the type of placentation, for example in dizygotic twins there are two ova which are being fertilised by 2 different sperms and 2 zygotes are formed.
The foetal membranes are chorion and amnion.
By 8 days and 10 days after fertilisation, chorion (outer membrane) and amnion (inner membrane) is formed respectively.
In dizygotic twin each twin will

have its own amnion and chorion.
Dizygotic twins will always be
Dichorionic and Diamniotic (DCDA).



Monozygotic twins :
The number of chorion and amnion depends on the time :



Important concepts

00:18:10

All conjoint twins are monochorionic monoamniotic.
In all monochorionic monoamniotic twins, C-section is done at 32-34 weeks of pregnancy.

Complications :
The cord of the twins can get entangled leading to sudden IUD of both the twins.
C-section is done at 32-34 weeks of pregnancy and

corticosteroids are given for lung maturity.

Done in :

- Monochorionic monoamniotic twins
- Conjoined twins

The most common variety of twins is dichorionic diamniotic twins (All dizygotic).

The most common variety of monozygotic twins : monochorionic diamniotic.

Question :

1. All dizygotic twins are dichorionic : True.
2. All dichorionic twins are dizygotic : False.
   In monozygotic twins if division happens in less than 4 days then they are dichorionic.
3. All monozygotic twins are monochorionic : False.
   If division happens in less than 4 days monozygotic twins are dichorionic.
4. All monochorionic twins are monozygotic : True.

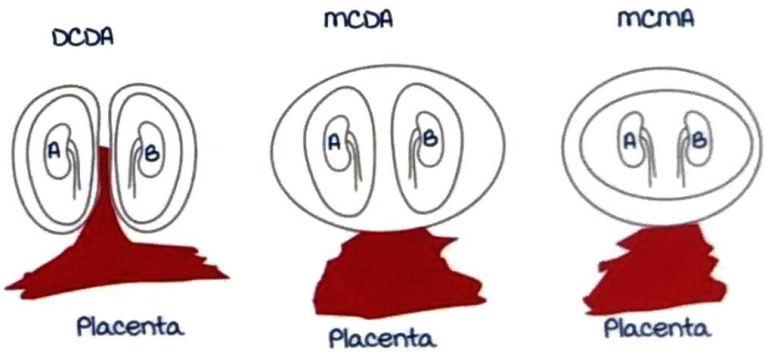
The prognosis of the twins depends on the chorionicity :

- All monochorionic twins have a poor prognosis in comparison to dichorionic twins.
- Prognosis depends on chorionicity and not zygosity. (Dichorionic can come from dizygotic/monozygotic depending on when division happens).

Investigation of choice to know the chorionicity :

Ultrasound (TVS)

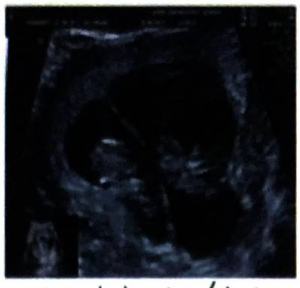
Time : 10 weeks (10-14 weeks/ 1st trimester)



	Dichorionic Diamniotic	Monochorionic Diamniotic	Monochorionic Monoamniotic
No of layers between the twins	4	2	X
Thickness of membrane	≥ 2mm	<2mm	X
Vascular connections between twins	X	Deep vascular connections	Superficial vascular connections
Sex	Same / Different	Same	Same
Number of placenta	2 placenta appear as a single placenta	Single placenta	Single placenta
On USG	Because the placenta is coming in between the chorion, Twin peak sign/ Lambda sign is seen.	Placenta does not come between the twins since they have a single chorion. Twin peak sign absent. T sign is seen.	Placenta does not come between the twins since they have a single chorion. Twin peak sign absent. T sign is seen.
Prognosis	Good	Bad	Bad
Specific complications	X	Because of the deep vascular connections, it can cause twin to twin transfusion syndrome.	Cord entanglement.
Delivery	38 weeks	36 weeks	32-34 weeks C-section after the administration of corticosteroids.

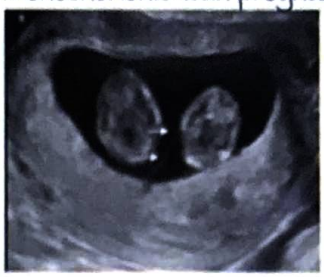
Active space

DCDA

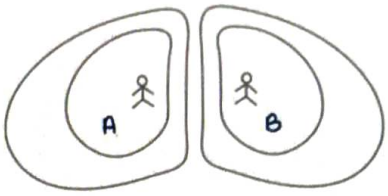


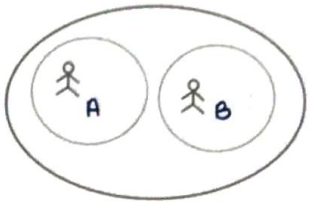
Lambda sign/ twin peak sign

Monochorionic twin pregnancy



T sign





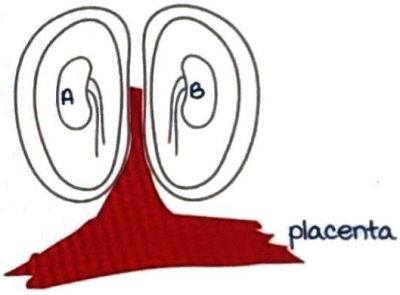
In the first diagram, the placenta can come between the chorion.

In the second diagram, the placenta cannot come in between the chorion.

USG 1st trimester importance :

1. To know gestational age
2. To know chorionicity. (earliest at 7 weeks, best is 10 weeks)
3. To look for Nuchal Translucency (increased NT means twin to twin transfusion syndrome must be suspected).

Ideal time to detect TTTS is in the second trimester.



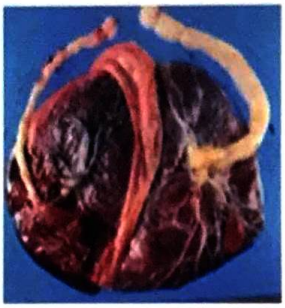
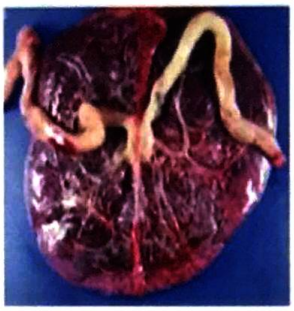
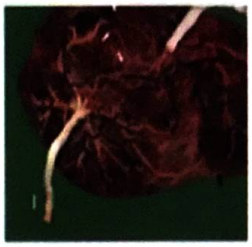
Twin peak sign

markers of dichorionicity on USG :

- 4 layers of membranes between the twins.
- membrane thickness : ≥ 2mm.
- Different sex of the twins.
- 2 different placentas.
- Twin peak sign is positive.

Question :

Based on the different images of placenta classify the following based on the membrane thickness vascular connections

Prescence of thick membranes between the cords. This means it is a Dichorionic Diamniotic Placenta.	A thin membrane between the cords can be appreciated, this means it is a Monochorionic Diamniotic placenta.	No membranes present between the cords. Hence it is a Monochorionic Monoamniotic placenta.
Vascular connections are absent.	Vascular connections are present.	Vascular connections are present.

Cord entanglement is a specific complication of Monochorionic Monoamniotic placenta.

Conjoined Twins :

Complication of Monoamniotic twins.

Most common variety is Paraphagus (they are joined at lower abdomen and pelvis).

Paraphagus > Thoracophagus

Least common : Rachiphagus (joined at the level of vertebral coloum).

Rachiphagus is less common than Craniophagus (2nd best answer).

Management : C-section between 32-34 weeks after completing the course of steroids.

Active space

TWIN PREGNANCY : PART 2

Maternal complications of twin pregnancy 00:00:08

maternal risks of twin pregnancy :

1. ↑ Hemodynamic changes.
2. ↑ Placenta size.
   - ↑ Pre-eclampsia (↑ Exposure to paternal antigens)
     - Abruptio placentae
     - Placenta previa
   - ↑ HCG
     - Hyperemesis gravidarum
   - ↑ Human placental lactogen
     - Gestational diabetes
3. Polyhydromnios : Increased chances of pre term labour, premature rupture of membrane, post partum hemorrhage, cord prolapse, and malpresentation.

4. Intrahepatic cholestasis, acute fatty liver of pregnancy.
   In all twin pregnancies, since it is a risk factor for PIH
   ↓
   Start on low dose aspirin.
   Before 16 weeks, ideally at 12 weeks.
   80 to 150 mg per day.

Fetal complications 00:03:30

All fetal complications are more common in :

1. Monochorionic > Dichorionic twins.
2. Monozygotic > Dizygotic twins.

Except : Cumulative risk of chromosomal anomaly.
If risk of monozygotic (single zygote) is x%, it becomes 2x% in dizygotic twins (x% in each zygote).

Testing for aneuploidy :
In monozygotic : Sample of any one twin is sufficient.
In dizygotic : Sample should be taken from both twins.

All complications are related to chorionicity & amnionicity except :

1. Pre-term labor.

2. IUGR (Intrauterine Growth Retardation).

These are related to number of fetus.

In multi-fetal pregnancy : Do fetal reduction to twin pregnancy.

DOC : Intracardiac injection of KCl to unwanted fetus at 10-13 weeks. Based on ultrasound, the fetus with least chance of survival, KCL is given. It does not affect the survival of other twins.

The 3 complications which are seen in all twin pregnancies (monochorionic/dichorionic) :

1. Preterm labour.
2. IUGR (Intrauterine Growth Retardation).
3. Congenital anomalies.

most common fetal complication of twin pregnancy is preterm labour. In a primigravida with twin pregnancy do not do cervical cerclage, just to prevent 2nd trimister abortion or preterm labour.

Fetal complications : Congenital anomalies 00:13:20

Risk of congenital anomalies is more in twins > singleton.

In twins : Risk is more in monochrionic > dichorionic.

Heart defects : Seen in monochorionic twins because of twin to twin transfusion syndrome/TTTS.

Generally not seen in dichorionic twins.

In all monochorionic twins : Echo is recommended between 18 to 22 weeks, especially in case of TTTS.

ECHO is not recommended in all dichorionic diamniotic twins.

Target scan/anomaly scan/level II scan should be done in all pregnancies (singlet/twins) to rule out gross congenital anomalies of fetus.

Vanishing twin : Early spontaneous reduction from twin to singleton pregnancy. It is more common in IVF pregnancies.

The vanishing twin has no effect on survival of 2nd twin.

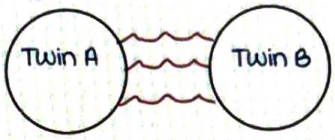
Some studies has shown 2nd twin : ↑ Low birth weight & ↑ Small for gestational age.

Active space

Death of one twin 00:16:55

Can lead to complications in surviving monochorionic twin due to vascular anastomosis.
No complications in surviving twin as there are no vascular anastomosis.

In monochorionic twins : When twin B is about to die, twin B has hypotension and becomes a low pressure system.



Twin A → Blood flow → Twin B

Twin A will have : Hypotension, anemia, and exsanguination.

↓

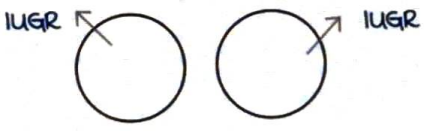
Death of Twin A

Case 1 :
Pregnant female with death of 1st twin and surviving other twin.
Action : No need to deliver the surviving twin.
Reason : Maximum morbidity and mortality of surviving twin occurs at the time of death of the 1st twin.

Case 2 : Pregnant female with twin pregnancy, on routine USG showing impending death of 1st twin.
Action : Deliver both the twins immediately.

Complications : Only in monochorionic twins 00:23:25

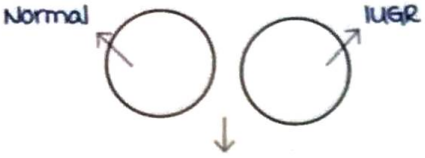
TTTS (Twin to Twin Transfusion Syndrome).
TAPS (Twin Anemia Polycythemia Sequence).
TRAP (Twin Reverse Arterial Perfusion).
Selective IUGR.



Here, both twins have IUGR.

Active space

Related to number of twins and not related to chorionicity.

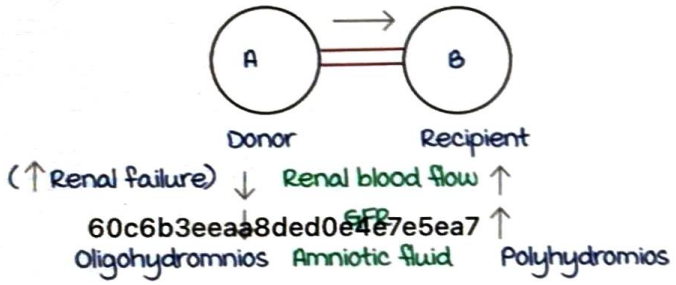


Selective IUGR : Complication of monochoirionic twins.

Twin to twin transfusion syndrome 00:26:35

Due to deep vascular anastomosis between artery and vein.
Seen in monochorionic diamniotic twins.
Not seen in dichorionic diamniotic twins (no vascular connections). Less commonly seen in monochorionic monoamniotic twins (superficial anastomosis).

Vascular connection such that blood flows only in 1 direction :



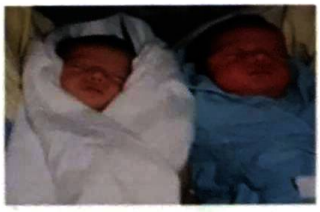
Best method to assess amniotic fluid in twins : Single largest vertical pocket on USG.

Donor
Anemic
↓
Heart failure
↓
≥ 1.5 MOM

Hemoglobin
↓
Leading to
(Peak systolic velocity of middle cerebral artery)

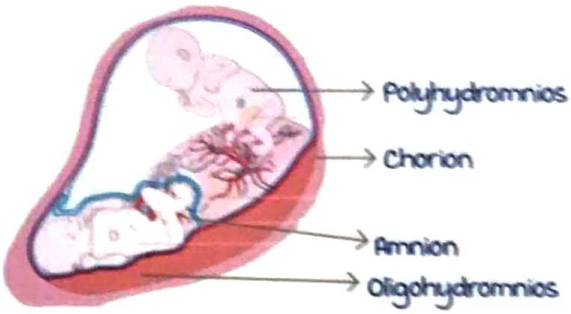
Recipient
Polycythemic
↓
↑ Thrombosis,
↑ Congestive heart failure.
↓
<0.8 MOM

Hydrops fetalis/death in both twins.



Active space

Monochorionic diamniotic twins : TTTS.



Criteria for diagnosing TTTS on USG :
Monochorionic diamniotic twins.
One twin : Polyhydramnios.
Other twin : Oligohydramnios.

Early marker of TTTS on USG : ↑ nuchal translucency.

In donor twin : In order to maintain intravascular volume & BP
↓
Activation of renin angiotensin aldosterone system
↓
Oliguria, anuria, anhydramnios
↓
Giving appearance of stuck twin.

Staging for TTTS/Quintero staging 00:37:50

Stage 1 : One twin : Polyhydtramnios.
Other twin : Oligohydramnios : Bladder can be seen (oliguria).

60c6b3eeaa8ded0e4e7e5ea7

Doppler study : Normal.
Stage 2 : One twin : Polyhydramnios.
Other twin : Oligohydramnios : Bladder can not be seen (anuria).
Doppler study : Normal.
Stage 3 : Doppler study is abnormal.
Stage 4 : Hydrops fetalis in one/both the twins.
Stage 5 : Death of one/both the twins.

Evaluation of TTTS after diagnosis :

1. Doppler studies at 16 to 18 weeks of :
   Umbilical artery, vein & ductus venosus.
   Peak systolic velocity of middle cerebral artery.
2. USG :
   Growth assessment by fetal biometry.
   Oligohydromnios/polyhydromnios.
   Diagnosis of hydrops fetalis.
3. Echo of recipient twin :
   Pulmonary atresia/pulmonary stenosis.
   Hypertrophy.
   Right sided dysfunction > Left sided dysfunction.

Management :
Upto 28 weeks : Fetoscopic laser ablation of vascular anastomosis.
After 28 weeks : Amnioreduction from sac of polyhydromnios.

Twin Anemia Polycythemia Sequence (TAPS) 00:42:23

It is an atypical chronic form of TTTS caused by slow transfusion of RBCs through very small (< 1 mm) & few Placental artero-venous anastomosis.

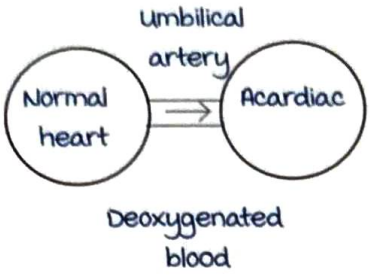
Donor twin	Recipient twin
↓	↓
Anemia	Polycythemia
Amniotic fluid volume : Normal (Peak systolic velocity of middle cerebral artery ≥ 1.5 mo	Amniotic fluid volume : Normal. (Peak systolic velocity of middle cerebral artery <0.8 mom

TAPS may occur spontaneously or after laser ablation of TTTS.

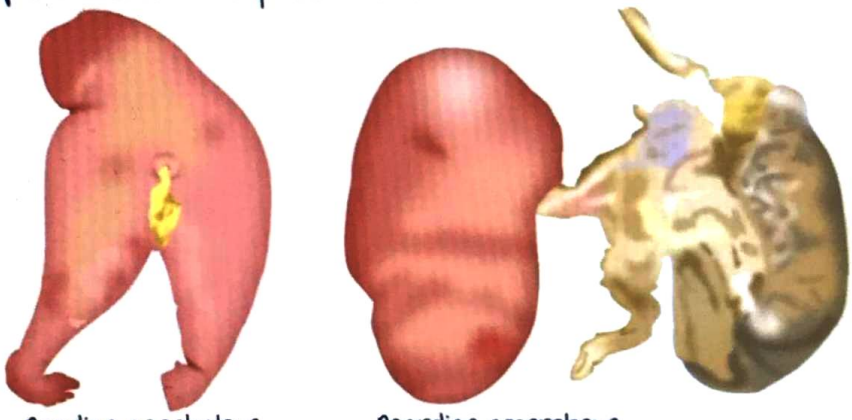
Twin Reversed Arterial Perfusion (TRAP) 00:44:28

Rare complication of monochorionic twins.
One twin is acardiac.
Development of abberant arterio-arterio anastomosis.

between acardiac twin and the normal twin.
Normal twin gives deoxygenated blood to acardiac twin.



Since the acardiac twin is getting deoxygenated blood from umblical artery of normal twin, it is known as twin reversed arterial perfusion.
This results in :
Acardiac acephalus : Abnormal development of the fetus, such that only lower part of the body is developed.
Acardiac amorphus : No part of the acardiac twin develops & appears as an amorphous mass.



Acadiac acephalous Acardiac amorphous

Selective IUGR

00:49:08

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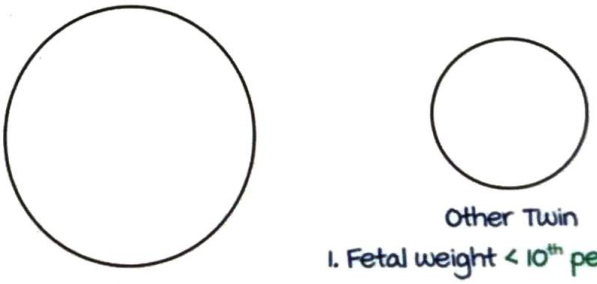


Normal Twin

Other Twin

1. Fetal weight < 10th percentile of normal fetus.
2. Difference in weight ≥ 25% in comparison to normal twin.

Could result in : Unequal placental sharing.
Unequal splitting of initial cell mass.

Active space

Specific complications of monoamniotic twins :

1. Cord entanglement :
   Due to formation of true knots.
   Deliver the baby by cesarean section at 32 to 34 weeks.
2. Conjoint twin.

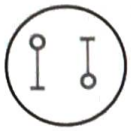
Delivery in twin pregnancy

00:51:23

Most common presentation : Both twins Vertex.
2nd most common : 1st twin vertex & 2nd twin breech.
(Twin 1 : whichever twin which comes first during delivery or the one which is more close to internal Os during pregnancy).

Interlocking of twins :
Happens when first twin is in breech and 2nd twin is in cephalic presentation.

1st : Breech

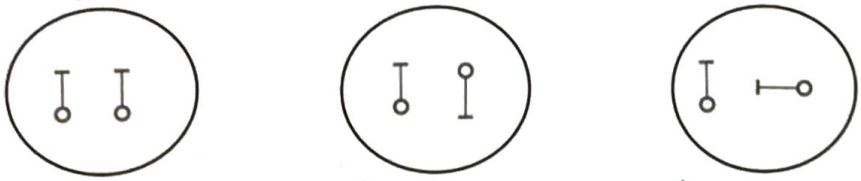


2nd : Cephalic.

Always do cesarean section.

Mode of delivery depends on : Presentation of 1st twin.
If 1st twin is vertex : Vaginal delivery.
If 1st twin is breech or in transverse lie : Do cesarean section.

If Ist twin is Vertex : Mode of delivery in 3 situations :



1st : Vertex : Vaginal
2nd : Vertex : Vaginal

After the delivery of Ist twin do not give Inj. methyl ergometrine

Max time gap b/w 1st & 2nd twin : 30mins.

1st : Vertex
2nd : Breech

1st : Vaginal
2nd : Assisted breech delivery

1st : Vertex
2nd : Transverse lie

1st : Vaginal delivery

Shift to OT

Give general anaesthesia

Take hands inside uterus

Hold the feet of baby & make it breech

Internal podalic version & breech extraction

The only indication for internal podalic version is 2nd twin transverse lie.

Done in OT under general anesthesia.

Internal podal version is absolutely contraindicated in previous cesarean section patients.

PRETERM LABOR : PART 1

Preterm birth refers to the birth of an infant at <37 completed weeks of gestation.
Every preterm labour does not end in preterm birth.

ACOG classification :

- Early preterm labour : <34 weeks.
- Late preterm labour : ≥ 34 weeks upto 36 weeks + 6 days.

WHO classification :

- Moderate-late PTB : 32-37 weeks.
- Very PTB : 28-32 weeks.
- Extremely PTB : < 28 weeks.

As per birth weight :

- LBW : <2.5 kg.
- VLBW : < 1.5 kg.
- ELBW : < 1 kg.

Incidence of preterm birth : 5 to 18% (11%).

- Spontaneous (m/c, 40-45%) : Due to preterm labour, PROM.
- Iatrogenic : Ex : Termination of pregnancy at 34 weeks due to severe preeclampsia (30-35%), following preterm prelabour rupture of membranes (30-35%).

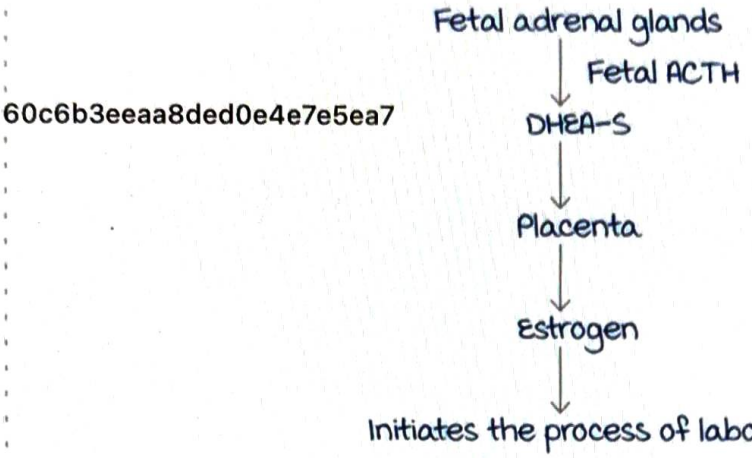
Mechanism of preterm labour

Reasons for preterm labour :

1. Premature activation of fetal hypothalamic pituitary adrenal axis (maternal or fetal stress).
2. Exaggerated inflammatory response (infection).
3. Decidual hemorrhage.
4. Pathological uterine overdistension.
5. Cervical diseases.

All these factors increase gap junction proteins, oxytocin, Pgs, inflammatory markers & estrogen.
Decreases of progesterone activity (functional progesterone withdrawal).

Premature activation of fetal Hypothalamo-pituitary-adrenal (HPA) axis :



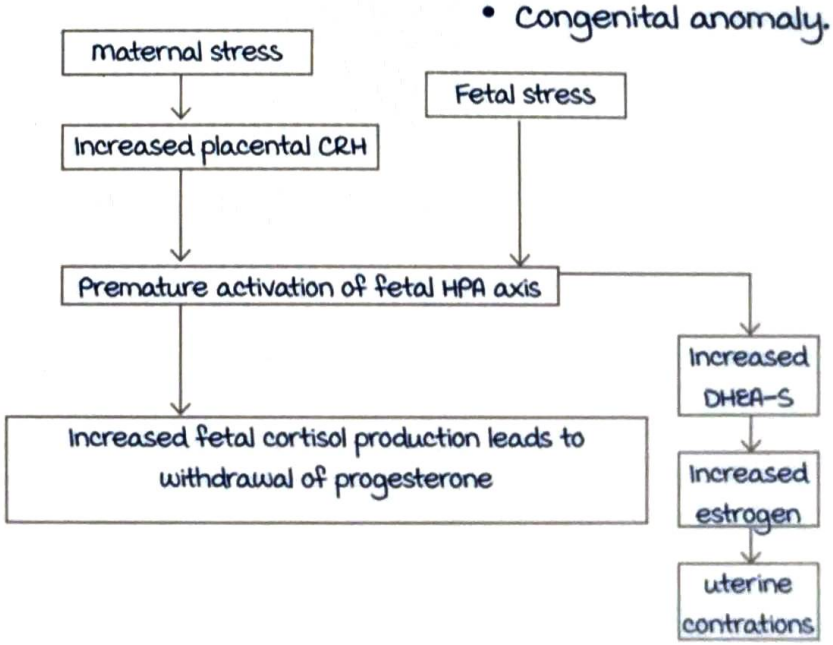
Premature activation of fetal HPA results in premature release of estrogen from the placenta, thereby initiating preterm labour.
Risk factors :

Maternal stress :

- Chronic disease : DM, anemia, Kidney disease.
- APLA.

Fetal stress :

- Uteroplacental insufficiency.
- IUGR.
- Congenital anomaly.



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Infections 00:06:13

Infections produces endotoxins : Directly cause uterine contractions.
Production of phospholipase A2 : Increases prostaglandins.
Inflammatory markers increase IL-1 and TNF alpha.
This in turn increases prostaglandins and brings functional withdrawal of progesterone.

Seen in case of infections.
Risk factors :

- Asymptomatic bacteriuria.
- Chorioamnionitis (clinical & subclinical).
- Bacterial vaginosis.
- Trichomonas vaginitis.
- COVID infection (iatrogenic).
- Periodontal infections.

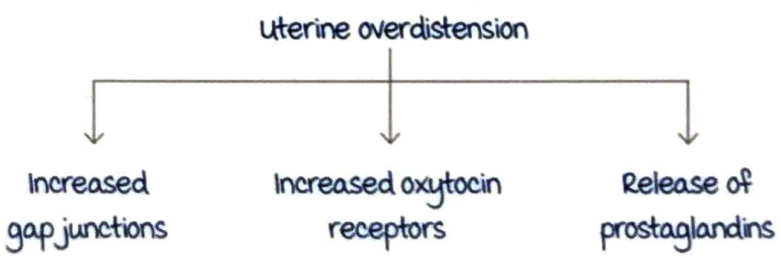
Candida doesnot lead to preterm labour.

Decidual haemorrhage 00:08:11

Release thrombin → increase uterine contractility → release metalloproteinase enzymes → Degrades membranes → PROM → Functional progesterone withdrawal → Preterm labor.
Risk factors :

- Abruptio placenta.
- Placenta previa.
- History of vaginal bleeding in early pregnancy.

Uterine overdistension 00:09:25



Risk factors :

- multifetal pregnancy.
- Polyhydramnios.

Cervical diseases 00:10:05

Early Cervical remodelling → Preterm birth.
Cervical incompetence (surgeries/short cervix) → Preterm labor.
Example : Cervical conization, LEEP.

Short cervix could be due to previous cervical surgeries like conization or LEEP (Loop electrosurgical excision procedure) done previously.

Risk factors for preterm birth 00:10:55

- most important : Previous history of preterm labour.
  Increased risk by 2 times.
  No of preterm birth increases → Risk of preterm labor also increases.
- Previous abortion/MTP.
- Decidual hemorrhage (H/O bleeding : Threatened abortion, placental previa, abruptio).
- Infections :

  COVID 19 : Earlier reports shows increased incidence.
  mostly iatrogenic.

- maternal medical conditions :

1. PIH.
2. APLA syndrome.
3. Chronic bronchitis.
4. Renal diseases.
5. Diabetes.

- Fetal fctors :

1. UPI
2. IUGR
3. Fetal anomalies.

- Uterine overdistentions :

1. Multiple pregnancies
2. Polyhydramnios.
3. Large fibroid.
4. Uterine anomalies.

- Cervical factos :

1. Short cervic.
2. Cervical surgery.
3. H/O cervical insufficiency

- Others :

1. Inter pregnancy interval < 18 months or > 59 months.
2. Extremes of maternal weight (under weight/over weight).
3. Cigarette smoking.
4. Working for long hours.
5. Poor weight gain in pregnancy.
6. Pregnancy after ART.

Factors associated with maximum risk :

1. Prior preterm birth.
2. Bleeding.
3. Multiple pregnancies.
4. H/O Cervical insufficiency.

Consequences of prematurity in neonate 00:14:18

Immediate :

1. RDS.
2. NEC.
3. ICH.
4. Hypothermia.
5. Hypoglycemia.
6. Infections.
7. Retinopathy of prematurity.

Long term :

1. Neurological disturbances like cerebral palsy.
2. Increased infant mortality rate.

Prediction of preterm labour 00:15:09

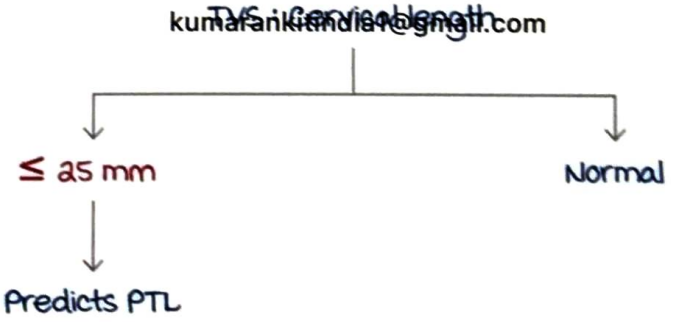
1. Assessment of cervical length (as cervix dilates, length becomes shorter) :

- By TVS.
- B/w 16 -24 weeks as LVS and cervix are not easily distinguished before this time.

ACOG recommends :

1. All females with previous history of preterm birth (spontaneous) should undergo screening with TVS for cervical length between 16 to 24 weeks of pregnancy.
2. In females without any history of preterm birth, routine screening with TVS for cervical length remains controversial.
3. It may be indicated in females with other risk factors for :

   Polyhydramnios.
   Short cervix discovered on routine ultrasound.



For diagnosis of PTL, cervical length < 20 mm.

For measuring cervical length by TVS :

1. Bladder should be empty.
2. Cervical length is measured from internal os to external os.
3. If internal os is open, then from tip of funnel to external os.

Funneling is the protrusion of amniotic membrane into cervical canal.

TAS Is not reliable for measuring cervical length.

Prevention of PTL 00:22:00

1. Cervical circlage.
2. Progesterone therapy.
3. Cessation of smoking.
4. Low-dose aspirin (+/-).

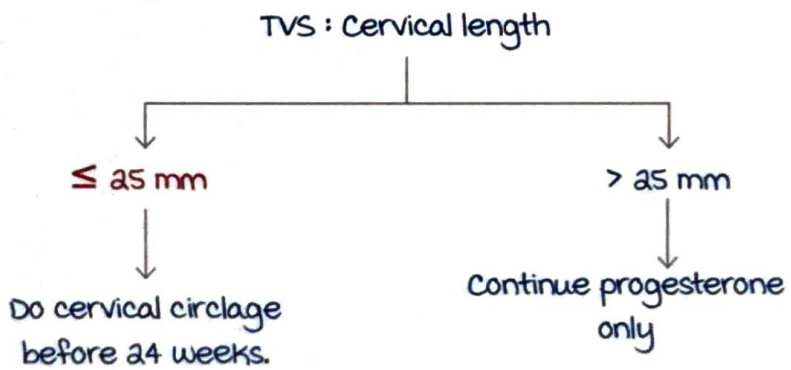
ACOD does not recommend low-dose aspirin prophylaxis to prevent spontaneous preterm birth in absence of pre-eclampsia as a risk factor.

No benefit :
Bed rest.
Nutrient supplementation.
Screening for genital tract infections.
Empirical role of antibiotics.

Treating periodontal diseases during pregnancy improves periodontal diseases but does not have any effect on preterm labour.

Case 1 :
Female with previous history of preterm birth with singleton pregnancy.

1. Start progesterone : 17 alpha hydroxyprogesterone caproate 250 mg IM weekly injections, from 16-20 weeks till 36 weeks. OR vaginal micronized progesterone (100-200 mg tablets daily).
2. TVS For assessing cervical length between 16 to 24 weeks. Single/serial TVS.



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According to ACOG, indications for doing cervical circlage :
At </= 24 weeks.

1. Previous history of preterm birth.
2. Length of cervix on TVS </= 25 mm.
3. Singleton pregnancy.

Route of circlage : Vaginal circlage.
In females with history of failed vaginal circlage : Abdominal circlage.

Cervical circlage is not recommended in :

- Females with no previous history of Preterm birth but with short cervix seen on ultrasound. Management is progesterone.
- Females with multi fetal pregnancy with or without short cervix : Progesterone use is controversial.

Clinical Case 2: A G1P0 primigravida at 30wks of pregnancy presents for routine USG and length of cervix is 2cms. Next step in management :
Incidental finding of cervical shortening + no previous H/O pre-term birth next best step is progesterone is given. It is given in the form of 17 hydroxyprogesterone caproate IM injection or micronized vaginal progesterone.

Remember : It can prevent pre-term labor but is not a tocolytic. It has no role when pre-term labor begins or when membranes rupture.

Diagnosis of pre-term labor :
ACOG Definition 2020 :

- Pre-term labor is regular uterine contraction accompanied by progressive dilatations and effacement of cervix.
- Regular uterine contraction + dilatation of cervix is at at least 2cms on initial presentation.

Case : If a pregnant female c/o uterine contractions, pelvic pressure, menstrual cramps like pain. On P/V – cervical dilatation is between 1-2cm and length of cervix is ≥2cms.
This is Threatened Pre-term labor case.

Next step : Admit and observe cervical changes after 1-2 hours. If dilatation remains <2cms send back home. If dilatation increases treat as pre-term labor.

In a study It was seen that, Pregnant females with dilatation of cervix <2cms who were sent homes, 90% of them delivered if dilatation was between 1-2cms within 2|days of initial presentation.

Conventional definition of pre-term labor :
Any pregnant female who is having,

- Uterine contractions : ≥ 4 contractions in 20 mins or ≥ 8 contractions in 60 mins.

+ Anyone of the following :

1. Cervical dilatation ≥3 cms or
2. Length if cervix ≤ 2 cms in TVS.
3. Length of cervix Is between 2-3 cms + fetal fibronectin protein is present.

Note : For prediction of pre-term labor the cutoff length of cervix is ≤2.5 cms. For diagnosis of pre-term labor the cutoff length of cervix is 2 cms.

Question INICET May 2022 :
Q. Which of the following is not a diagnostic criteria for pre-term labor ?
A. 4 contractions in 20mins or 8 contractions in 60mins with changes in cervix.
B. Cervical dilatation 1-2 cm : Threatened PTL
C. More than 80% cervix effaced.
D. Cervix posterior.

Presentation of a pregnant female with pre-term labor :

- Menstrual cramp like pain or
- Low back ache or
- Pressure symptoms or
- Vaginal discharge.

On General examination : One of the important reasons of pre-term labor is abruptio placenta and patient may have concealed hemorrhage in such cases. On G/E Heart rate may be high and B.P -low and patient may be in shock.

Active space

Vitals :

1. H.R and B.P
2. Temperature: As pre-term labor can lead to PROM It can lead to chorioamnionitis.

On per abdominal examination check for :

1. Uterine contractions : Intensity, duration and frequency.
2. Tone of uterus : Increased tone and tender uterus is seen in pre-term labor.
3. Position, lie and presentation of fetus.
4. Fetal heart sounds.

Note : Do not jump directly to P/V examination directly. Why?

1. Pre-term labor can lead to PROM and in PROM P/V is contraindicated as there are increased chances of infection.
2. Placenta previa also leads to pre-term labor. It has to be ruled out before doing p/v.

On per-speculum examination:

1. Rule out PROM.
2. Check for any bleeding to rule out placenta previa and abruption placenta.
3. Dilation of cervix.

Swab :

1. Cervicovaginal swab : It is taken to check for fetal fibronectin protein. Ideal way to take this swab is take the swab into posterior fornix and rotate it for 10 seconds.
2. Rectovaginal swab is taken to rule out Group-B streptococcal infections.

Per vaginal examination should be done in patients of pre-term labor only after ruling out placenta previa and PROM.

LAB Investigations :

1. Urine culture and sensitivity : as asymptomatic bacteriuria is one of the causes for pre-term labor.
2. Recto vaginal swab for group B streptococci.
3. Cervicovaginal swab for fetal firbonectin protein.

IOC for pre-term labor : USG – TVS.

Fetal fibronectin protein (FFN)

00:51:08

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Extracellular matrix protein present at the interface of chorion and decidua.

Uterine contractions or rupture of membranes

↓

Chorionic decidual interface gets disrupted

↓

Fetal fibronectin protein gets released into vaginal secretions

If FFN is ≥ 50 ng/ml in vaginal secretions, the test is positive and indicates preterm labour or PROM.

FFN has a role in diagnosing preterm labor, PROM, PPROM and in predicting preterm labour.

Best investigation to predict preterm labour is TVS.

Active space

PRETERM LABOR : PART 2

Effects of preterm labour 00:00:20

Lungs of the fetus are not matured (maturation starts by 34 weeks and matured by 37 weeks).
Brain of the fetus is not matured (increased chances of cerebral palsy).

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Corticosteroids can be given for lung maturity.
$MgSO_4$ is given to decrease the chances of Cerebral palsy (neuroprotection).

Role of Corticosteroids in pre term labour :

- Accelerates lung maturity, formation and release of surfactant. Decreases chances of respiratory distress syndrome and transient tachypnoea of newborn.
- Brings about vascular stability, there by decreasing the chances of intraventricular hemorrhage and necrotizing enterocolitis.

Indications for corticosteroid therapy :

- Preterm labor < 34 weeks.
- ACOG guidelines : If preterm labor happens between 34 weeks to 36 weeks + 6 days, corticosteroids should be given provided :
  Patient does not have chorioamnionitis.
  Patient has not been given dose of corticosteroid earlier.
  Neonates are monitored for hypoglycemia.
- If C-section is being done for any reason < 37 weeks.

Onset of action : Immediately.
Best result : After 48 hours of first dose (maximum efficacy : 2-7 days).

If corticosteroids are given for preterm labor < 34 weeks,

wait for 48 hours & then deliver (tocolytics can be used for 48 hours).

Tocolytics are not used, if corticosteroids are given for preterm labor between 34 weeks to 36 weeks + 6 days.

Side effects :
Maternal : Hyperglycemia.
Clinical implication :
Screening for GDM should be done before giving steroid or 5 days after giving steroid. Monitor glucose levels in mother and neonate.

Betamethasone : 2 IM injections of 12 mg each 24 hours apart.
Dexamethasone : 4 IM injections 6 mg each 12th hourly.
Both these drugs can cross placental barrier.
Absolute contraindication : Chorioamnionitis.
Diabetes and HTN are not contraindications.

Repeat corticosteroid injections should not be given (increases risk of Cerebral Palsy).

Tocolytics 00:17:28

Role : To buy time for corticosteroids to act.
Maximum given up to 34 weeks of pregnancy.
Never given ≥ 34 weeks, for > 48 hours.
First line tocolytics : Indomethacin, Nifedipine.
In India : Tocolytic of choice is Nifedipine.
ACOG : Up till 32 weeks : Tocolytic of choice is Indomethacin.
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Between 32 weeks to 34 weeks : Tocolytic of choice is Nifedipine.

If Indomethacin is used beyond 32 weeks, it causes

- Premature closure of ductus arteriosus.
- Oligohydramnios (used >48hours).

Second line : Atosiban, $MgSO_4$, beta 2 agonist like Terbutaline,

 Nifedipine. Progesterone is not a tocolytic.

Tocolytic	Dose	Maternal side effects	Fetal side effects	Contraindications
Nifedipine : Safest CCB.	Loading dose : 20-30 mg orally Maintenance dose : 10-20 mg every 3-8 hourly Maximum : 180 mg/day	Vasodilatation : Flushing, headache, dizziness, hypotension	Nil	Hypotension, Heart failure with decreased ejection fraction
Indomethacin : Nonspecific COX inhibitor, Anti-platelet drug	Loading dose : 50-100 mg orally Maintenance dose : 25mg every 4-6 hourly	Nausea, gastritis, GERD, platelet dysfunction	≥ 32 weeks : Premature closure of ductus arteriosus. Indomethacin use > 48 hours : Oligohydramnios	Maternal : Liver disease, Kidney disease, bleeding diathesis, ulcerative disease
Beta 2 agonist : Only terbutaline is used nowadays. Monitor HR : Stop if HR >/= 130 bpm. Monitor blood glucose and potassium levels every 4-6 hourly		mc : Tremors, palpitations, tachycardia, hyperglycemia, hypokalemia. Rarely pulmonary edema¶ MI	Neonatal hypoglycemia	Heart failure with tachycardia, Diabetes, poorly controlled hyperthyroidism. used cautiously in patients with risk of bleeding (placenta previa)
Atosiban : Oxytocin vasopressin receptor antagonist. Not FDA approved. Not available worldwide and in India. Best tocolytic in heart disease patients.		nil	nil	nil
$MgSO_4$ Monitor : Respiratory rate, urine output ¶ deep tendon reflexes	9-10 mEq/L	Diaphoresis, Slurring of speech, loss of deep tendon reflexes	nil	Myasthenia gravis, cardiac conduction defects, renal failure, myocardial infarction. Never used with CCB (respiratory depression)

Important one liners

00:33:30

Safest tocolytic : Nifedipine.

Drawback of indomethacin if used in patients with gestational age ≥ 32 weeks : Premature closure of ductus arteriosus.
Tocolytic of choice in heart disease patients : Atosiban.
Tocolytic contraindicated in diabetes : Beta 2 agonist.
Tocolytic of choice in diabetes : Nifedipine.

Absolute contraindications to tocolytics :

- Intra uterine death of the fetus.
- Lethal anomaly of the fetus on USG.
- Fetal distress/category 3 tracing on CTG.
- Chorioamnionitis (steroid itself is contraindicated).
- Maternal hemodynamic instability.
- Preterm labor ≥ 34 weeks.
- Preterm premature rupture of membranes < 34 weeks and unstable lie (increase chances of cord prolapse).

Relative C/I : Cervical dilatation ≥ 3cm.

$MgSO_4$ & management of preterm labor

00:40:50

$mgso_4$:

Decreases chances of cerebral palsy.
Given in preterm labor < 32 weeks.
Dose :
Loading dose : 4g IV over 20 min.
Maintenance : 1g/hr IV.
Maximum for 24 hours.
Monitor : Respiratory rate, urine output and deep tendon reflexes.
C/I : myasthenia gravis, cardiac conduction defects, renal failure, myocardial infarction.

Management of preterm labor :

- Preterm labor ≥ 34 weeks.
- Preterm labor < 34 weeks.

In both these cases :

- Admission.
- Observe the patient for dilatation and contractions (at least for 4-6 hours).

- Collect a rectovaginal swab for culture and sensitivity and start GBS prophylaxis, if swab is positive continue with the antibiotics, else stop.
- Corticosteroids to accelerate lung maturity.
- Tocolytics if < 34 weeks and $MgSO_4$ if < 32 weeks.

In established preterm cases : No role of progesterone and induction of labor.

All these patients should be monitored for 4–6 hours and if the contractions subside and no dilatation : Can send home.

Assess fetal membranes and rule out abruptio & fetal distress in all preterm labor.

Group B streptococci screening 00:47:49

Done in all pregnant females between 36 weeks to 37 weeks + 6 days and in all preterm labor.

Done by a rectovaginal swab (vaginal swab : Lower vagina near introitus, rectal swab : 1 cm above anal fissure).
1 or 2 swabs, transported in Stuart media at room temperature.

Exceptions :

- If the pregnant female has a child who was infected with group B streptococci causing neonatal sepsis.
- Pregnant female with group B streptococci bacteriuria in current pregnancy.

Group B streptococci prophylaxis must be given in these two group of females irrespective of screening results.

Group B streptococci prophylaxis :
Uses : To prevent neonatal sepsis. Should be given intrapartum.
Indications as per International guidelines :

- Screening positive females.
- Pregnant female with group B streptococci bacteriuria in present pregnancy.

- If the pregnant female has a child who was infected with group B streptococci causing neonatal sepsis.
- Unknown Group B streptococci status with,
    1. Intrapartum fever ≥ 100.4 F.
    2. All preterm labor.
    3. Preterm premature rupture of membranes (ROM < 37 weeks).
    4. Premature rupture of membranes (ROM >/= 37 weeks but before onset of labor for ≥ 18 hours.

DOC : Penicillin G.

Dose : 5 million units as loading dose and 2.5 million units every 4 hourly up till delivery.

Alternative : Ampicillin (MC used in India) : Initially 2g IV and 1g IV 4th hourly up till delivery.

Allergic to penicillin – Cefazolin : Initially 2g IV and 1g IV 8th hourly.

Resistant cases : Vancomycin.

PRE-LABOR RUPTURE OF MEMBRANES (PROM)

Definitions

00:01:15

Pre-labor rupture of membranes (PROM) :
membranes rupture after 37 weeks, but before the process of labor begins.
PROM earlier used to be premature rupture of membranes and is currently changed to pre-labor rupture.
Preterm pre-labor rupture of membranes (PPROM) :
membranes rupture at < 37 weeks of pregnancy.

Risk factors :

- Previous history of PROM or PPROM.
- Infection.
- Abruptio placenta.
- Trauma (abdominal).
- Smoking.
- Overstretching of membranes like in twin pregnancy or polyhydramnios.

Clinical presentation :
The diagnosis of ruptured membranes is made clinically.
A pregnant woman presenting with history of sudden gush of fluid from the vagina (typical history) leading to soaking of her clothes must warrant suspicion of PROM or PPROM.
The fluid is described as either clear or pale yellow by the patient.
1st step in examination : Sterile per speculum examination.

- Pooling of fluid in the vaginal vault.
- Fluid leaking from the cervical os.

The above mentioned findings are diagnostic of rupture of membranes. Patient is asked to cough, perform a valsalva maneuver or the uterine fundus is pushed from above if the pooling of fluid is not visible.

A per vaginal examination increases the chances of chorioamnionitis (infection) and hence must not be performed.
If in doubt : USG is performed.
Oligohydramnios is supportive in the diagnosis of ruptured membrane.

Other findings noted on per speculum examination :

- Dilatation of the cervix.
- Rule out cord prolapse.

In some instances, the entire membranes may not be ruptured, and the discharge is due to a high leak from a small break in the amniotic membrane. It is also considered PROM or PPROM and can be confused with vaginal discharge or urination.

Differential diagnosis 00:10:26

Amniotic fluid vs Urine :
The head of the fetus irritates the bladder which can lead to increased urinary frequency.
Differentiating features are :

- Amniotic fluid is odorless and urine has a typical odor.
- If the leaking stops after emptying the bladder, it is suggestive of urine. If the leaking continues, it is suggestive of amniotic fluid.

Vaginal discharge :
Amniotic fluid and vaginal discharge can be differentiated based on the pH. Vaginal discharge has an acidic pH of 3.5 – 4.5 and amniotic fluid has an alkaline pH of 7 – 7.5.

Tests to differentiate amniotic fluid and vaginal discharge :

1. Nitrazine paper test (like a litmus paper) : If it turns blue, it is suggestive of alkaline fluid (amniotic fluid). False positive result is seen if blood or semen is present.
2. Fern test : A sample of amniotic fluid is fixed on the slide

Active space

and observed under a microscope.
Amniotic fluid appears as a fern like pattern (fern test positive). Ferning is absent if it is vaginal fluid.

Cervical mucous shows a fern like pattern under the influence of estrogen. Ferning disappears under the influence of progesterone (hormone maintaining pregnancy).
The ferning is thin and delicate in case of amniotic fluid. Cervical mucous under the influence of estrogen shows a thick ferning.

3. Laboratory tests : Both the tests are slide tests and a vaginal swab is used as the sample.
   - Actim test : Tests for placental protein 12 or insulin like growth factor binding protein 1.
     A single line in the slide indicates that the test is negative for amniotic fluid and a double line is indicative of a positive result.
   - Amnisure : Tests for placental alpha microglobulin 1 (PAMG 1).

Both nitrazine paper test and fern test are outdated tests and are not currently performed clinically.

Outcomes of PROM/PPROM

00:20:46

The outcomes of PROM/PPROM are :

- Delivery within 1 week is the most common outcome.
- Chorioamnionitis in 60% of cases.
- Cord prolapse.
- Malpresentation.
- Rarely the leaking might stop spontaneously.

Risks of membrane rupture :
most patients deliver within a week.

1. < 37 weeks : Fetal lung immaturity.
   - Corticosteroids are given to manage such cases.

Tocolytics are added if steroids are given at < 34 weeks. It is

not required if the gestational age is ≥ 34 weeks.

2. < 32 weeks : Risk of cerebral palsy.

$MgSO_4$ is given for its neuroprotective effects.

3. At any gestational age (GA) :

- Increased chances of intra-amniotic infection (chorioamnionitis).

All patients with PROM/PPROM must be monitored closely for variations in the pulse rate, temperature and for uterine tenderness.

- Fetal distress : Decreased amniotic fluid decreases the uterine space and can lead to cord compression causing fetal distress.

Fetal monitoring by performing non-stress test (NST) is done in all cases of PROM/PPROM.

If NST is non-reactive, a biophysical profile and weekly USG is done to ensure proper fetal growth.

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Management

00:25:48

According to the new guidelines :

- If PPROM occurs < 34 weeks of GA : Expectant management.
- If PPROM occurs between 34 – 36 wks + 6 days : Induction of labor (IOL) was done earlier to prevent development of chorioamnionitis.
  Currently, expectant management is preferred only if indicated and then to expedite management.
- If PROM occurs (≥ 37 weeks) : Expedite management (IOL and not cesarean section).

The preferred mode of delivery in patients with PROM/PPROM is vaginal delivery.

Indications for expedite management :

- Associated with (A/W) chorioamnionitis.
- Associated with abruptio placenta.
- A/W fetal distress or category 3 cardiotocography (CTG) tracings.
- If there is PROM (≥ 37 weeks) irrespective of the

presence of other associated conditions.

- If it is a case of PPROM associated with high chances of cord prolapse.

Management of PPROM at < 34 weeks 00:30:24

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Expectant management is done if there are no indications of expedite management.

1. Admit the patient.
2. A course of corticosteroids is administered. It is contraindicated if there is associated chorioamnionitis.
3. Short term tocolytics for 48 hours is administered to buy time for the corticosteroids to act.
4. Rectovaginal swab for group-B streptococci (GBS) screening.
5. Start GBS prophylaxis. The antibiotics are stopped if the GBS screening is negative.
6. Maternal monitoring for :
    - Temperature.
    - Uterine tenderness.
    - Uterine contractions.
    - Fetal movements (mother is asked to monitor).
7. Fetal monitoring :
    - NST (daily).
    - Biophysical score (BPS) if NST is non-reactive.
8. Periodic USG to monitor fetal growth.
9. If PPROM occurs at < 32 weeks, $MgSO_4$ is administered for neuroprotection.

Management of PPROM between 34 – 37 weeks + 6 days is the same as in PPROM < 34 weeks except :

- Tocolytics are not administered.
- Expedite management is performed if there are indications for the same.

Active space

Management of PROM 00:35:39

The rupture occurs at ≥ 37 weeks and so, the fetal lungs would have matured and there is no risk of cerebral palsy.

The steps of management include :

1. Induction of labor.
2. GBS prophylaxis is given only if PROM has occurred for ≥ 18 hours and if the GBS status is unknown (unlike in all patients like in a case of PPROM).
3. There is no role for :
    - Corticosteroids.
    - Tocolytics.
    - $MgSO_4$.

In PROM or PPROM, there is absolutely no role for amnioinfusion with normal saline.

Chorioamnionitis/intra amniotic infection :

It is a polymicrobial infection. The membranes prevent the infective organisms present in the cervix and vagina from entering.

A break in the membrane can result in the ascend of infection leading to chorioamnionitis.

A presumptive diagnosis of chorioamnionitis is made based on clinical symptoms :

If a pregnant woman with ruptured membranes presents with temperature :

- ≥ 39° C on one occasion.
- ≥ 38° C on two occasions 30 minutes apart.

Along with any one of the following findings :

1. Fetal tachycardia (fetal heart rate ≥ 160 beats per minute).
2. Maternal WBC count ≥ 15,000 cells/cc. WBC counts up to 15,000 is seen physiologically.
3. Purulent discharge from the os.

Although maternal tachycardia and uterine tenderness are features of chorioamnionitis, they are not included in the diagnostic criteria.

If in doubt :

- Amniotic fluid obtained from amniocentesis is sent for gram staining and culture.
- Membranes can be sent for histopathological examination.

Active space

Definitive diagnosis of chorioamnionitis 00:43:43

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Definitive diagnosis is made when any one of the following features is present along with the presumptive diagnosis :

1. Amniotic fluid :
    - Gram stain positive.
    - wwCulture positive for infection.
    - Decreased glucose level in amniotic fluid.
    - Increased WBC count in amniotic fluid.
2. Signs of inflammation and infection on histopathological examination.

Management of chorioamnionitis :

1. Induction of labor.
2. Vaginal delivery is preferred in cases of chorioamnionitis. Cesarean section is associated with increased chances of postpartum endometritis.
3. Antibiotics : Ampicillin + gentamicin. If C-section is done for any obstetrical reasons (inadequate or contracted pelvis, fetal distress etc), metronidazole is added as well.
4. Stop antibiotics :
    - Immediately after vaginal delivery.
    - After C-section when the patient becomes afebrile or asymptomatic for at least 24 hours.

In chorioamnionitis, there is no role for :

- Expectant management.
- Corticosteroids and tocolytics.

C-section is performed only for obstetrical reasons.

Complications of chorioamnionitis 00:47:40

The complications include :

- Sepsis.
- Postpartum endometritis.
- Septic pelvic vein thrombophlebitis.
- Abnormal labor.
- Atonic PPH.

ABORTION : PART 1

Abortions

00:00:30

Termination of pregnancy at < 20 weeks of gestation.
WHO criteria : Termination of pregnancy occurs in a fetus weighing <500 g, at the time of termination.
Early pregnancy loss : Abortions occurring at < 12 weeks.
Pregnancy loss >20 weeks → stillbirth.

Anembryonic pregnancy :
Non-viable pregnancy with a gestational sac that does not contain a yolk sac/embryo.
Also called blighted ovum.

Diagnosis is made by :

- If mean sac diameter (MSD) ≥ 25 mm and no embryo is seen → best criteria.
- ≥ 11 days after the sac showing gestational sac with yolk sac, but no embryo.
- ≥ 2 weeks after scan showing gestational sac without yolk sac or embryo.

Most common time for abortion : First trimester → more commonly <8 weeks.

Risk factors for abortion :
Increased maternal age of ≥ 35 years.
Previous history of abortions.
Other risk factors include :

- Maternal infections like Syphilis.
- Viral infections like parvovirus B19 infection, Zika virus infection, CMV.

Toxoplasma and HIV are not associated with increased risk for pregnancy loss.

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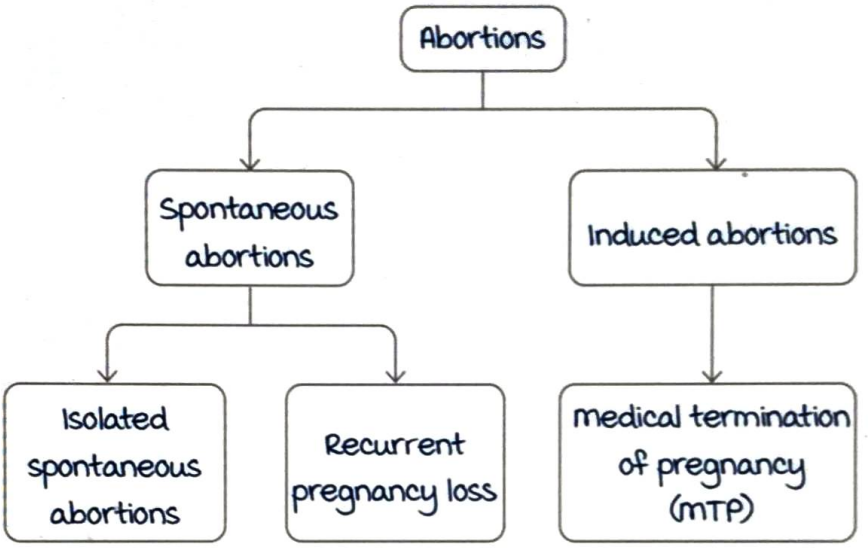
Maternal factors increasing the risk for abortions are :
Uncontrolled diabetes.
Thyroid disorders : Hypothyroidism, hyperthyroidism.

Active space

Obesity.
Stress.
Pregnancy with IUCD in place.
Substance abuse.
Radiation exposure.

Types of abortions

00:05:38

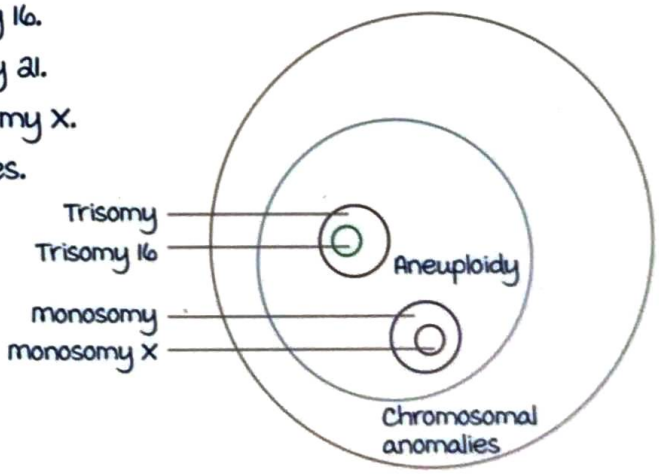


Isolated abortions :
Can happen in 1st or 2nd trimester.
Most common cause of isolated 1st or 2nd trimester abortion :
Chromosomal anomalies.
Aneuploidy > trisomy (group trisomy) > monosomy X (20%) > trisomy 16 (16%).

Q : Most common cause of 1st trimester abortions :

A. Trisomy 16.
B. Trisomy 21.
C. Monosomy X.
D. Diabetes.

Ans : C.



Other causes of isolated abortions :

Uterine anomalies :

- Fibroids.
- Adhesions.
- Septa.
- Cervical incompetence (only 2nd trimester abortions).

Trauma.

Infections : Chorioamnionitis, maternal infections like TORCH infections.

Thrombophilia.

Most common causes of isolated abortions :

Chromosomal anomalies > uterine anomalies > trauma.

Most viable trisomy : Trisomy 21 (down's syndrome).

Most common outcome of trisomy 21 → abortion.

Most lethal trisomy : Trisomy 16.

Recurrent pregnancy loss

00:12:29

≥3 consecutive pregnancy losses at <20 weeks.

Investigations should begin ≥2 abortions.

Most common cause : Idiopathic.

Most common group of causes : Endocrinopathies > uterine causes > immunological causes > chromosomal abnormalities.

Endocrinopathies (15- 60%)	Uterine causes (10- 50%)	Immunological causes	Chromosomal abnormalities
Established cause : Hypothyroidism. Other causes : Uncontrolled diabetes mellites. Increased prolactin levels. Luteal phase defect. PCOS.	Established causes : Cervical incompetence. Uterine malformations. Submucous fibroid. Asherman's syndrome.	Established cause : APLA syndrome (anti-phospholipid antibody).	Established cause : Balanced translocation of chromosomes.

Luteal phase defect : Decreased progesterone in the 2nd half of the cycle → causes abortion.

Well controlled diabetes does not lead to isolated or recurrent pregnancy loss.

Proven causes for recurrent pregnancy loss :

- Hypothyroidism.
- Uterine abnormalities.
- APLA syndrome.
- Balanced translocation of chromosomes.

Single most common cause for recurrent pregnancy loss : APLA syndrome.

Q : Most common cause for recurrent pregnancy loss :

A. Hypothyroidism.
B. Uterine anomalies.
C. APLA syndrome.
D. Balanced translocation of chromosomes.

Ans: B.

Uterine anomalies as a whole constitute more to causing recurrent pregnancy loss, as compared to APLA syndrome, which is a single cause.

Q: Most common cause for recurrent pregnancy loss :

A. APLA syndrome.
B. Syphilis.
C. Cervical incompetence.
D. Diabetes.

Ans : A.

Here the options are all single causes.

Infections that never lead to recurrent pregnancy loss : TORCH infections and syphilis.

Syphilis follows Kassowitz's law → as the number of pregnancy losses increase, the period of pregnancy at which the loss occurs also increases.

1st pregnancy → abortion (<20 weeks).
2nd pregnancy → stillbirth (>20 weeks).
3rd pregnancy → preterm labor.

Most common chromosomal anomalies that leads to recurrent pregnancy loss : Balanced translocation of chromosomes.

Case 1 :

A G_4P_0 presents with bleeding at 11 weeks of pregnancy. The investigations needed are :

- APLA antibodies.
  Lupus anticoagulant.
  Anti-cardiolipin antibody.
  Anti β2 glycoprotein-1.
- Transvaginal sonography (TVS) for uterine anomalies like mullerian malformations, fibroid, cervical incompetence.
  IOC for mullerian malformation : 3D USG.
  Gold standard for mullerian malformations : MRI.
- TSH to assess thyroid status.
- Karyotyping of the parents to assess chromosomal malformations.

Investigations not advised are : TORCH test.

1st investigation to be done : TVS.
2nd investigation to be done : APLA antibodies.
Investigations should begin ≥2 pregnancy losses.

APLA syndrome 00:26:26

Antibodies are present against the following phospholipids.

- Lupus anticoagulant antibody → most common.
  Name is misnomer. It causes thrombosis.
- Anti- cardiolipin antibody.
- β2 microglobulin antibody.

All these cause thrombosis : Arterial, venous or placental.

Placental thrombosis :
Complete cut off of blood supply <20 weeks of pregnancy
→ abortion (recurrent pregnancy loss).
Complete cut off of blood supply >20 weeks of pregnancy
→ stillbirth.
Incomplete cut off of blood supply → IUGR.
PIH in mother.

Diagnosis of APLA syndrome → modified Sapporo criteria/ Sydney criteria :
1 clinical criteria with 1 lab criteria should be present.

Clinical criteria :

- ≥3 pregnancy losses at <10 weeks.
- ≥1 pregnancy loss at >10 weeks.
- ≥1 preterm labor at <34 weeks due to early onset preeclampsia or IUGR (uteroplacental insufficiency).
- Vascular thrombosis

Lab criteria :

Presence of lupus anticoagulant (LAC)/anti-cardiolipin/β2 glycoprotein → presence of any of these in medium to high titers on 2 occasions 12 weeks apart.

Management of APLA syndrome in pregnancy :

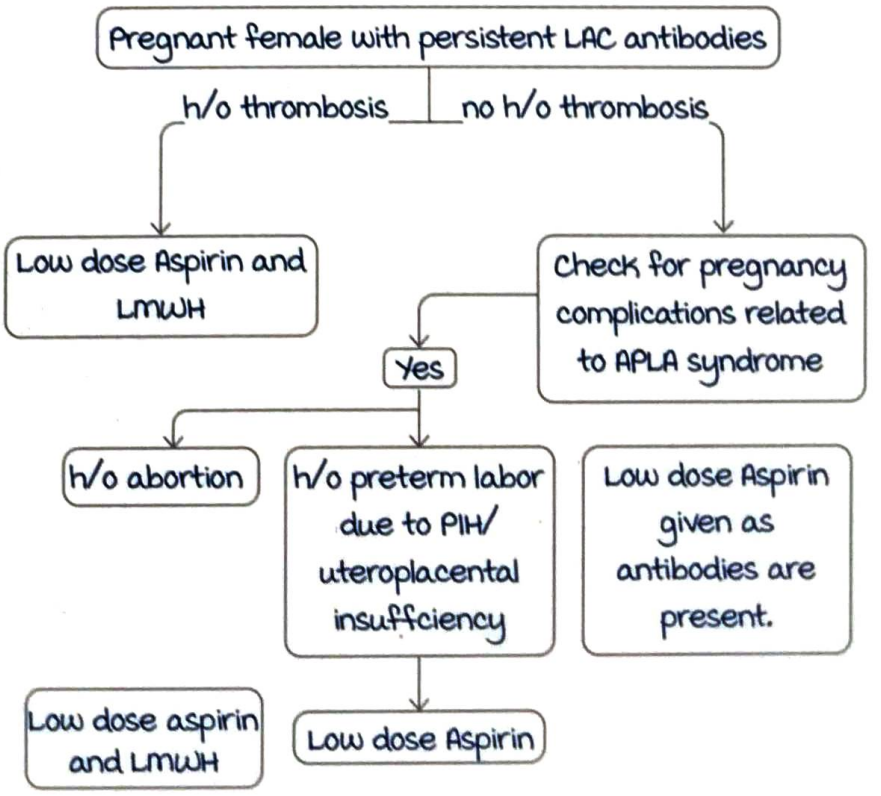
In a non-pregnant female : Warfarin is the anticoagulant of choice.

In a pregnant female with APLA syndrome : Low dose aspirin.

- Given in all cases of APLA syndrome.
- Started as soon as pregnancy is diagnosed.
- Ideally should be started before conception.

Low molecular weight heparin :

- Started after confirmation of intrauterine pregnancy.
- Given only if there is history of thrombosis or history of abortions.



Uterine anomalies 00:36:48

They can be congenital or acquired.
Congenital uterine anomalies are Mullerian malformations.

- Most common cause leading to recurrent pregnancy loss is septate uterus > bicornuate uterus.

Acquired causes include :

- Cervical incompetence :
  Most common uterine anomaly causing abortions.
- Submucous fibroids.
- Polyps.
- Adenomyosis.
- Asherman syndrome.

Most common uterine anomaly causing recurrent pregnancy loss : Cervical incompetence.
Cervical incompetence commonly leads to 2nd trimester abortions.
Most common uterine anomaly leading to :
1st trimester/early recurrent pregnancy loss → septate uterus.
2nd trimester pregnancy loss → cervical incompetence.

Investigation for uterine anomalies in a pregnant female :
TVS.

Investigations for uterine anomalies in a non-pregnant female :
Saline infusion sonography : Polyps and submucous fibroids can be detected.
3D USG : IOC for mullerian malformation.
MRI : Gold standard investigation for mullerian malformation.
Hysteroscopy.
Laparoscopy.

Cervical incompetence 00:40:29

Causes mid trimester pregnancy loss (2nd trimester), never 1st trimester abortions.
History based diagnosis of cervical incompetence : ≥2 painless 2nd trimester pregnancy losses.

Spontaneous dilation of cervix, which is painless → expulsion of production of consumption spontaneously.
With every subsequent pregnancy, the time of pregnancy loss decreases.
For e.g. : 1st abortion at 20 weeks, 2nd at 18 weeks, 3rd at 14 weeks.

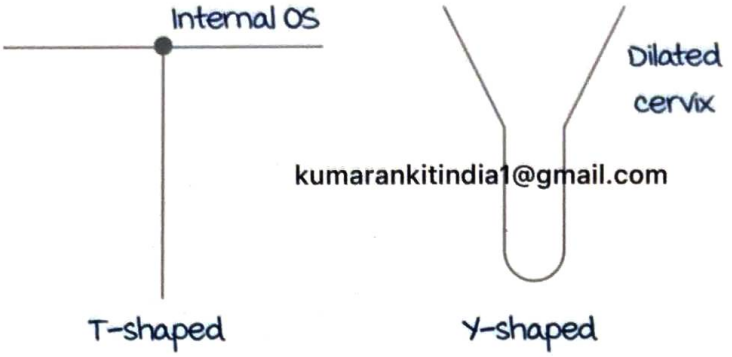
Risk factors for cervical incompetence :
Past history of surgery on cervix → Conization, LEEP (past history of CIN) or amputation of cervix in Fothergill's surgery for vaginal prolapse.
Cervical trauma during labor, instrumental delivery.
Congenital abnormality (rare).
Mostly cervical incompetence is an acquired defect.

Diagnosis :
History of pregnant female with ≥2 T_a painless abortion.
Managed with cervical cerclage and progesterone.

History of 1 painless 2nd trimester abortion → TVS done between 18–24 weeks (ideal time), can be done as early as 14 weeks.
Principle for diagnosis : As the cervix dilates, the length of the cervix shortens.

- Cervical length ≤2.5 cm with one 2nd trimester abortion is taken as cervical incompetence.
  Normal length is 3– 4 cm.
- Diameter of internal os ≥2 cm.
- Shape of the cervix becomes U shaped.
  Normal shape of cervix in TVS is T.
  As the cervix shortens, it becomes Y shaped, then V shaped and then U shaped.
  Os is completely dilated.

For USG based diagnosis : History of one or more 2nd trimester abortion and TVS showing cervical length as ≤2.5 cm.
Management by cervical cerclage and Progesterone.



Diagnosis of cervical incompetence in a non-pregnant female : If Hegar no.8 dilator can be passed through the internal os, without any resistance from the female.

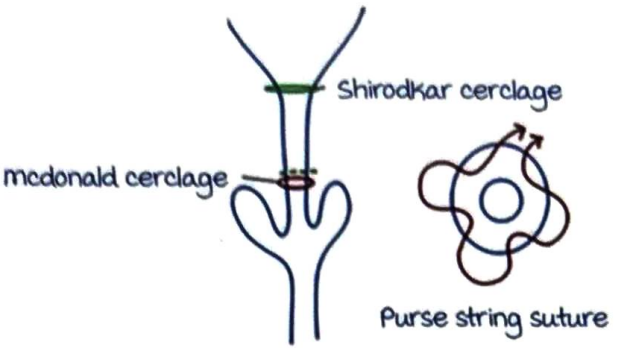
A pregnant female with cervical incompetence may present with :
2nd trimester abortion.
As a case of early preterm labor (< 24 weeks).

Management of cervical incompetence 00:55:28

Surgery done is cervical cerclage → done via transvaginal or transabdominal routes.
Transvaginal cervical cerclage :
most common method done.

- mc.Donald cerclage : Attempt is made to reach as close as possible to the internal os.
  The sutures are applied at cervicovaginal junction.
  Purse-string sutures with non-absorbable suture material.
  2 o' clock → 10 o' clock → 8 o' clock → 4 o' clock → 2 o'clock : Anti-clock direction.
  Easier to do.
- Shirodkar cerclage :
  The cervicovaginal junction is cut.
  Suture applied at the internal os.
  Non absorbable sutures used.
  Less failure rate.

Active space



Transabdominal cervical cerclage :

Only done if transvaginal cerclage fails.

Ideal time for doing cerclage : 12–14 weeks.

Can be done up till 24 weeks → not to be done beyond 24 weeks.

In all patients who undergo cervical cerclage → supplemental progesterone given up to 36 weeks + 6 days of gestation.

Indications for cervical cerclage :

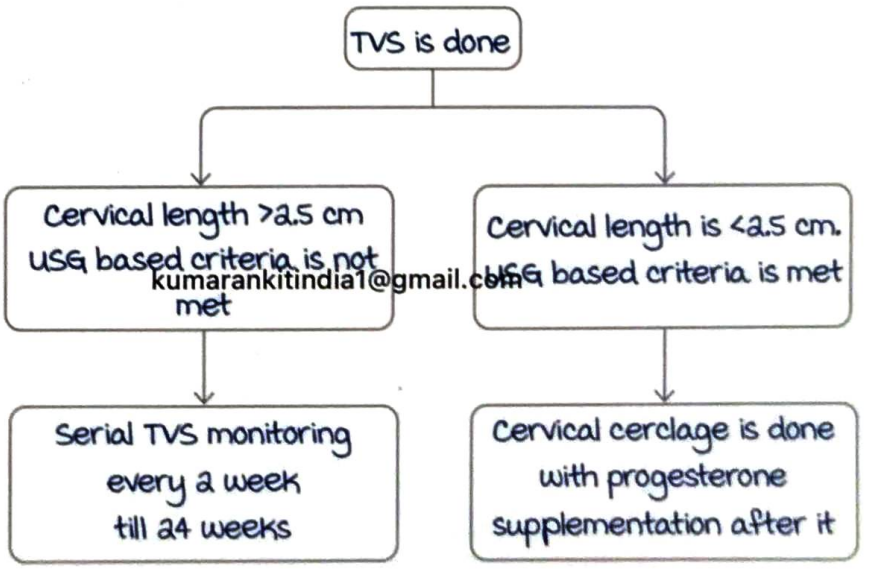
If history based or USG based criteria for cervical incompetence is met.

Increased chance of preterm labor in multifetal pregnancy → not an indication of cervical cerclage.

Case 1 :

A G_2P_1 pregnant female at 14 weeks of pregnancy comes for routine ANC. She has a history of pervious T_2 abortion (or early preterm labor) at 18 weeks of pregnancy. What is the next step ?

TVS is done to measure the cervical length.



Case 2 :

G_3P_2 pregnant female came for routine checkup, has history of 2 T_2 abortions. What is the next step ?

Cervical cerclage + progesterone.

TVS is not required.

Cervical cerclage is done in these patients irrespective of cervical length.

Case 3 :

A G_3P_2 female of 18 weeks pregnancy with no history of abortions. On TVS, cervical length is <2.5 cm.

She is at high risk for preterm labor.

Only Progesterone supplementation given, cerclage not done.

Case 4 :

A female with 16weeks pregnancy comes with dilated cervix and membranes are bulging without membrane rupture.

Emergency cerclage → therapeutic procedure than preventive.

Bad prognosis for the pregnancy.

Also called as physical examination based cerclage.

Contraindications for cerclage 01:10:52

Absolute contraindications :

Fetus has gross congenital anomaly, not compatible with life.

Current pelvic infection.

membranes are ruptured.

Relative contraindication : Placenta previa.

Time to remove cerclage stitch : At 37 weeks.

Cerclage stitch should be removed irrespective of period of gestation in :

Rupture of membranes.

Patient goes into preterm labor.

Chorioamnionitis.

Active space

Q. A 30 year old G_4P_3 had first pregnancy loss at 8 weeks, second at 11 weeks with no cardiac activity and third preterm delivery due to early onset pre-eclampsia. Diagnosis is ?

A. Syphilis.

B. APLA syndrome.

C. TORCH infections.

D. GDM.

Ans : B.

ABORTION : PART 2

Types of abortions 00:00:11

Threatened abortion :

Process of abortion has started but it is reversible.

D/D for bleeding in early pregnancy :

- Abortion → Bleeding > Pain.
- Ectopic pregnancy → Pain > Bleeding.
- Molar pregnancy.

History → Spotting PV +/- pain abdomen.

P/A examination → Height of the uterus = Period of gestation (POG).

Internal os → Closed (reversible).

Management → No definitive treatment.

Emperical treatment :

- Avoid heavy weight lifting.
- Avoid intercourse.
- Rest for 48 hours.

Anti-D injection to be given to the Rh negative pregnant women with threatened abortion at ≥ 12 weeks (2ndtrimester).

USG → Cardiac activity is present.

Inevitable abortion :

The process of abortion has reached a stage from where it is not reversible.

History → Bleeding + Pain abdomen.

No H/O expulsion of product of conception (POC).

P/A examination → Height of uterus = POG.

Internal os → Open (not reversible).

Management → Complete the process of abortion by surgical/medical methods.

USG → Cardiac activity is absent.

Anti-D injection is give to all Rh negative pregnant females with inevitable abortion whether it is < 12 weeks or ≥ 12 weeks (due to increased chances of feto-maternal

Active space

hemorrhage).
If < 12 weeks → 50 mcg.
If ≥ 12 weeks → 300 mcg.

Incomplete abortion :
The process of abortion begins and POC start coming out.

History → POC coming out, bleeding, pain abdomen.
It is the 2nd MC type of abortion which leads to shock.
MC type of abortion which leads to shock → Septic abortion.
P/A examination → Height of the uterus < POG.
Internal os → Open + POC coming out.
Management → Complete the process of abortion.

Anti-D injection to be given in all Rh negative pregnant females with incomplete abortion whether it is at < 12 weeks or ≥ 12 weeks.

Complete abortion :
The entire process of abortion is completed on its own.

History → Initial H/o bleeding, pain abdomen, expulsion of POC; with stoppage of bleeding later.
P/A examination → Height of the uterus < POG.
Internal os → Closed.
USG → Empty uterus.
Management → Reassurance.
Anti-D injection to be given if complete abortion occurs at ≥ 12 weeks.

Missed abortion :
The cardiac activity of the fetus stops and the patient is unaware about the abortion.
History → No history as there is no bleeding.
P/A examination → Height of uterus < POG.
Internal os → Closed.
Management → Expedite the process.
USG :

- Mean sac diameter (MSD) of the gestational sac reaches

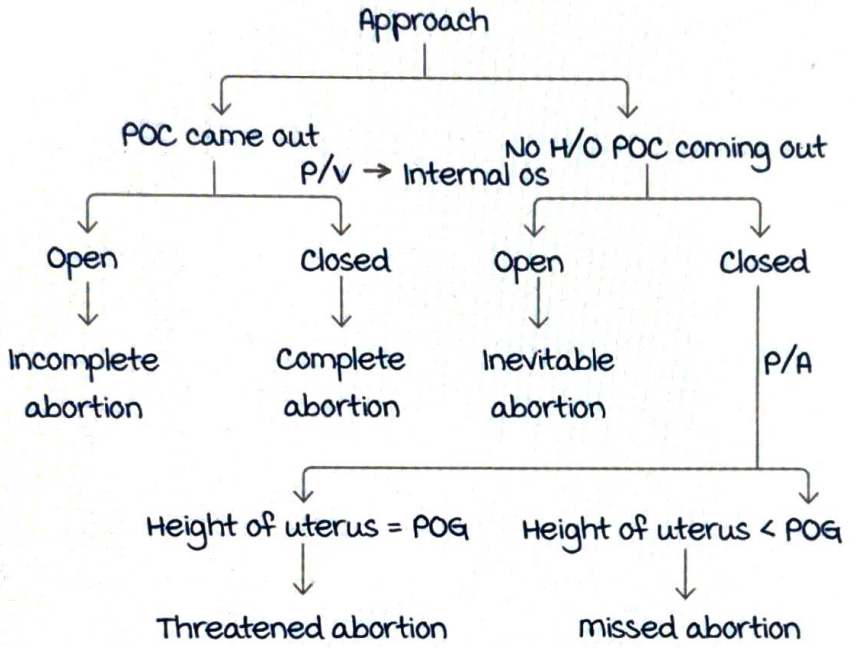
≥ 25mm with no fetal pole/cardiac activity.

- If Crown-rump length (CRL) ≥ 7mm with no cardiac activity.

Anti-D injection to be given whether it is at < 12 weeks or ≥ 12 weeks.

Approach to a case of abortions

00:14:51



MTP

00:19:00

MTP act came in 1971.

Amendment → 2022.

Common points :

Consent :

- Only female's consent needed (partner consent not needed).
- If the female is < 18 years /mentally ill : Gaurdian's consent.

Qualification for doing MTP :

- RMP who has assissted in 25 MTPs (atleast 5 should be as a primary surgeon).
- RMP who has done 6 months of house job in OBG.
- Diploma/degree in OBG.

Active space

Changes :

1971 act		2022 amendment
20 weeks	MTP can be done upto	24 weeks (only in some cases)
20 weeks	If pregnancy is due to contraceptive failure	20 weeks
20 weeks	Fetal anomaly	24 weeks If severe fetal anomalies : No upper limit
uptil 12 weeks	Single doctor's opinion needed	uptil 20 weeks
12-20 weeks	Two doctors' opinion needed	20-24 weeks

Conditions where MTP can be done upto 24 weeks :

- Minor female.
- Mentally unstable female.
- Pregnancy is a result of rape.
- Pregnancy is a result of incest.

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Severity of the congenital malformation is decided by a medical board consisting of :

- Gynaecologist.
- Pediatrician.
- Radiologist.
- A person assigned by the state.

Methods of doing MTP

00:25:53

Ist trimester :

- Medical abortion.
- Suction and evacuation.
- Manual vaccum aspiration.
- Menstrual regulation (not done anymore).

Active space

And trimester :

Medical abortion :

- Prostaglandin.
- Extraamniotic Ethacridine (not used now).
- Intraminiotic saline (not used now).
- Oxytocin

Dilatation and evacuation.

Medical abortion

00:26:58

India		WHO
7 weeks	Upper limit	9 weeks
As an out patient procedure	Done on	If 7–9 weeks : On inpatient basis
T. Mifepristone 200mg orally	Day 1	T. Mifepristone 200mg orally
T. Misoprostol 400 mcg oral/buccal/ pervaginal/ sublingual/ perrectal	Day 3	T. Misoprostol 800 mcg oral/buccal/ pervaginal/ sublingual/ perrectal
To ensure that the process is complete	Day 15	To ensure that the process is complete
Not needed at any step	Need for USG	Not needed

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Till 7 weeks → Best method is Medical abortion.

7–12 weeks → Best method is suction evacuation.

Suction evacuation

00:32:38

Done using Karman's cannula.

The number of the Karman's cannula corresponds to the size of the uterus (POG).

Dilatation of the cervix → Hegar's dilator.

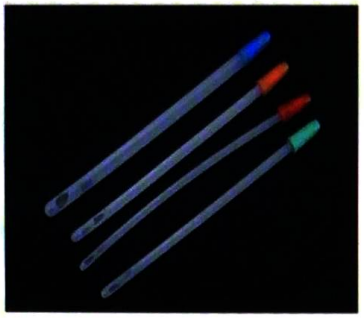
Karman's cannula is connected to a suction machine.

Active space

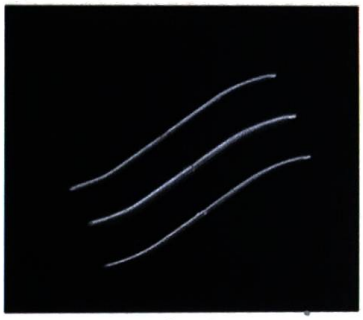
Pressure generated → 600 mm of Hg.

End point of suction :

- Decreased blood loss.
- Gripping sensation.
- Grating sensation.
- Air bubbles in the cannula.



Karman's cannula



Hegar's dilator

If perforation occurs during suction evacuation

- While using Hegar's dilator → Stop the procedure, Monitor the vitals
- While using Karman's cannula → Stop the procedure, Do not take out Karman's cannula, Immediate laproscopy

MTP in rural areas (electricity is not available) :

Alternative to suction evacuation :

Manual vaccum aspiration (MVA).

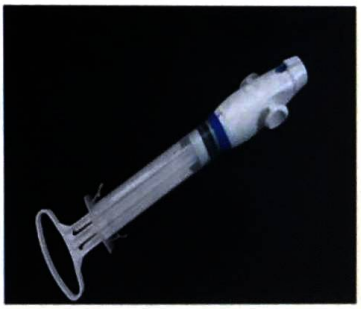
Done using MVA syringe (2 pinch valves/1 pinch valve).

Plane syringe with no pinch valves :

Menstrual regulation syringe.

Capacity of the syringe → 60 mL.

Pressure generated → 660 mm of Hg > 600 mm of Hg.



Active space

Abortion in 2nd trimister

00:38:57

Abortion in 2nd trimister

- Medical methods
  - Admission is needed
  - Mini Labour
    - PG's
      - PG E1 : Misoprostol (Best)
      - Dose → 200-800mcg
      - MC used protocol :
      - 400mcg pervaginally
      - X 4 hourly
      - Other PG's :
      - Carboprost (PGF-2α)
      - Dinoprostone (PG E2)
    - Other drugs
      - Extramniotic Ethacridine
      - Intramniotic saline
      - Oxytocin
- Surgical methods
  - Dilatation & evacuation
  - using Ovum forceps/
  - sponge holding forceps

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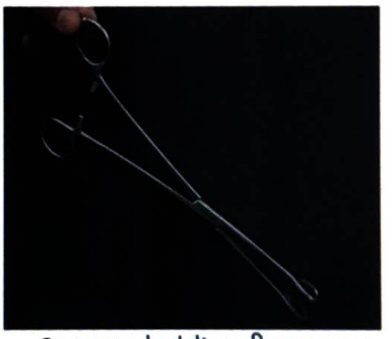
Ovum forceps :
Spoon shaped forceps
No rachet lock



Sponge holding forceps :
Opening in the blades
Rachet lock present

Ratchet lock is absent in :

- Ovum forceps.
- Cheatle's forceps.

Suction evacuation and dilatation and evacuation procedures are done under paracervical block (3' o clock and 9' o clock positions are avoided due to the presence of descending cervical artery).

Active space

After the procedure, check curettage is done using blunt curette, except in molar pregnancy where sharp curettage is done.

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Procedure & instruments used in surgical abortion 00:46:28

Suction evacuation :

Take the consent and explain the procedure to the patient.

Ask the patient to empty the bladder.

Patient is asked to be in lithotomy position and perspeculum and pervaginal examination is done.

The size and position of the uterus should be known before the start of the procedure.

Per speculum examination is done using Sim's non-self retaining posterior vaginal wall retractor.

Anterior wall of the vagina is retracted using Anterior vaginal wall retractor.

Anterior lip of the cervix is held using Vulsellum.

Size and position of the uterus is assessed by uterine sound (first dilator).

Internal os is dilated using Hegar's dilators (held like a pen).

Suction and evacuation is done using Karman's cannula (size of the Karman's cannula should be equal to the size of the uterus), where one end is inserted in the os and the other end is attached to a suction machine (600mm of Hg pressure).

End point of Suction evacuation :

- Decreased blood loss.
- Air bubbles in the cannula.
- Grating sensation.

Suction machine should be switched on only after the cannula is inside the internal os.

In rural areas, MVA syringe is used.

Difference between MVA and Menstrual regulator syringe :

MVA syringe → Double/single pinch valve, 60mL syringe.

Menstrual regulator syringe → No pinch valves, 50mL syringe.

After suction, curettage is done using blunt forceps.

Dilatation and evacuation :

The steps are similar to suction evacuation till the dilatation of the internal os.

Sponge holding forceps/ovum forceps is used to carry out the abortion.

Check curettage with blunt curette is done.

Cusco's bivalved self retaining speculum :

Can retract both anterior and posterior vaginal wall at the same time.

Self-retaining, assistant not needed.

ECTOPIC PREGNANCY : PART 1

Implantation of the blastocyst at a site other than the uterus.

Most common site : Fallopian tube.

Fallopian tube : Ampulla is most common site.

- Causes : Fertilization occurs here.
- Mucosal folds called plicae are maximum in ampulla.

Least common site in fallopian tube : Interstitium.

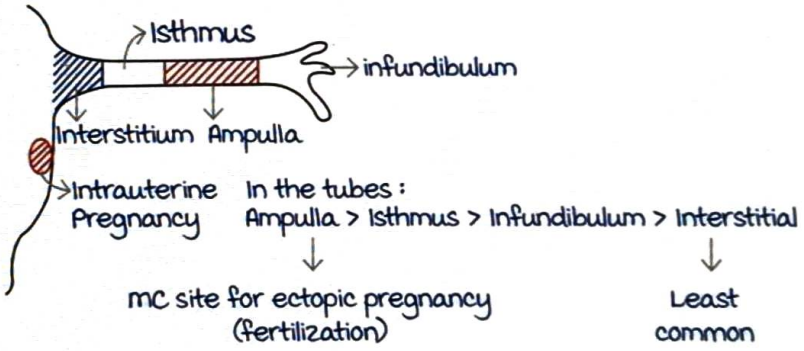
Cornual pregnancy : Ectopic pregnancy in the interstitium of the fallopian tube.

Most common non tubal site : Ovary.

Least common site for ectopic pregnancy :

- Cervical ectopic.
- Ectopic in cesarean section scar.
- Abdominal ectopic.

Hence ectopic is not always extrauterine.



Narrowest part of fallopian tube : Interstitium (anatomical sphincter).

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2nd narrowest part of fallopian tube : Isthmus (physiological sphincter).

Outcomes of ectopic pregnancy :

- Tubal rupture.
- Tubal abortion.

Most common site for tubal rupture : Isthmus.

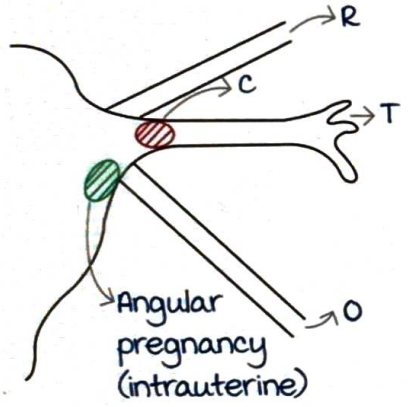
Most common site for tubal abortion : Ampulla.

Tubal ectopic pregnancy ends at :
Isthmus : 6 weeks.
Ampulla : 8 weeks.
Interstitium : 10-12 weeks (close to uterus, myometrium supports the pregnancy, hence longest tubal ectopic).
It is the most dangerous type of ectopic pregnancy.

Site for longest duration ectopic pregnancy : Abdominal ectopic.

Cornual pregnancy and Intrauterine pregnancy 00:11:36

Angular pregnancy : Intra uterine pregnancy near the angles of uterus.
Round ligament is the most important structure to differentiate angular and cornual pregnancy.
If round ligament is lateral to pregnancy : Angular pregnancy.
If round ligament is medial to pregnancy : Cornual pregnancy.



- Anterior to posterior : Structures attached to angle/cornua of uterus → RTO

C → Cornual pregnancy
R → Round ligament
T → Fallopian tube
O → Ovarian ligament

In cornual pregnancy on ultrasound myometrium bed is : < 5mm.
In angular pregnancy on ultrasound myometrium bed is : > 1cm.

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Earlier considerations of cornual pregnancy :
A pregnancy in rudimentary horn of unicornuate uterus.
A pregnancy in non-functioning horn of bicornuate uterus.
Nowadays, these are considered as intrauterine pregnancies and have highest risk of uterine rupture.

Outcome of angular pregnancy :
80% of results in live births.
20% of results in an abortion.

Active space

Uterine ruptures are seen rarely.

Pregnancies associated with uterine ruptures :

- In rudimentary horn of unicornuate uterus.
- In non-functioning horn of bicornuate uterus.
- Ectopic on caesarean scar.

Heterotopic pregnancy : Twin pregnancy where one pregnancy is intrauterine, and the other is ectopic.

Incidences are increasing due to assisted reproductive techniques (ART).

Management : Surgical management in ectopic, intrauterine pregnancy should be continued.

Methotrexate not to be used.

Risk factors for ectopic pregnancies 00:20:03

1. Previous history of ectopic (highest risk factor) :
   If one previous history of ectopic, chances of ectopic in next pregnancy : 15 %.
   If two previous histories of ectopic, chances of ectopic in next pregnancy : 30 %.
2. Previous history of tubal surgery (due to formation of adhesions).

3. Pelvic inflammatory disease (PID)/ salpingitis (most common)
   Highest risk is PID due to chlamydia (chlamydia leads to production of PROKR2 protein, which makes pregnancy more likely to implant in tubes).
4. Genital TB : Ectopic pregnancy rates are not high (tubal damage decreases spontaneous conception = Infertility).
5. Endometriosis : Theory of retrograde menstruation.
6. Multiple sexual partners
7. Cervicitis
8. Low socio-economic status
9. History of infertility

   (6–9) — risk factors for PID

10. Smoking :
    Leads to impaired motility of tubes.
    Leads to decreased immunity → Even if female is a past smoker risk for PID persists.

11. Ovulation inducing drugs : Clomiphene, Letrozole, gonadotropins.
(Hyperovulation → Risk for multiple pregnancies).
12. IVF/ART.

Role of contraceptive methods in ectopic pregnancy

00:29:01

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- Decreases the absolute risk of ectopic pregnancy, as they decrease the chance of conception.
- Failure of contraceptive agent increases risk of ectopic pregnancy (increases relative risk).

Contraceptive methods increasing risk of ectopic pregnancy :

- Progesterone containing contraceptive.
  Progesterone only pills.
  Progesterone IUCD : Mirena.
  OCP.
- Tubal ligation
- Copper T.

↓ tubal motility

Blockage of tube

Tubal ligation (Lap> Hysteroscopic) > Progesterone IUCD = Mirena > Copper T > Progesterone only pills > OCP.

Clinical presentation

00:34:30

Triad :
Abdominal pain (most consistent symptom).
Amenorrhea.
Vaginal bleeding.
(Similar to abortion, but abortions presents mainly with bleeding).

High suspicion for ectopic pregnancy in patients presenting with above symptoms and :

- If pregnancy is confirmed, but not a confirmed intrauterine pregnancy.
- History of conception through IVF/ ART.

Active space

- Pregnancy not confirmed, amenorrhea of > 4 weeks.
- Hemodynamic instability and acute abdomen that is not explained by any diagnosis.

Pain abdomen in ectopic pregnancy 00:40:18

Site : Lower abdomen/pelvic area.
Unilateral pain.
Nature : Mild/severe/blunt/sharp/constant/intermittent.
Reasons :
In ruptured ectopic : Hemoperitoneum.
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unruptured ectopic : Due to stretching of tubes
pain arises at nerve roots of T 11, T 12, L 1.
In case of ruptured ectopic : Abrupt onset of severe pain.

Pain of middle or upper abdomen :
Seen in cases of intraperitoneal blood which reaches upper abdomen.
In abdominal ectopic pregnancy pain may be present.
If intra peritoneal blood reaches diaphragm → Irritates diaphragm → Shoulder tip pain.
Pooling of blood in cul-de-sac (Pouch of Douglas) → Pressure on rectum → Urge to defecate.

History indicating to ruptured ectopic :
- Shoulder tip pain.
- Syncope attack/postural hypotension.
- Urge to defecate.

Active space

ECTOPIC PREGNANCY : PART 2

Examination in ectopic pregnancy 00:00:08

	Ruptured Ectopic	Unruptured Ectopic
General Examination Findings	Tachycardia. Hypotension.	Not significant
Per Abdomen Examination Findings	Abdominal distension. Rebound tenderness. Guarding.] localising Rigidity.] signs	Not significant.
[illegible]	1. Most significant finding : Presence of adnexal mass. 2. Cervical motion tenderness.	

Cervical motion tenderness :

- Pain even on touching the cervix during P/V examination.
- This happens due to Salpingitis which further causes peritonitis.
- Occurs in both PID & Ectopic pregnancy.

Uterus enlarges (due to endocrine changes of pregnancy) and soften, but size is smaller than Period of gestation(POG).

Case

Female with 6-8 weeks of amenorrhea, spotting & pain in abdomen, Vitals unstable.

Next investigation ? : UPT. (UPT is positive in IU Pregnancy + Ectopic pregnancy)

↓ UPT + ve

Next step ?

↓ Resuscitate patient

P/A Examination :

- Localising Signs -ve → FAST → If Intraperitoneal bleeding present → Laparotomy
- Localising Signs +ve → Laparotomy

Active space

Best management for Ruptured Ectopic : Surgery.

No role of :

- Medical Management.
- Expectant management.

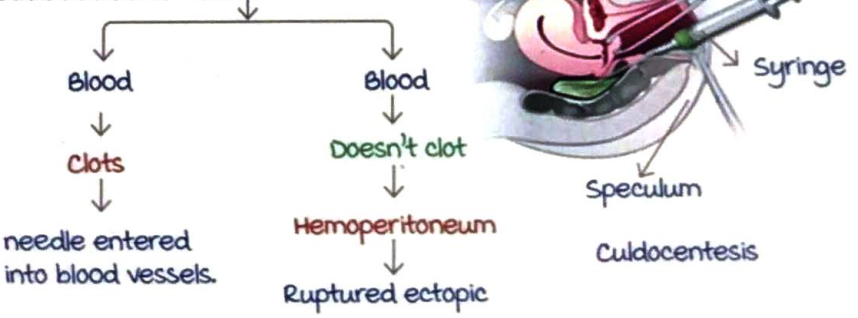
Route of surgery :
Vitals unstable : Laparotomy.
Vitals stable : Laparoscopy.
Surgery of choice : U/L salpingectomy. (Irrespective of Primigravida/Multigravida).
No role of any other surgery like salpingostomy.

Case
Primigravida patient with positive UPT. Amenorrhea of 5 weeks. B/P - 110/76. Guarding and rigidity present, complaints of pain in abdomen. What would be the next steps of examination ?

A. Fast.
B. Laparotomy + Salpingectomy.
C. Laparoscopy + Salpingectomy.
D. Laparoscopy + Salpingostomy.

Culdocentesis 00:14:18

Through the posterior fornix of vagina, blood is aspirated from the pouch of Douglas.
Hemoperitoneum can be detected.
For Culdocentesis,
Take blood and leave it in the syringe for 5 minutes.



Culdocentesis

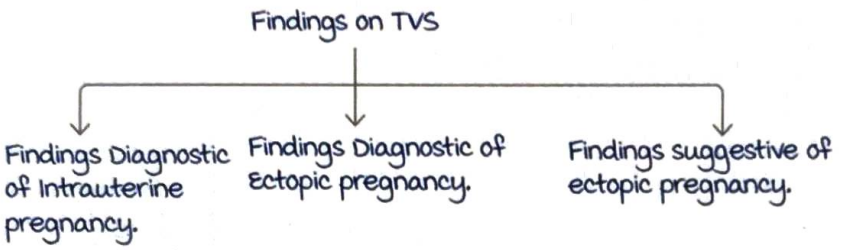
Case 2

Female with 6-8 weeks of Amenorrhea, pain in abdomen & spotting. Vitals stable.

What will be the Next steps ?

UPT (99% ectopic positive).

Investigation of choice : Transvaginal sonography (TVS).



Signs on TVS seen in intrauterine pregnancy :

- Pregnancy : intra-decidual sign.
- IU : Double bleb sign.
- IU : Double decidual sac sign.

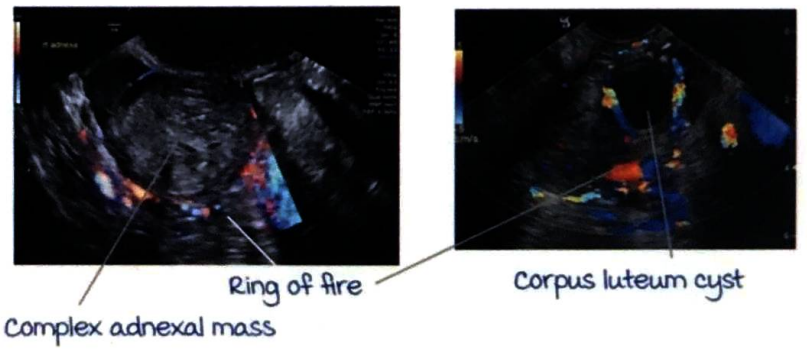
Signs seen on TVS for definitive diagnosis of ectopic pregnancy :

Extra uterine G-sac with Yolk sac /embryo with or without cardiac activity.

Presence of G-sac alone is not diagnostic of ectopic pregnancy. It is suggestive of ectopic pregnancy.

Signs on TVS suggestive of ectopic pregnancy :

- Empty uterus.
- Complex adnexal mass (most common. Seen in 89% cases).
- Increase vascularity of mass (Ring of fire appearance).
- G-sac in tube without yolk sac or without embryo.



Next steps of suggestive ectopic pregnancy :
Serial HCG estimation.

HCG

00:28:00

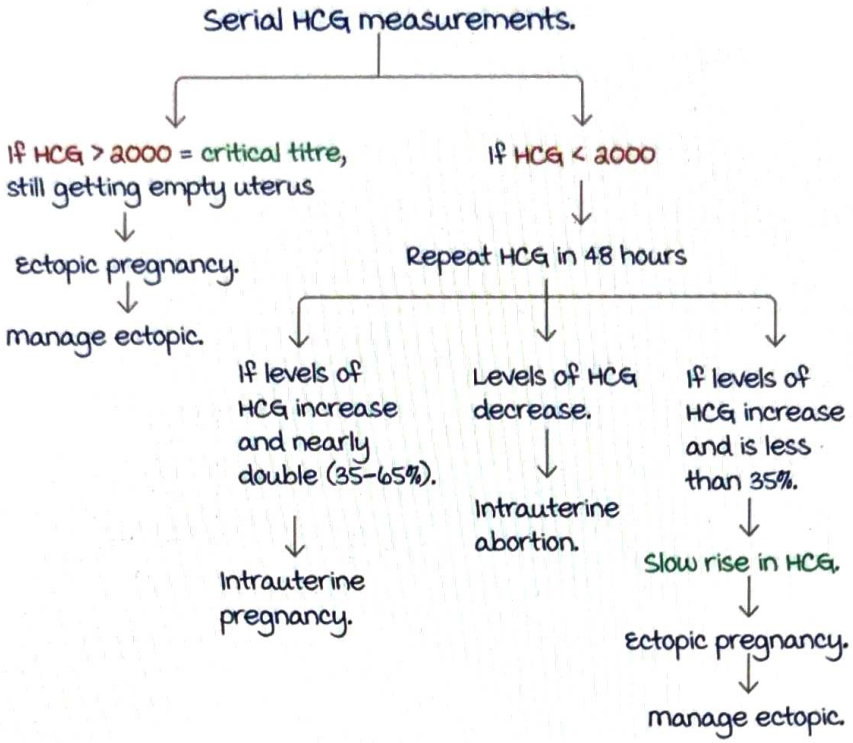
Discriminatory score /critical titre :
That value of HCG above which in Intrauterine pregnancy on ultrasound in 100% cases G-sac will be visible in uterus.
For TVS = 2000 IU.
For TAS = 6500 IU.

Case
If Patient's HCG levels > 2000 & intrauterine G-sac is not visible .
It is case of ectopic pregnancy.

Maximum level of HCG at which G-sac should be visible on TVS in IU pregnancy is 2000 IU.
Minimum level of HCG at which G-sac can be visible on TVS in IU pregnancy is 1000 IU.

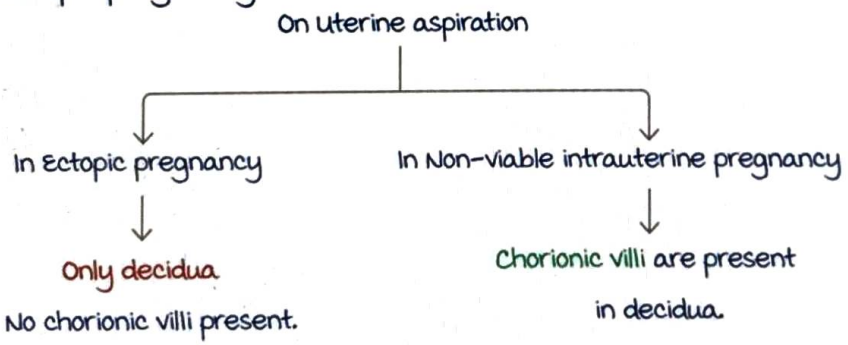
- In early intrauterine pregnancy the levels of HCG roughly doubles in 48 hours (increase by 35% - 65%).
- But in case of Ectopic pregnancy, levels of HCG increase in 48 hours but increase is less than 35%.
- Non-viable intrauterine pregnancy : In case of aborting or dying pregnancy the levels of HCG decrease after 48 hours.

Question :
Female with 6 weeks of Amenorrhea, complaints of pain + spotting, UPT positive, on TVS empty uterus & complex adnexal mass.
Findings are suggestive ectopic pregnancy
Next steps :



Gold standard investigation to diagnose ectopic pregnancy :
Laparoscopy.

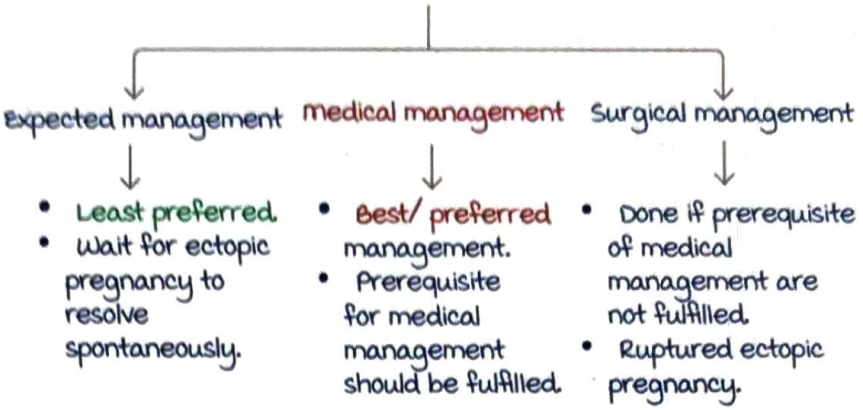
Serum progesterone levels :
> 25 ng/ml indicates viable intrauterine pregnancy.
< 5 ng/ml indicates Non-viable intrauterine pregnancy or ectopic pregnancy.



Tests not done in ectopic pregnancy :

- HSG.
- Hysteroscopy.
- Colpotomy (method to drain pelvic abscess).

Management of unruptured ectopic pregnancy 00:41:08



	medical management	Surgical management
Vitals of mother	Stable (only in unruptured ectopic).	Unstable/ ruptured ectopic.
Family	kumarankit.nda1@gmail.com	complete.
HCG	<5000IU	>5000IU
Size of G - sac	< 4cms	> 4cms
Cardica activity	Absent (Not an absolute req.)	Present

1. In cases where Cardiac activity is present -> Preferred management is surgical, but medical management can be done although the chances of failure increases.
2. In cases where cardiac activity is present, medical management should only be done for size of sac ≤ 3.5 cms.

Conditions for expectant management :
Patients should be hemodynamically stable.
No visible sac.
HCG ≤ 200 IU with a falling trend.

Medical management :
Drug of Choice (DOC) : methotrexate.
Dose : 50 mg/m^2
Route : Intramuscularly.

Active space

Protocol

- Single dose of methotrexate.
- Day 1 : Injection methotrexate (entire dose), measure baseline HCG levels.
- Day 4 : HCG levels check.
- Day 7 : HCG levels check.

Successful medical management :

- Decrease in HCG levels between D4 & D7.
- Decrease should be ≥ 15%.
- If decrease on D7 is less than 15% from D4 -> repeat methotrexate injection.

Maximum : 3 times methotrexate can be given.

↓ results not obtained

Failed medical management.

↓

Indication of surgical management.

Case 1

Female with ectopic pregnancy having G-Sac = 2.5 cms, HCG = 3000 IU (pretreatment).

D1 : methotrexate injection given.

D3 : HCG 3200IU.

Next step?

Between D1 to D4 levels of HCG could rise.

It is not an indication of failed medical management.

Cause : Shrinking sac release HCG, hence HCG rises.

Check HCG values on D7.

HCG should not increase between D4 and D7.

Case 2

Same patient, 60c6b3eeaa8ded0e4e7e5ea7

D4 : 3400 IU

D7 : 4000 IU

Next steps ?

Case of failed medical management.

Next step becomes surgical management.

Active space

Case 3

Same patient,

D4 : 3400 IU

D7 : 3200 IU

Next steps ?

D7 value has decreased but decrease in the value is less than 15%.

Repeat injection methotrexate.

Case 4

Same patients :

D4 : 3400 IU

D7 : 2000 IU

Next steps ?

Decrease is greater than 15%.

Case of successful medical management.

Repeat HCG values weekly till they are undetectable.

Precautions during therapy :

1. Avoid intercourse & new conception until HCG is undetectable.
2. Avoid pelvic examination during surveillance of methotrexate therapy due to theoretical risk of tubal rupture.
3. Avoid sun exposure to limit risk of methotrexate dermatitis.
4. Avoid vitamins containing Folic acid.
5. Avoid NSAID's as methotrexate & NSAID interaction decrease renal excretion of methotrexate, hence increases chances of toxicity.

Pain after treatment :

Case 1

Female on methotrexate for ectopic pregnancy.

Complaints of mild to moderate pain.

Next steps ?

Management : Acetaminophen.

This pain is due to tubal abortion or tubal distension due to Hematoma.

Case 2

Female on methotrexate for ectopic pregnancy.

Complaints of severe pain.
Next steps ?
Possibly a case tubal rupture.
Management : TVS + vitals monitoring.
Cause : Could be Hemoperitoneum.

Surgical management of unruptured ectopic :

Route : laparoscopy.
Surgery of choice :
Family complete : Salpingectomy.
Family not complete : Salpingostomy or linear Salpingostomy.

Salpingostomy

- Make an incision on the antimesenteric part directly over the distended tubal part.
- Remove ectopic by hydro-disection.
- Leave the tube & incision site. No sutures required.
- Heals by secondary intention.

If Family not complete; size of G-sac is > 5cms and it is an unruptured ectopic.
Surgery to be done Salpingectomy.

Should salpingo-oophorectomy be done in Ectopic ? : No.
Except in case of ovarian Ectopic.

Ectopic at other sites	Criteria for diagnosis
Ovarian ectopic	Spigelberg criteria.
Abdominal ectopic	Studiform criteria.
Cervical ectopic	Palman and Rubin criteria. Rubin Criteria

Points to remember :
1. When salpingectomy is done laproscopically :
Stay near the infundibulo-ovarian ligament and cut this ligament.
Stay away from infundibulopelvic ligament as it contains ovarian vessels and nerves.
If damaged it can lead to menopause like symptoms and amenorrhea at young age.
2. While cauterising the tube, stay away from the uterus as it can lead to a uteroperitoneal fistula.

GESTATIONAL TROPHOBLASTIC DISEASE

Introduction 00:00:08

When trophoblast of placenta undergoes abnormal proliferation, it results in gestational trophoblastic disease.
Benign condition.
Has malignant potential.

Modified WHO classification of GTD :

1. Molar pregnancies :
   - Hydatiform mole (benign) : Complete & partial.
   - Invasive mole : Malignant.
2. Trophoblastic tumors :
   - Choriocarcinoma.
   - Placental site trophoblastic tumor.
   - Epitheloid trophoblastic tumor.

Other classification :
Molar pregnancy :
- Complete mole.
- Invasive mole.

Gestational Trophoblastic Neoplasia (GTN) :
- Invasive mole.
- Choriocarcinoma.
- Placental site trophoblastic tumor (PSTT).
- Epitheloid trophoblastic tumor (ETT).

Each GTN has a different histological charcteristic, but HPE biopsy is rarely done to identify them.
They are mostly diagnosed based on clinical exam & HCG levels and treated with chemotherapy as GTN.

Risk factors :
- Single most important risk factor : Previous history of molar pregnancy.

- Age of patient :
  Chances are high at both extremes of age :
  Adolescent age & > 40 years (Ova from these age groups is susceptible to abnormal fertilisation).
- most common in South East Asian countries.

Molar pregnancy

00:03:42

Also known as Hydatidiform mole.
Abnormal proliferation of trophoblast.
Size of uterus > Period of gestation.
In molar pregnancy along with trophoblastic proliferation, there is hydropic degeneration.

Types :
- Complete mole : No fetal tissue.
- Partial mole : Fetal tissue may be present.

Pregnancy has to end.
most common presentation : Vaginal bleeding.
Patient has early onset PIH.

Investigation :
- USG : Snow storm appearance.

Due to undue proliferation of trophoblast.

↓

Increased levels of Beta hcg.

↓

hcg > period of gestation.
Lead to Hyperemesis gravidarum.
Alpha subunit of hcg is similar to alpha subunit of TSH : Hyperthyroidism.
Lead to formation of bilateral theca lutein cyst in ovary(hcg has functional similarity with LH & FSH).

Placenta has 3 types of trophoblast :

1. Synctiotrophoblast :
   Highly differentiated : secretes hcg.
2. Cytotrophoblast :
   Primitive trophoblast : No hormone.
3. Intermediate trophoblast :
   Invades decidua, myometrium & blood vessels.
   Secretes hcg ,not to same extent as synctiotrophoblast.

   AST (PSTT arise from this trophoblast (hcg is not used as tumor marker in these conditions).

Pathogenesis :

Partial mole :

- Triploid : 69 (XXY) or 69 (XXX) & rarely 69 (XYY).
- Most common : 69 (XXY).
- Extra chromatin : Paternal.
- Dispermic.

Complete mole/vesicular mole :

- Maternal chromosomal inactivation.
- Paternal chromosomal duplication.
- Diploid : 46 (XX).
- Entire chromsomal matter : Paternal origin (Androgenesis).
- 80 % : Monospermic.
- 20 % : Dispermic.

Twin pregnancy :

One normal fetus & one molar pregnancy.

Complications to surviving twin :

- Abortion.
- Pre eclampsia.
- Hemorrhage.
- Thyrotoxicosis.

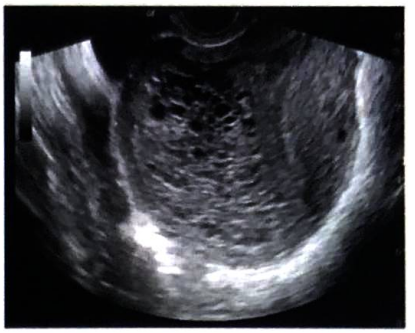
Complete v/s partial mole

00:14:10

	Complete mole	Partial mole
Karyotype	46 (XX).	69 (XXY).
maternal genes	Absent.	Present.
P57 Kip 2 immunostaining : (Paternal gene which is maternally expressed)	Negative.	Positive.
most common symptom :	First trimester bleeding : Some females may complaint of grape like vesicles coming out.	
On USG (Investigation of choice).	• Complex echogenic intrauterine content with cystic anechoic spaces known as snow storm appearance. • Absence of fetal parts. • Absence of Amniotic fluid. • Presence of theca lutein cysts.	• Cystic spaces in placenta. • Decreased Amniotic fluid. • Increased transverse diameter of gestational sac. • Resembles missed abortion. • Accurate diagnosis is made after HPE.

Active space

Snow storm apperance



Management :

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	Complete mole	Partial mole
Management	Suction evacuation for any gestational age & size of uterus. Keep packed cells ready (As chances of bleeding is more). After process begins, start oxytocin. If oxytocin given before suction evacuation : lead to trophoblastic embolisation. Do sharp curettage : After procedure send tissue for HPE. HPE : Gold standard for diagnosis. If age of patient > 40 years + Family complete + complete mole. ↓ Hysterectomy	
Management of Theca lutein cysts.	No management needed. Resolves spontaneously after evacuation. While doing hysterectomy, theca lutein cyst do not need removal.	

On HPE : • Fetal / embryonic tissue. • Hydropic swelling of chorionic villi. • Trophoblastic proliferation. • Scalloping of villi. • Trophoblastic inclusion bodies.	Absent. Diffuse. Diffuse. Absent. Absent.	Present. Focal. Focal. Present. Present.
Follow up : Investigation of choice : Beta hcg.	Done using hcg levels. ↓ 1st level : After 48 hours. Repeat weekly. ↓ Till they become undetectabe : 7 weeks. ↓ Repeat monthly. ↓ Till 6 months.	6 weeks.
Pregnancy.	Contraindicated for 6 months.	Contraindicated for 6 months.
	Although not recommended but if female conceives within 6 months. Rate of live birth & congenital anomalies mirror general population.	
Contraceptive of choice.	OCP's.	OCP's.

Rate of subsequent GTN.	15 to 20 %. • 15 % : Locally invasive. • 4 to 5 % : metastatic. metastasis is most common when GTN develops after non molar pregnancy. most common site : Lungs (80 %). Vagina (30 %). Pelvis (20 %). Liver & brain (10 % each).	1 to 5 %.

Role of Anti D injection in Rh -ve females after molar evacuation :

1. Partial mole :
- Fetal red cells with D antigen.
- Anti D is given in case of Rh -ve female.

2. Complete mole :
- Also it is given because a definite diagnosis of complete mole V/S partial mole may not be confirmed until HPE of evacuated products.

Risk factors for development of GTN :
- hcg ≥ 10^5 mIU/ ml.
- Older age (> 40 years).
- Theca lutein cyst (≥ 6 cm).
- Increased size of uterus > gestational age.

Mnemonic : HOTS.

Prophylactic chemotherapy : Not given these days.

Quiscent Gestational Trophoblastic Disease :

In some women :

Low levels of hcg (< 200 mIU/ml).

↓

Persist for several months after evacuation.

↓

Indicates a small active focus.

It should be followed up (In 20 %, eventually lead to active disease).
Doesn't need chemotherapy.
A variant of Beta hcg : Hyperglycosylated hcg (hcg H) may be used to differentiate between quiscent & active GTN.
If present : Indicates active GTN.

Gestational Trophoblastic Neoplasia (GTN) 00:30:35

Most common GTN after molar evacuation : Invasive mole.
Choriocarcinoma most commonly develops after : Molar pregnancy.
Most common GTN after non molar pregnancy / Full term pregnancy : Choriocarcinoma.
PSTT : most commonly develops after full term pregnancy.

GTN may follow :

- Molar pregnancy (most common).
- Abortion.
- Ectopic pregnancy.
- Normal pregnancy : Term & pre-term.

Signs & symptoms of GTN after Hydatiform mole evacuation :

1. Persistent bleeding.
2. Persistent theca lutein cyst.
3. Subinvolution.
4. Shock.
5. Metastasis (Lungs or vagina).

Lab criteria :

- Increasing hcg levels (≥ 10 %) x 3 weeks.
- Plateau levels (within 10 % of previous value) x 4 weeks.
- hcg detectable after 6 months of suction evacuation.
- HPE report : GTN present.

Invasive mole :

- most common GTN overall.
- Most common GTN after molar pregnancy.
- Locally invasive.
- metastasis in 5 % cases.

Active space

- Always develops after hydatiform mole.
- On HPE :
  - Villi are present.
  - Trophoblast extend into myometrium.
  - Tendency to perforate uterus.

- Complication : Shock or hemorrhage.

Choriocarcinoma :

- Most common GTN after non molar pregnancy.
- It can develop after molar & non molar pregnancy.
- Appears as highly vascular dark red or black mass.
- Locally invasive,but can metastasize.
- On HPE :
  - Sheets of trophoblasts.
  - Absence of villi (characteristic feature).
  - Also extends till myometrium.

Priniciple :

The diagnosis of GTN is made on basis of clinical presentation, elevated hcg & evidence of metastasis on imaging.

Invasive biopsy/ histology is seldom needed.

FIGO staging of GTN

00:37:57

Stage 1 : Disease confined to uterus.

Stage 2 : GTN extends outside uterus but within pelvis.
- most common site of metastasis in pelvis : Vagina (suburethral nodules : very vascular + bleed profusely).

Stage 3 : GTN extends into lung :
- Patient complaints of cough & hemoptysis.
- most common finding on chest X ray :
- Cannon ball appearance > Snowstorm appearance.

Stage 4 : Distant metastasis :
- Liver : Occurs late : leads to intra peritoneal bleeding.
- Brain : leads to convulsion.

Snow storm appearance :

On USG : Molar pregnancy (complete mole).

On Chest X ray : Choriocarcinoma (metastasized to lungs).

WHO Scoring system :

- Divides GTN into low risk & high risk types.
- Stage I : FIGO is always taken as low risk.
- Stage IV : FIGO is always taken as high risk.
- Stage 2 & 3 : WHO scoring done.

Risk factor	Score			
	0	1	2	4
Age (years)	< 40	≥ 40	-	-
Antecedent pregnancy	Mole	Abortion	Term	-
Interval (months)	4	4 to 6	7 to 12	> 12
Pre treatment serum hcg (mIU/ml)	$< 10^3$	10^3 to 10^4	10^4 to 10^5	$> 10^5$
Largest tumor (including uterus)	< 3 cm	3 to 4 cm	≥ 5 cm	-
Site of metastasis	Lung	Spleen, Kidney	GI tract	Brain, liver
Number of metastases	-	1 to 4	5 to 8	> 8
Prior failed chemotherapy	-	-	Single drug	≥ 2 drugs

If total score : 0 to 6 : Low risk.

If total score : ≥ 7 : High risk.

Management of GTN

00:44:12

Highly chemosensitive tumor.

Low risk GTN	High risk GTN
Stage I : FIGO.	Stage IV : FIGO.
Stage II & III FIGO if low risk as per WHO (0-6).	Stage II, III : if high risk as per WHO (≥ 7).

Active space

multiagent chemotherapy.

Single agent chemotherapy :
Multidose methotrexate (1 mg/kg)
given on Day 1, 3, 5, 7 for 2 weeks.
Alternating with folinic acid (0.1 mg/kg) IM.
Alternative to methotrexate :
Actinomycin D.

In Stage I disease : disease confined to uterus :

Fertility not desired. → Hysterectomy + Single agent chemotherapy.

Fertility desired. → Single agent chemotherapy on curettage + Single agent chemotherapy.

Multi drug therapy : Bag shaw regime.

- Etoposide.
- methotrexate.
- Actinomycin D.
- Cyclophosphamide.
- Oncovin (vincristine).

Mnemonic : EMACO.

Follow up :
Low risk / High risk GTN : For 1 year.

Pregnancy :
Contra indicated for one year.

Indications for hysterectomy in GTN :

- Complete mole + family of patient is complete + age ≥ 40 years.
- Excessive uncontrollable bleeding during Suction evacuation.
- Invasive mole with excessive uncontrollable bleeding.
- Stage I GTN (FIGO) : Hysterectomy + Single agent chemotherapy.
- PSTT + ETT : Hysterectomy + Multi dose chemotherapy.

Indication for radiotherapy in GTN :

Brain metastasis (Stage IV) : multidrug Chemotherapy + Radiotherapy.

Pregnancy after GTN :

- Risk of repeat molar pregnancy : 1 to 2 %.
- No risk for increased congenital anomalies or abortions.
- Higher risk of stillbirth.
- Early USG is advised.
- After delivery, their placenta or products of conception is sent for HPE.
- Beta hcg levels are measured 6 weeks postpartum.

Case scenario :

Female with molar pregnancy undergoes suction evacuation. Post evacuation, she has persistent unusual bleeding. what is the next step ?

Ans :

Clinical assessment for metastasis
(appears as bluish vascular masses)

↓

Biopsy not done (Highly vascular).

↓

measure Beta hcg levels.

↓

Diagnosis verified : GTN +

Do investigations to rule out metastasis.

LFT, RFT, TVS, Chest X ray, CT scan(Brain & Abdomino pelvic).

Disease is confined to Uterus.	If it is extra uterine
↓	↓
Stage I.	Do staging & scoring.
↓	↓
Hysterectomy/ Second curettage.	Start Chemotherapy based on staging & risk score.
↓	
Followed by single agent CT.	

Active space

ANTEPARTUM HAEMORRHAGE

Antepartum haemorrhage 00:00:52

Definition :

Any bleeding that occurs into or from the genital tract beyond the period of viability (28 weeks).

Period of viability : 28 weeks in India and 20 weeks in USA.

Causes :

Most important :

- Placenta previa (1 in 300 pregnancies).
- Abruptio placenta (1 in 200 pregnancies).

Less important :

- Vasa previa (vessels connecting umbilical cord to the placenta that lie near the internal os) .
- Preterm labor (show).
- Rupture of uterus.

Most common cause of antepartum haemorrhage is abruptio placenta. 60c6b3eeaa8ded0e4e7e5ea7

Abruptio placenta :

Premature separation of placenta before the delivery of the baby.

Normally, placenta is located in the upper uterine segment.
Placenta previa : Placenta is located in lower uterine segment.

Causes of bleeding :

- Abruptio placenta :

Inciting factors like trauma/ pregnancy induced hypertension → Rupture of spiral arteries in decidua basalis → Collection of blood behind placenta → Increase in intervilluos space pressure → Bleeding + release of tissue

Active space

thromboplastin (uterotonic agent, DIC , induction of labor).

- Placenta previa :

Placenta is located in the lower uterine segment.
When uterus contracts/ cervical changes occur → Shearing force to the inelastic placental attachment site → Opening of venous sinuses (no detachment of placenta and no release of tissue thromboplastin) → Bleeding from intervillous space (maternal blood) → Hence uterus is soft .

Vaginal examination & intercourse can cause bleeding in patients of placenta previa, hence contraindicated.
tranvaginal USG not contraindicated as probe kept 2cms below OS.

Steps in managment of APH

00:12:27

Pregnant female has bleeding at ≥ 28 weeks.
Step 1 :
maternal resuscitation :

- Insert 2 large bore IV cannulas (no. 14 : orange/ no. 16 : gray).
- Obtain samples for ABO, Rh type, CBC, bleeding time, clotting time, coagulation profile. Start ringer lactate/ normal saline and give oxygen by mask.
- Maintain airway, breathing and circulation.
- Based on h/o and P/A examination :
  Abruption : Tense tender and rigid abdomen,
  Previa :n Non tender and soft

If vitals are stable → Transabdominal scan is done as a screening test.

- On transabdominal scan, if placenta is in lower segment → placenta previa → investigation of choice is transvaginal sonography.
- On transabdominal scan, if there is retroplacental hematoma/ placental thickening/ Jell-O sign (shimmering of the placenta on maternal movement/ transducer movement) → Abruptio placenta

Management of abruptio placenta.

If vitals are unstable/ fetal distress/ fetal death/ DIC is present → Next step is emergency caesarean section.

- Abruptio placenta is a clinical diagnosis. USG is not diagnostic and cannot be used to rule out Abruptio.
- Per vaginal examination is contraindicated in APH unless placenta previa is ruled out
- In patients of antepartum haemorrhage, fetal death indicates severe haemorrhage and increases the risk of DIC. Hence emergency caesarean section is performed.

  If the patient has stable vitals and no DIC, then vaginal delivery can be performed for dead fetus

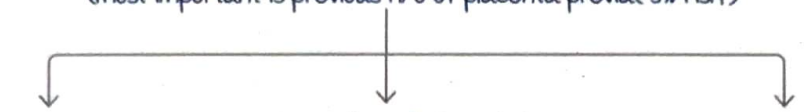
Placental migration 00:19:00

- Low lying placenta can be detected by usg at 16 weeks.
- In 90% of cases, placenta found in the lower uterine segment during the first trimester migrates to the upper uterine segment during the third trimester, is called trophotropism.
- It occurs due to differential growth of the uterus (lower part grows more compared to upper part).
- Length of the lower uterine segment (LUS) is from isthmus and is 5 mm in the first trimester. As pregnancy advances, LUS increases in size. This relocates placenta away from the internal os. Length of the LUS in the third trimester is 5 cm.
- Best time to do usg for localizing placenta is 3rd trimester (at 32 & 36 weeks)
- Scar in the LUS due to LSCS/ previous uterine surgery (fibrous tissue) prevents placental migration.

Risk factor for palcenta previa

00:22:23

Risk for factors for placenta previa
(most important is previous h/o of placenta previa(5% risk)



Large placenta
- Twin pregnancy
- Placenta succenturiata
- Placenta bilobata
- Smoking (leads to placental hypertrophy due to CO hypoxemia)

Prevention of placental migration :
- Caesarean section scar.
- Hysterotomy scar.
- ↑ number of Caesarean section Increased risk of placenta previa.
- Previous h/o placenta previa + Previous h/o Caesarean section is placenta accreta syndrome (rule out by doing doppler).

Others :
- ↑ maternal age
- ↑ maternal parity
- ↑ in maternal serum alpha feto protein
- ART/IVF (↑ maternal age,twins)

Classification of placenta previa

00:28:346

New classification :
- Placenta previa : Placenta is at the level of internal os or above it (covering internal os).
- Low lying placenta : Placenta is within 2 cm of the internal os but does not touch or cover it.

Older classification :
- Type 1 (lateral placenta previa) : Placenta is in LUS but does not reach until the level of internal os (within 2 cm of internal os).
- Type 2 (marginal placenta previa) : Placental edge reaches the margin of internal os but does not cover it.
- Type 3 (incomplete placenta previa) : Placenta covers the internal os partially.
- Type 4 (complete/ central placenta previa) : Placenta covers the internal os completely.

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- In type 1 and type 2 placenta previa, placenta could be located either in anterior or posterior wall of the uterus.
- Type 1 anterior and posterior placenta previa and type

2 anterior placenta previa were called as minor degree placenta previa.

- Type 2 posterior placenta previa, type 3 and type 4 placenta previa were called as major degree placenta previa.
- Type 2 posterior placenta previa was also called as dangerous variety of placenta previa.
- Stollworthy's sign : Seen in posterior type 1 & 2 Placenta previa, when the foetal head is pushed into pelvis → sAs placenta located posteriorly → Cord compression → Foetal distress.

Clincal features

00:33:18

Placenta previa	Abruptio placenta
• Bleeding ≥ 28 weeks. • No pain in abdomen (painless), except in preterm labor. • Bright red in colour. • Causeless bleeding. • Recurrent in the same pregnancy. • In some cases, initial bleeding is less → warning haemorrhage → Followed by excessive bleeding.	• Bleeding ≥ 28 weeks. • Pain in abdomen due to thromboplastin. • Dark red blood. • Reason for bleeding is present such as trauma/ high BP. • Bleeding is not recurrent in the same pregnancy. • No warning haemorrhage. • Can lead to preterm labor (thromboplastin)

Placenta previa	Abruptio placenta
may have hypotension if bleeding is more.	BP may be low or high.
Per abdominal : • Placenta does not separate → thromboplastin not released → Uterus remains relaxed. • Uterus relaxed, soft, non tender. • Fetal heart sounds are easily heard. • Fetal parts are easily palpable. • Fundal height is same as the period of gestation. • Malpresentations are common (most common : Transverse lie > breech).	Per abdominal : • Placental detachment occurs → Tissue thromboplastin is released → Increased basal tone of uterus. • Uterus is tender and rigid. • Fetal heart sounds are not easily heard. • Fetal parts are not easily palpable. • Fundal height is more than the period of gestation as blood collects behind the placenta (concealed type). • Malpresentations are uncommon.
DIC is uncommon.	DIC is common due to release of tissue thromboplastin.
Per vaginal examination : Contraindicated.	Per vaginal examination : Not contraindicated (done only after ruling out placenta previa).

- In placenta previa, if the patient has a transverse lie, fundal height will be less than the period of gestation.
- Most common cause of transverse lie at term is placenta previa.
- Most common obstetrical cause of DIC is abruptio placenta.
- Per speculum examination is also contraindicated in placenta previa.

- Per vaginal examination in abruptio placenta is needed to check the cervical dilatation to check progressive labor (but placenta previa has to be ruled out)
- H/o of trauma, non reassuring FHS, on CTG- sinusoidal heart rate, late deceleration or bradycardia → Always suspect abruptio.
- In all cases of preterm labor do per abdominal examination → Tone of uterus is increased → Suspect Abruptio.

Management of placenta previa 00:39:56

If placenta previa is just an incidental finding on second trimester USG and patient has no bleeding :

- In 90% of cases, placenta migrates to upper uterine segment in third trimester.
- In 10% of cases, placenta previa persists in third trimester.
- USG findings help to determine whether placenta will migrate or remain as placenta previa.

Signs on USG that indicate placenta will not migrate :

1. Posterior placenta.
2. Placenta covers ≥ 25 mm of internal os.

Advise for patients with placenta in LUS during 2nd trimester :

- Avoid heavy weight lifting.
- Avoid sexual intercourse.
- Avoid moderate to strenuous exercises.
- Avoid long standing hours (≥ 4 hours/day).
- Immediately report if there is bleeding/ uterine contractions.

Repeat ultrasound is done in third trimester.

Transvaginal ultrasound (TVS) at 32 weeks :

- If there is no placenta previa and low lying placenta → Follow routine antenatal visits.
- If placenta previa/ low lying placenta is seen → Repeat TVS at 36 weeks.

Transvaginal ultrasound (TVS) at 36 weeks :

- If there is no placenta previa and low lying placenta → Follow routine antenatal visits.
- If placenta previa is confirmed → Planned caesarean section at 36 – 37 weeks + 6 days.
- If low lying placenta (placental edge is within 2 cms of internal os) is seen : Discuss the risks and benefits of vaginal delivery trial.
  - If placenta lies within 1 cm of internal os : Planned caesarean section.
  - If placenta lies between 1 – 2 cms of internal os : Vaginal delivery can be tried.

Best time to do USG for localization of placenta is third trimester.

Importance of USG in patients with placenta previa :

- To confirm the diagnosis.
- Diagnose malpresentations.
- Rule out placenta accreta spectrum (PAS).

If caesarean section is done for patients of antepartum haemorrhage →

General anaesthesia is used in emergency C – section.
Neuraxial anaesthesia is used in elective C – section.

If placenta previa is diagnosed in a patient with a prior history of caesarean section → Possibility of placenta accreta spectrum (PAS) should be kept in mind (doppler to rule out PAS).

If patient is a known case of placenta previa with bleeding :
Goals of treatment :

1. Maternal resuscitation.
2. Assess if delivery is needed immediately or not.

Assessment of delivery :
Active management : Immediate delivery by caesarean section.

Expectant management : Continue pregnancy.
Goal is to attain lung maturity of the fetus without putting mother's life at risk.

Active management	Expectant management
• mother is hemodynamically unstable. • Severe persistent bleeding. • Patient is in active labor. • CTG shows category 3 tracing/ fetal distress. • If significant blood loss has happened and gestational age ≥ 34 weeks. • On USG : Gross congenital anamolies seen (incompatbile with life) irrespective of gestational age its active management	• mother's vitals are stable. • No active bleeding. • CTG tracing and fetal heart sounds are normal. • Gestational age is < 34 weeks. • If gestational age is ≥ 34 weeks and there is no significant blood loss. • On USG congenital anamolies seen (compatible with life) expectant mabagement.

Expectant management of placenta previa

00:54:12

mcAffe and Johnson regime.

Steps :

- Admit the patient.
- Give corticosteroids.
- If gestational age is < 34 weeks and contractions are present, give tocolytics. Nifedipine is the drug of choice. Indomethacin (antiplatelet) and terbutaline (tachycardia and hypotension)should not be given.
- If gestational age is < 32 weeks, give magnesium sulphate for neuroprotection.
- Give anti-D if patient is Rh negative.
- Correction of anemia (upto Hb 10 mg/dl).
- Foetal montioring (NST weekly, biophysical profile, growth monitoring on USG)
- No role for cervical cerclage.

- Termination of pregnancy is done at 36 - 37 weeks + 6 days.

If for week the pregnant lady has no bleeding, transport is available within 30min transit time to the hospital then discharge her and ask her to follow up every 2 weeks upto 36 weeks or if labor starts to come to hopital immediately, advice no lifting heavy weight or intercourse.

Risk factors for Abruptio placenta 00:57:40

- Previous h/o of abruption.
- Smoking with or without cocaine abuse.
- Folic acid deficency.
- PIH/high BP.
- PROM.
- Polyhydraminos, twins.
- Fibroid uterus.
- Abdominal trauma.
- Increased maternal age.
- Increased maternal parity.
- Increased maternal serum alpha feto protein.
- Increased inhibin.
- Increased PAPP-A (Pregnancy Associated Plasma protein A).
- Lupus anticoagulant.
- Thrombophilias

Grading classification of abruptio placenta :

Grade 0 : Abruptio placenta is recognized after delivery due to retroplacental clot.

Grade 1 : Bleeding + pain with normal fetal heart sounds.

Grade 2 : Bleeding + pain with fetal distress.

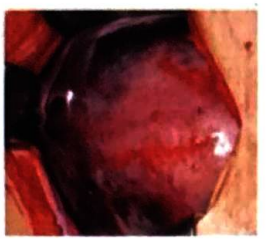
Grade 3 : Bleeding + pain + mother in shock/ fetal death +/- DIC.

Types of abruptio placenta :

1. Revealed variety : Bleeding is visible outside.

2. Concealed variety :

Blood collects behind the placenta → Enters myometrium of uterus → Appears as if uterus is bruised → Couvelaire uterus/Uteroplacental apoplexy.



Retroplacental clot

Couvelaire uterus

Couvelaire uterus is not an indication for hysterectomy. There is increased chance of DIC and postpartum haemorrhage.

- 3. Mixed : features of concealed and revealed varities.

Indicators of severity of abruptio placenta :

- Maternal sequale : DIC → shock → transfusion → Hysterectomy → Renal failure → Death.
- Foetal complications : Non reassuring FHR status → foetal growth restriction → Death.
- Neontal complications : IUGR → Preterm labor → Death.

Predictors of placental abruption :

Trauma.

Uterine contractions.

Foetal complications and death are more common in abruptio placenta (foetal blood loss) than placenta previa (maternal blood loss).

Chronic abruption

01:14:26

Normally placenta separates

↓

Thromboplastin released

↓

Labor starts

↓

But if placental abruption is not followed by delivery

↓

Known as chronic abruption (placental ischemia)

↓

may lead to oligohydramnios and Foetal growth restriction.
CAOs (chronic abruption oligohydramnios Sequence)

markers :
maternal serum alpha feto protein.
PLacental specific RNA.

Management of abruptio placenta 01:16:16

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Important points :

- Vaginal bleeding and the degree of placental separation do not correspond to each other.
- If placental separation is >50%, it will lead to fetal death or DIC.
- In 10 – 15% of patients, there will be concealed haemorrhage and patients will present with preterm labor.

Initial management is resuscitation.
After resuscitation :

- If mother is hemodynamically stable and fetal heart rate is normal → Look for gestational age.
- If gestational age is < 34 weeks : Expectant management → Admit, give corticosteroids, tocolytics not prefered.
  If the bleeding is mild, expectant management.
  If mother is RH negative do Kleihauer betke test for dos age of anti D.
  Foetal surveillance : NST, biophysical profile, USG growth monitoring.
  If mother is hemodynamically unstable or if there is fetal distress after resuscitation → Emergency caesarean section.
- If there is fetal death and DIC is present/ mother is

unstable → Emergency caesarean section.

- If there is fetal death and DIC is absent/ mother is stable → Vaginal delivery.

- If gestational age is ≥ 34weeks → Expedite delivery → Give corticosteroids and induce labor. Tocolytics are contraindicated.
  Preferred route of delivery is vaginal delivery.

- If DIC or coagulopathy present management is caesarean section under general anaesthsia.

Previously expectant management was not prefered but present guidelines state can go with expectant management provided adequate blood and fluids are given.

DIC/ consumptive coagulopathy 01:24:43

Obstetric causes :
Abruptio placenta (m/c).
Amniotic fluid embolism
Sepsis.
Severe pre eclampsia/ Eclampsia/HELLP syndrome.
Acute fatty liver of pregnancy .
Retained dead foetus (very rare).

Diagnosis is made by checking PT & APTT levels ,if abnormal then follwing investigations will be derranged :
↓ Serum fibrinogen < 150 .
↑ Fibrin degradation products.
↑ D Dimer.
↓ Platelet count.
↓ Hb.
In such cases transfuse to the mother, RBC : FPP : Platelet :: 1:1:1 till Hb becomes > 7 , Fibrinogen > 300, platelets > 50,000 and APTT , PT decreased by 1.5 times.

PLACENTA ACCRETA SPECTRUM

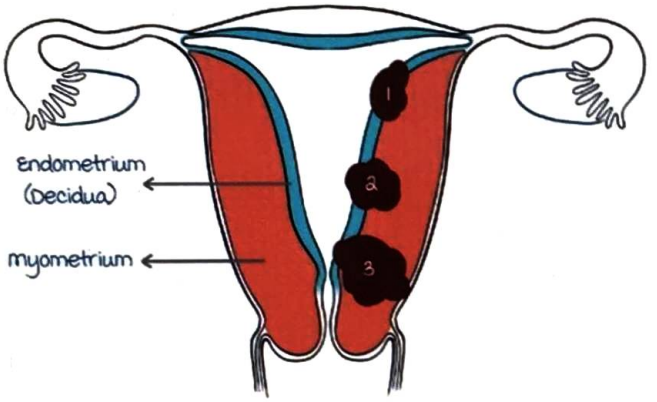
Introduction 00:00:54

It is also known as morbidly adherent placenta.

In PAS : The villi of placenta are not attached to endometrium/decidua but a part or all of the placenta is attached to or infiltrate the myometrium.

Classification :

1. Placenta Accreta : It is the most common variety. In this, villi are attached superficially to myometrium.
2. Placenta Increta: Villi infiltrate into myometrium.
3. Placenta percreta: Villi attached to serosa.



Figo classification of PAS 00:02:30

Grade 1 : Placenta accreta.

Grade 2 : Placenta increta.

Grade 3 : Placenta percreta.

- 3a : Villi attached to serosa.
- 3b : Villi attached to the bladder.
- 3c : Villi attached to any other pelvic structure.

Etiopathogenesis 00:03:14

1. Absent decidua basalis or (defective decidualization).
2. Nitabuch's layer (layer of fibrinoid degeneration between trophoblast and decidua basalis) is absent.

- Nitabuch's layer limits the penetration of trophoblast (villi) into decidua.

- Due to the absence of Nitabuch's layer there will be deeper penetration of trophoblast.

3. Hyperinvasiveness of cytotrophoblast also plays an important role in causation of PAS.

Risk factors 00:04:54

1. Placenta previa (anterior) in present pregnancy.
2. Prior surgery :
   - Cesarean section in past : as the number of cesarean sections increase, the risk also increases. Most important risk factor.
   - Myomectomy.
   - Curettage.
   - Endometrial ablation.
3. Previous history of PAS
4. Risk factors of placenta previa.

Note : The two main important risk factors for PAS are placenta previa and prior cesarean section.

Markers 00:06:34

The following are used as markers for PAS :

- If MSAFP ≥ 2.5 MOM (multiples of meridian) or
- If β hcg ≥ 2.5 MOM

There will be higher chances of PAS if either of these are present.

Diagnosis of PAS 00:07:14

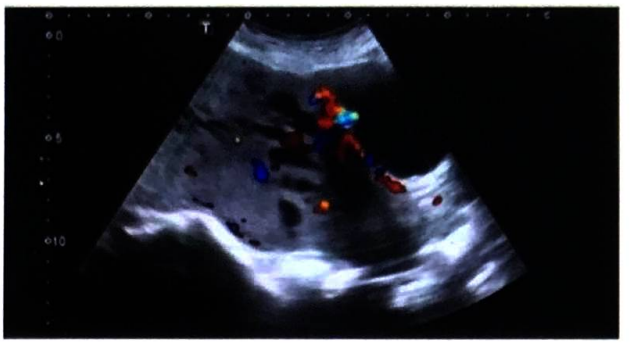
Antenatal diagnosis :

USG with color doppler :

- PAS is associated with characteristic findings on USG. These findings are present from 2nd trimester. Hence effective screening is possible with anomaly scan.
- A definitive prenatal diagnosis can be made by 28 weeks.
- IOC for PAS is USG with color Doppler.

5 signs of PAS on USG :

1. Large placenta lacunae/ placental lakes giving placenta a moth eaten appearance. (On Doppler : increased vascularity in lacunae).



2. Thinning of retro placental myometrium (distance between serosa and retroplacental vessels < 1 mm).
3. Bridging vessels from placenta to bladder serosa interface.
4. Disruption of continuous white line, reflecting bladder uterine serosa interface.
   (Doppler : hyper vascularity of serosa-bladder interface).
5. Loss of normal hypo echoic area behind placenta separating decidua basalis.

Note : Generally MRI is not required to diagnose PAS. Based on USG and Doppler if diagnose can't be made then MRI can be done.

If diagnosed in antenatal period as PAS 00:11:44

- ACOG : Plan Cesarean section between 34 weeks to 35weeks + 6/7days followed by hysterectomy. (With placenta in situ).
- General anesthesia is preferred.
- Baby is delivered by classical Cesarean section avoiding the placental site.
- No attempt should be made to separate or deliver placenta.
- Uterine incision should be closed to avoid bleeding and hysterectomy is done.
- Pre-op ureteric catheterization is helpful in ureteric identification and dissection in case placenta invades the bladder.
- But it does not decrease the risk of urinary tract injury.
- Arterial catheterization of internal iliac artery with balloon

catheter pre operatively and later after delivery of fetus, inflating the catheter will decrease the blood flow to pelvis and bleeding can be reduced. But it leads to increased chances of embolization hence not recommended by ACOG.

PAS if undiagnosed antenatally

00:15:24

Patient presents with :

- Patient presents with intractable PPH.
- Plane of cleavage for placental separation is not obtained and placenta cannot be separated.
- Occasionally, if it is placenta percreta it may infiltrate into bladder and giving rise to hematuria.

Management : Emergency hysterectomy.

Rarely, if female wants to conserve fertility :

- Placenta is left in situ and cord is ligated close to placenta insertion and hysterotomy incision is closed.
- Bleeding is controlled by compression suture or tamponade packing.
- Serial USG/MRI should be done.
- Serial βhcg not useful.
- Ultimately 20% will need hysterectomy later.
- Injection methotrexate is not given.

MATERNAL PELVIS

Pelvis

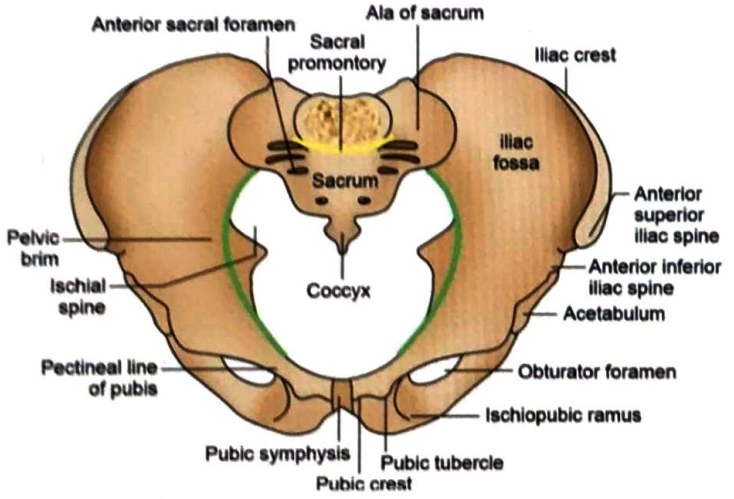
00:00:21

Parts of pelvis :

Pelvic brim / Linea terminalis :
From anterior to posterior it is formed by
Pubic symphysis → pubic crest → pubic tubercle → Iliopectineal eminence → Iliopectineal line → sacroiliac joint → Ala of sacral bone → sacral promontory.

Parts above the pelvic brim → False pelvis (only support gravidarum uterus).

Parts at and below pelvic brim → True pelvis (Takes part in labor).



Parts of true pelvis :

- Inlet : lies at the level of pelvic brim.
- Cavity : lies at the level of $S_2 - S_3$ vertebra
- Outlet : 60c6b3eeaa8ded0e4e7e5ea7
  a) Obstetric – lies at level of ischial spine.
  Called mid pelvis.
  b) Anatomical – lies at level of ischial tubersity

Active space

Pelvic inlet :

1. Anteroposterior diameter

Diameter	Definition	Measurement
True conjugate	Upper border of pubic symphysis to sacral promontory.	11 cm
Obstetric conjugate	Mid of pubis symphysis to sacral promontory	10–10.5 cm
Diagonal conjugate	Lower border of pubis symphysis to sacral promontory	12 cm

- Short AP diameter – obstetric conjugate (OC).

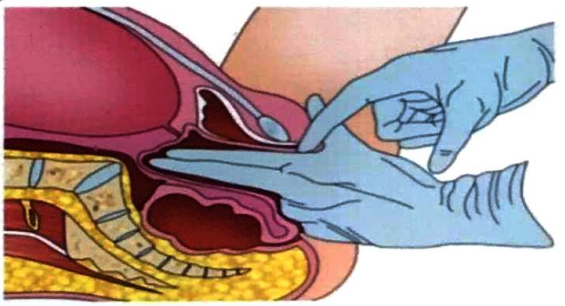
- Critical obstetric conjugate:
  Smallest OC diameter = 10 cm.
  If OC < 10 cm → vaginal delivery is not possible.
  ↓
  Such pelvis is called contracted pelvis.

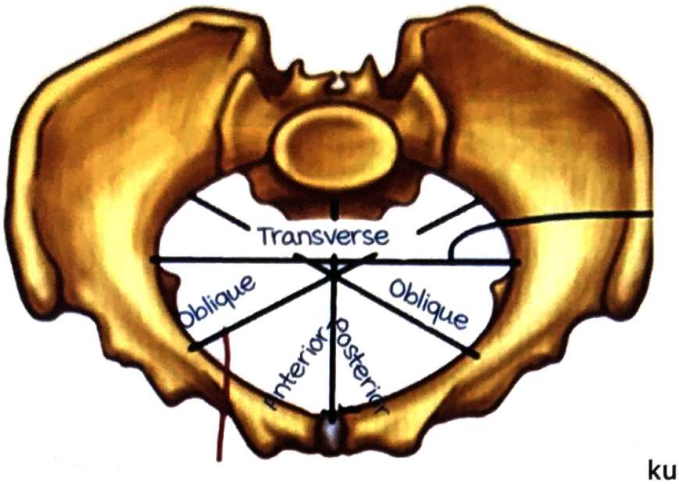
- Longest AP diameter – Diagonal conjugate (DC).

  If DC is normal or 12 cm (ideal)
  ↓
  Finger can't touch sacral promontory.

  If sacral promontory is touched by finger
  ↓
  DC < 12 cm

  OC = (DC – 1.5 to 2) cm
  TC = (DC – 1) cm





Transverse diameter (TD) :

Distance between 2 farthest points in Iliopectineal line. 13 cm.

Oblique diameter :

Distance between one side's sacroiliac joint to other side's iliopectineal eminence.

12 cms.

2 Oblique diameters – Right (start from right sacroiliac joint) and Left (start from left sacroiliac joint).

Shape of pelvic inlet in normal female is oval (transverse oval).

TD diameter > AP diameter.

Cavity

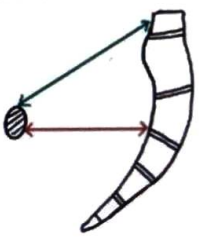
00:21:34

The part of the pelvis between pelvic inlet and outlet is pelvic cavity.

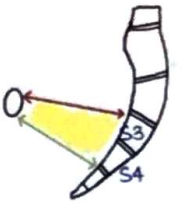
Its shape is like a truncated cylinder.

Plane of greatest pelvic dimension :

- Anteriorly : center of posterior surface of pubic symphysis.
- Posteriorly : junction of S2/S3.
- Laterally : obturator foramen.
- It is the roomiest part of pelvic cavity.
- All of its diameter's are 12cms.
- It does not have any obstetrical significance.



Plane of least pelvic dimension :



- Mid pelvis lies at this dimension.
- Anteriorly: lower border of pubic symphysis.
- Posteriorly: Junction of S4/S5 vertebra.
- Laterally: Ischial spine.
- It is the narrowest plane of pelvis.
- AP diameter is 11.5cms to 12cms.
- Transverse diameter is the distance between the two ishcial spines. It is also called inter-ischial diameter or inter-spinous diameter or bispinous diameter = 10cms. It is the smallest diameter of pelvis. And it is the most important diameter during labour.
- Posterior sagittal diameter of mid pelvis = 4.5cms to 5cms. From the posterior boundary and going until intersection of the transverse diameter and AP diameter.

Measurement of interischial diameter clinically :
Try to touch both the ishial spines simultaneously with 2 fingers of your hand, if possible it means IID is contracted, which means mid pelvis is contracted.

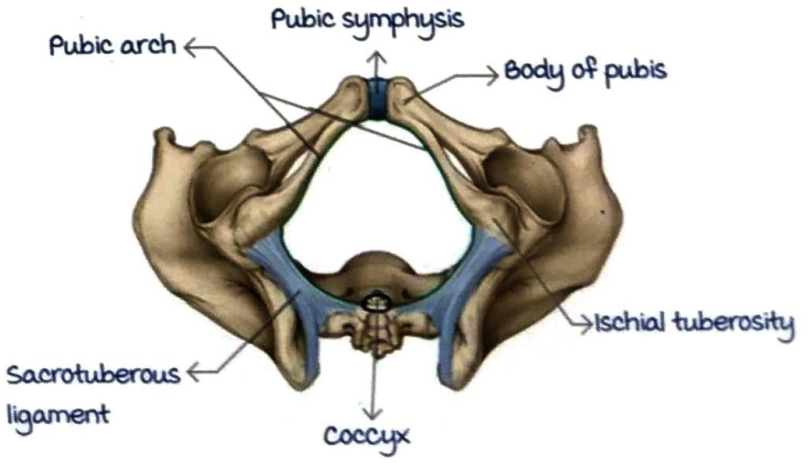
So Mid pelvis is called as contracted :

1. If IID is <8cms.
2. Both Ischial spines can be touched simultaneously with 2 fingers of same hand.

Note : In male pelvis or android pelvis, ischial spines are prominent. And, Deep transverse arrest occurs at the level of ishcial spine60c6b3eeaa8ded0e4e7e5ea7

Anatomical outlet

00:25:34



Diamond shaped.

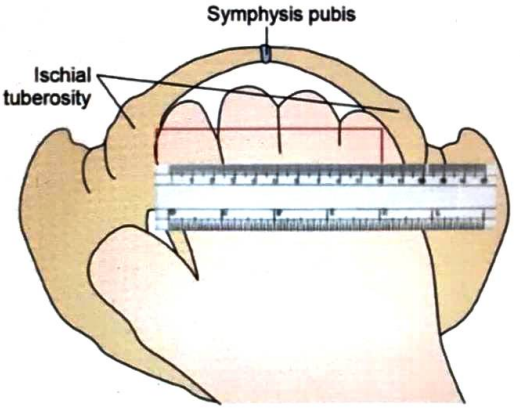
Boundaries of anatomical outlet:

1. Posterior – Tip of sacrum (or coccyx if it is not pushed back).
2. Anterior – lower border of pubic symphysis.
3. Lateral – Ishcial tuberosity.

Diameters :

- AP = 13cms
- Transverse = 11cms. It is the distance between two ischial tuberosities. It's also called bituberous diameter.
- If it is <8 cms : it is contracted.
- Posterior sagittal diameter = 7cms.

Clinical measurement of bituberous diameter : Ideally 4 Knuckles should pass between the two tubersoties.

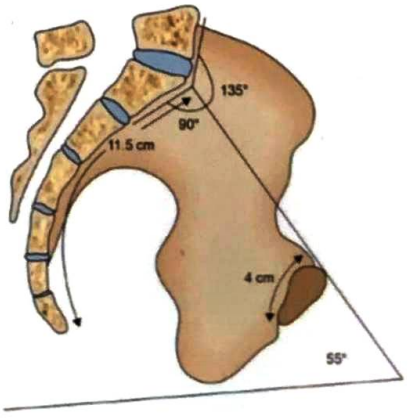


Angles related to pelvis :

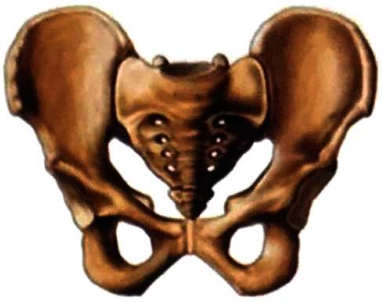
Angle of inclination :

Angle made by pelvic inlet with the horizontal.

It is 55 °.



Subpubic angle :



Angle between the 2 descending rami of pubic bone.
In male – Acute
In female – Obtuse

These clinical measurements are called as clinical pelvimetry.

- In primigravidas : Between 38 to 39 weeks.
- In multi gravida : At the onset of labour.

Note routine Clinical pelvimetry at the time of admission is not recommended by WHO.

Contracted pelvis

00:32:08

If any of the essential diameters of pelvis is shortened by 0.5 cm or
Contractd inlet (OC<10 cm) or
Contracted midpelvis (IID ≤ 8 cms) or
Contracted outlet (Bituberous diameter ≤ 8 cm).

Can be diagnosed by clinical pelvimetry.
mode of delivery – always cesarean section.

Whenever a female with contracted pelvis become pregnant → always cesarean section has to be done. No role of trial of labor.

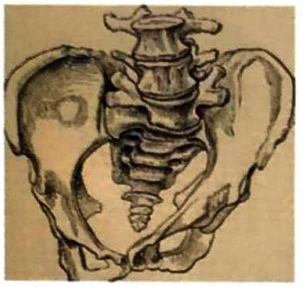
So, contracted pelvis is a indication for recurrent cesarean section.

Variety of contracted pelvis :

1. Naegle's pelvis :

   One Ala of sacrum is absent.

   Only one Ala is present.



2. Robert's pelvis :

   Both the Ala of sacrum are absent.

Management in both the cases is cesarean section.

Normal varieties of pelvis

00:37:08

Caldwell and Mohoy classification :

Based on shape of inlet.

1) Gynecoid pelvis – 50% (mc)

   Female like pelvis.

2) Android pelvis – 20%

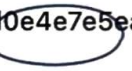
   Male like pelvis.

3) Anthropoid pelvis – 25%

4) Platypelloid pelvis – 5%

Flat bowl shaped pelvis.

Flag gynaecoid pelvis.



	Gynecoid	Android	Anthropoid	Platypelloid
Shape of inlet	Transverse oval.	Heart shaped.	Anteroposterior oval	Flag bowl like
TD & AP	TD > AD diameter	TD > AP diam-eter	AP diameter > TD	TD >>> AP diameter
Ischeal spine		Prominent		
Side walls	Parallel and broad	Convergent	Parallel & narrow	Divergent
Subpubic angle	Obtuse	Acute		

Active space

Cephalo pelvic disproportion (CPD

00:45:18

Pelvic is normal.

Baby is normal.

But, the pelvis is small for this baby.

CPD is a relative finding.

Here everytime a female becomes pregnant doesn't mean caesarian has to be done.

Trial of labor is done.

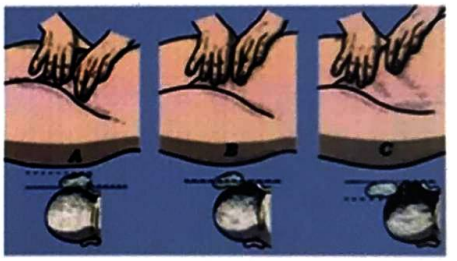
Clinical assessment is not best methods to assess CPD.

Best method to diagnose CPD : Trial of labor > MRI > clinical pelvimetry.

CPD can occure at level of

- Inlet — Diagnosed clinically by 2 methods.
- Midpelvis
- Outlet

1. Abdominal method



2. Abdominal vaginal method/ muller munroker method/ Bimanual method :

Trail of labor :

Done only if there is mild CPD at level of inlet.

Not done in case of severe CPD.

Not done in previous cesarean section patient if there is mild CPD also.

Trial of labor ≠ Trial of scar
(trial of vaginal delivery in previous cesarean section patient)
(VBSC)

management of CPD :

Trail of labor → successful → deliver vaginally.
↓
Unsuccessful (CPD at the level of midpelvis/ outlet)
↓
Cesarean section.

Go for direct cesarean section if severe CPD or previous h/o cesarean section.

No role of instrumental delivery.

CPD at the level of midpelvis or outlet : Trial of labour fails.
CPD indicators during labor :

1. moulding + slow progression of labor
2. Caput succedenum + slow progress of labor.

Active space

FETAL SKULL

Introduction 00:00:11

Fetal skull has 6 fontanelles at birth.

Anterior fontanelle :

- Diamond/rhomboid shaped.
- Also known as 'bregma'.
- Transverse & AP diameter are equal to 3 cm.
- Ossifies by 18 months after birth.
- Sinciput lies anterior to the anterior fontanelle.

Posterior fontanelle :

- Triangular shaped.
- Also known as 'lambda'.
- Lies close to the occiput (bony prominence over occipital bone).

Diameters of fetal skull 00:08:03

Antero-posterior diameters :

- AP diameters of the skull are always bigger than transverse diameters.
- The longest AP diameter of fetal skull is mento-vertical diameter (14 cm).
- The second longest AP diameter is submento-vertical/ occipito-frontal diameter (11.5 cm).

In Brow presentation, diameter of engagement is mento-vertical diameter which is 14 cm.

It is the largest diameter and hence in Brow presentation, always Cesarean section has to be done.

Transverse diameters :

- Transverse diameters are always smaller than AP diameters.
- Transverse diameters in ascending order of their size,
  Bimastoid diameter = 7.5 cm (smallest).
  Bitemporal diameter = 8 cm.

Super subparietal diameter = 8.5 cm.

Biparietal diameter = 9.5 cm (largest).

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Parts of fetal skull

00:14:37

Part	Definition	Seen in	Engaging diameter
Vertex	Part of skull lying between anterior fontanelle & posterior fontanelle	Fully flexed or partially flexed	Suboccipito bregmatic (SOB) diameter : 9.5 cm.
Brow	Part of skull between anterior fontanelle & root of nose	Head is partially extended	mento-vertical (mv) diameter : 14cms. Always do cesarean.
Face	Part of skull between root of nose & chin	Head is extended	Submento bregmatic (SMB) diameter : 9.5 cm or submento vertical (SMV) diameter : 11.5 cm.

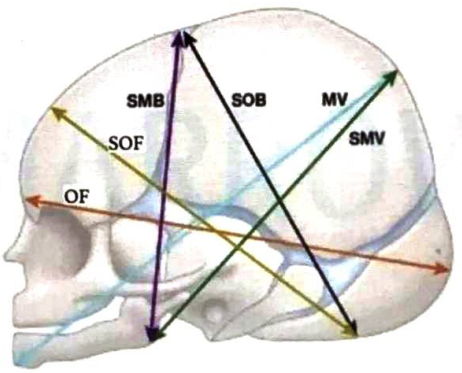
Three important diameters measure 9.5 cm :

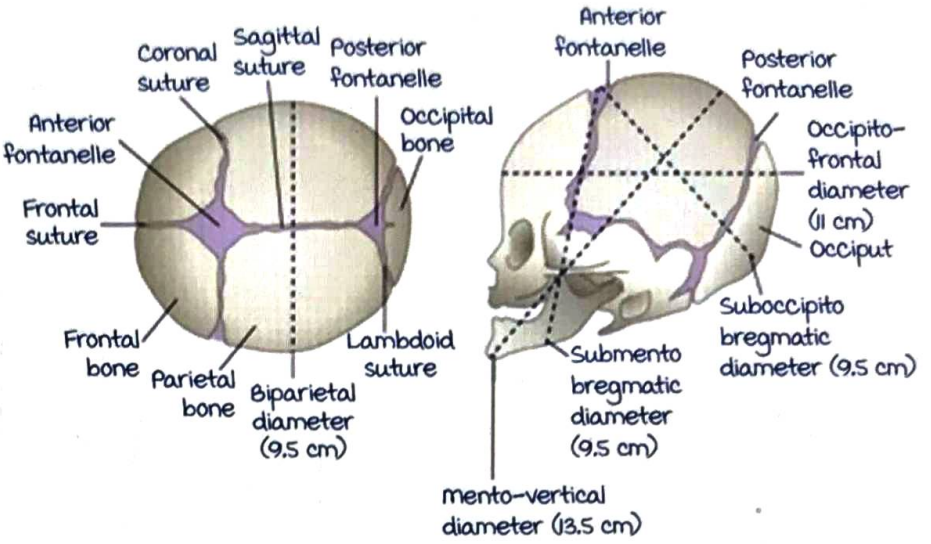
- Suboccipito-bregmatic diameter.
- Submento-bregmatic diameter.
- Biparietal diameter.

In case of a deflexed head,

- Vertex presentation is seen.
- Engaging diameter is occipito-frontal (OF) diameter (11.5 cm) or suboccipito-frontal (SOF) diameter (10 – 10.5cms).
- Engagement is delayed.

Longitudinal diameters





Moulding

00:31:03

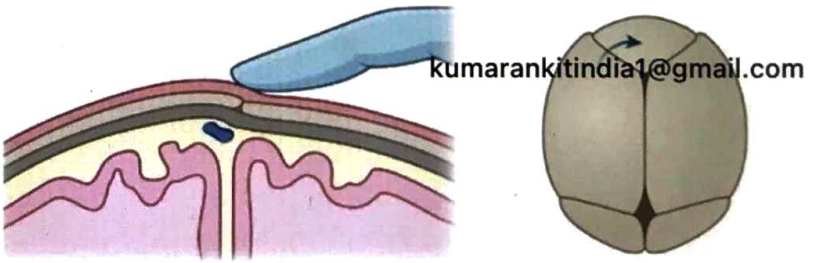
Moulding : It is the alteration of the shape of the forecoming head while passing through the resistant birth passage during labor.

Grading – there are 3 gradings of moulding :

- Grade 1 : Bones touch but not overlap.
- Grade 2 : Overlap but easily seprated.
- Grade 3 : Fixed overlapping.

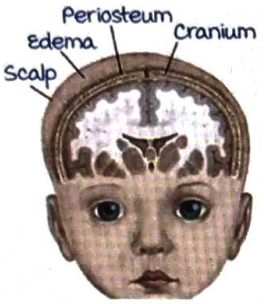
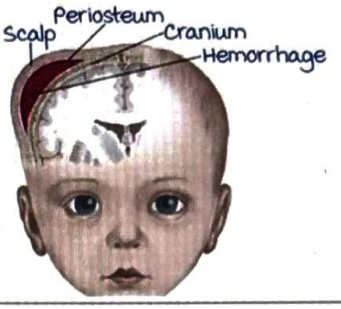
Grade 1 can be seen normally.

Grade 2 or 3 moulding + Slow progress of labour → CPD.



Swellings on fetal head

00:33:34

Caput succedaneum	Cephalhematoma
Collection of fluid/ edematous swelling above the periosteum.	Collection of blood just below the periosteum.
	
Cause : Head is stagnant for a long time in one position.	Cause : Due to traumatic instrumental delivery.
Pits on applying pressure.	Doesn't pit on applying pressure.
Can cross the suture lines.	Cannot cross the suture lines.
Present at birth and disappears within few hours of birth.	Not present at birth, appears few hours after birth and disappears in few days.
Not associated with fractures of underlying bone.	Can be associated with fractures of underlying bone.
Not associated with jaundice.	Associated with jaundice.

Caput succedaneum + slow progress of labor indicates CPD (cephalopelvic disproportion).

Q. The smallest diameter of the fetal skull is :

A. Bitemporal diameter.

B. Occipito frontal.

C. Suboccipto bragmatic.

D. Bimastoid diameter.

Q. The longest diameter of the fetal skull is :

A. Bitemporal diameter.

B. Occipito frontal.

C. Suboccipto bragmatic.

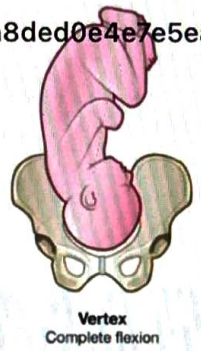
D. Bimastoid diameter.

TERMINOLOGY RELATED TO LABOR

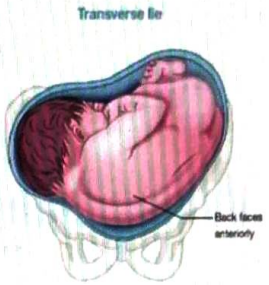
Lie

00:00:42

Relationship between longitudinal axis of the fetus and the longitudinal axis of the mother (i.e; maternal spine or centralized uterus).



Longitudinal lie
(mc lie)



Transverse lie

↓

Always do cesarean section
if patient comes in labor
whether baby is alive or dead.

Oblique lie
(cesarean
section)

Unstable lie

00:04:41

When lie of the fetus is not fixed by 37 weeks, it is unstable lie.

Causes :

- Idiopathic (mc).
- Polyhydramnios.
- Placenta previa.
- Abnormal shape of the uterus.

Oligohydramnios doesn't lead to unstable lie.
Uterine malformation doesn't lead to unstable lie.

Management : Cesarean section.

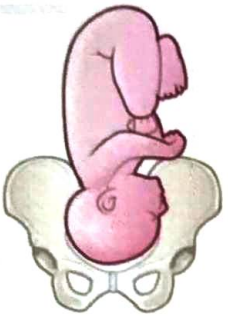
Active space

Presentation

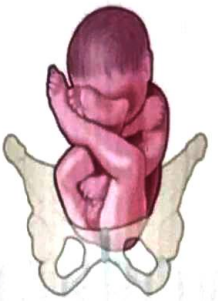
00:06:00

It is the part of the fetus which occupies the lower part of the uterus.

- In longitudinal lie :



Mc presentation :
Cephalic



Breech presentation
buttocks are down.

Mc presentation because :

1. Uterus is broad above and narrow below.
   Head needs less space than buttocks.
2. Because of gravity, head comes down.

Apart from cephalic presentation, rest all presentations are malpresentations.
Mc malpresentation is breech.

- In transverse lie :

Shoulder presentation

↓

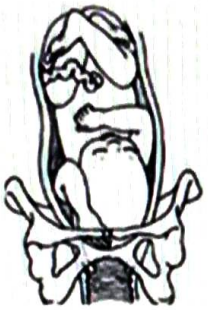
Management in labor is cesarean section (whether baby is alive or dead).

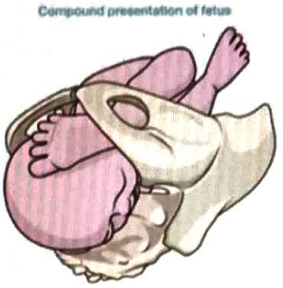
maximum chances of cord prolapse is seen with transverse lie.

If vaginal delivery is attempted, there is chances of hand prolapse.

- Compound presentation :

When 2 parts of the baby occupy the lower part of uterus.





Presenting part

00:15:40

Part of the presentation which lies directly over the internal os.

It is the first part felt on the P/V examination.

Presenting part depends upon whether the head of the baby is flexed/ extended.

	Presenting part
Flexed (fully, partially, deflexed)	Vertex (mc).
Partial extension	Brow.
Complete extension	Face.

Attitude of fetus

00:18:20

The relationship of different parts of fetus to each other.

mc attitude : Flexion.

Presenting part depends upon the attitude of the fetus.

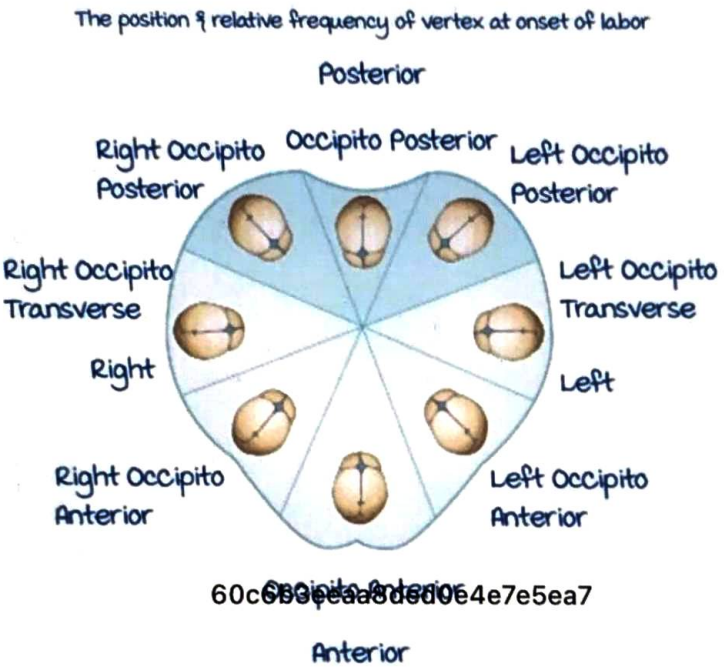
Brow & face are examples of abnormal attitude of the baby.

Denominator

00:20:56

Bony point of reference on the presenting part which comes in relationship to the maternal pelvis.

Presenting part	Denominator
Vertex	Occiput.
Breech	Sacrum.
Brow	Frontal eminence/ bone.
Face	mentum (chin).



From position 1-5, vaginal delivery is normal.
From position 6-8, vaginal delivery is called occipito-posterior delivery.
Occipito posterior position is the most common malposition.
MC position of fetus : LOT > LOA.
MC position during labor : LOT > LOA.
MC occipito anterior position : LOA.
MC occipito posterior position : ROP.
MC position in normal vaginal delivery : LOT.
MC position in breech : LSA (Left sacroanterior).
MC position in face : LMA (left mento anterior).

How to identify position in IBQs ?

00:40:31

Step 1 : Find out where is the occiput is facing :

Towards Pubic symphysis → occipito anterior (OA).

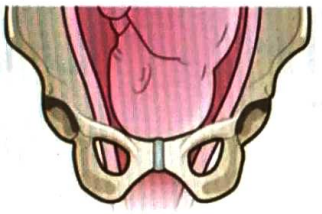
Towards sacral promontory → occipito posterior (OP).

midway between pubis symphysis & sacral promontory → occipito transverse (OT).

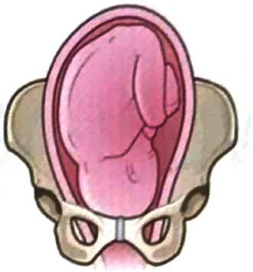
Step 2 : Find out whether the occiput is facing left or right.

In image if occiput is towards your left hand side → right side in mother and vice versa.

Q. Identify the fetal position :



LOA (left occipito anterior).



ROA (right occipito anterior).

Q. Identify the Fetal position :

Anterior fontanelle is diamond shaped and posterior fontanelle is triangle shaped.

Posterior fontanelle is nearer to occiput.

Step 1 : Identify occiput

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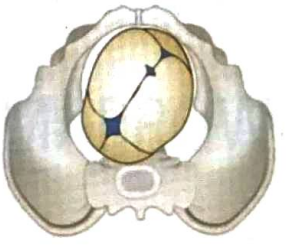
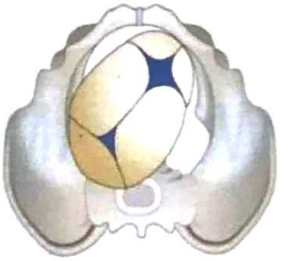
↓

Identify the posterior fontanelle.

Step 2 : same as before.



LOA (left occipito anterior).



ROP (right occipito posterior).

LEOPOLD MANOEUVRE AND ANTENATAL EXAMINATION

Examination of Antenatal patient 00:01:14

General physical examination :

1. Weight :
   Present/ current weight.
   Pre pregnancy weight : To estimate the weight gain during the period.
2. Height : Measured in cms.
   Short stature : Height < 140 to 145 cm (suspect CPD).
3. Body Mass Index (BMI) :
   Calculate based on pre pregnancy weight.
4. Pallor.
5. Icterus.
6. Cyanosis.
7. lymphadenopathy.
8. Edema :
   Checked at sites like :
   - Medial malleoli.
   - Anterior tibia.
   - Sacrum.
   - Anterior abdominal wall.

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Types :

Physiological edema :

- Because of fluid retention & obstruction by gravid uterus on lymphatics.
- Present on dependent parts of body.
- Subsides on rest.
- more prominent during evening hours.
- more common in third trimester.

Pathological edema :

- Edema over anterior abdominal wall generally indicates pathological edema.
- Seen through out the day.

Active space

- Can be seen in any trimester.

Mention whether patient is comfortable at rest or not :

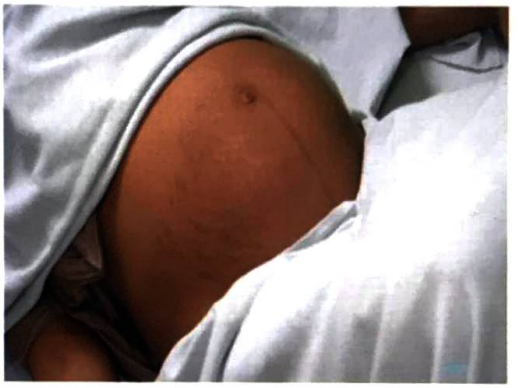
- Overdistended uterus : Respiratory discomfort.
- Heart disease : NYHA (Class 3 & 4).

Breast examination :

- Look for cracks, fissures.
- Check for retracted nipples.

Per abdominal examination

00:07:33



Done only after emptying the bladder.

Explain procedure to the patient.

Warm hands before examination.

Position the patient in dorsal position with knees semiflexed.

Adequately cover & adequately expose the patient :

- Area from xiphisternum to pubic symphysis kept uncovered.
- Legs & body parts above xiphisternum covered.

1. Inspection :

Abdomen distended : Longitudinally/ tranversely enlarged.

Abdominal wall edema present or not.

Position of Umbilicus : mostly everted.

Flanks full /not.

Sub umbilical flattening present or not :

If present, suggestive of occipito posterior presentation or breech presentation.

Hernial orifices intact.

Scar or distended veins.

Linea nigra :

- Brown colored line which runs from umbilicus to pubic symphysis.
- Present because of melanocyte stimuating hormone.

Striae gravidarum : stretch marks.

Palpation

00:12:11

2. Palpation :

Centralise the uterus before palaption (Since uterus is dextrorotated during pregnancy).

Abdominal girth : Measured at the level of umbilicus.

Fundal height :

Begin palpating the abdomen downwards from just inferior to the xiphisternum using the ulnar border of the left hand. Locate the fundus of the uterus (resistance felt).

If fundal height :

- At the level of pubic symphysis : Corresponds to 12 weeks of gestation.
- Midway between umbilicus & pubic symphysis : 16 weeks of gestation.
- Just below the level of umbilicus : 20 weeks of gestation.
- At the level of umbilicus : 22 weeks of gestation.
- Upper border of umbilicus : 24 weeks of gestation.
- One third distance between the umbilicus & xiphisternum : 28 weeks of gestation.
- Two third distance between the umbilicus & xiphisternum : 32 weeks of gestation.
- At the level of xiphisternum : 36 weeks of gestation.
- 40 weeks of pregancy : Fundal height corresponds to 32 weeks(not palpable).

Symphysiofundal height (SFH) :

As per nice guidelines (2008), symphysiofundal height should be measured in all pregnant females between 24 to 36 weeks.

From 16 weeks to 36 weeks : Symphysiofundal height corresponds to gestational age in weeks.

Symphysiofundal height not measured in :

- In transverse lie.
- Overdistended uterus.
- Known case of fibroid.

Conditions where height of uterus > period of gestation :

- Wrong dates.
- Full bladder.
- Multifetal pregnancy.
- Diabetic patients.
- Polyhydramnios.
- Concealed variety of abruptio.
- Molar pregnancy.
- Macrosomia.

Conditions where height of uterus < period of gestation :

- Wrong dates.
- IUGR.
- Intra uterine death of fetus.

- PIH.
- Oligohydramnios.
- PROM.

Obstetric grips : Leopold manouvre 00:23:29

Done per abdominally.

Patients bladder should be empty.

Position : Patient should be lying in dorsal position with knees flexed.

Examiner should stand on right hand side.

For first three manoeuvre (1, 2, 3), examiner should face towards the face of patient.

4th manoeuvre : examiner face towards the feet of patient.

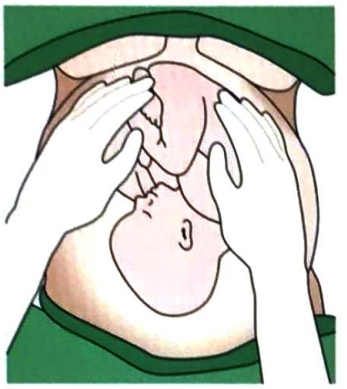
First manoeuvre (Fundal grip):

Tells about the lie & presentation.

- If 1st grip is empty : Transverse lie.
- If any part (buttocks or head) is felt : Longitudinal lie.

On fundal grip :

- Broad ,irregular soft part : Buttocks
  means cephalic presentation.
- Hard,firm & globular part : Head.
  means breech presentation.



Second manoeuvre (Lateral/ Umbilical grip) :

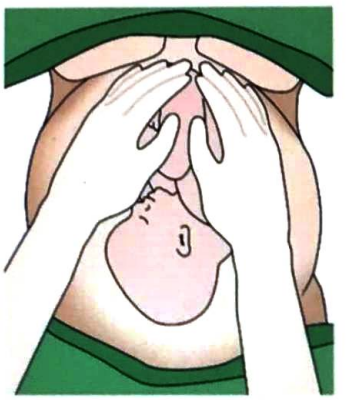
Tells about the position of fetus.

Feel :

Back of fetus : Board like feeling, smooth ,regular & curved.

Limbs : Small, multiple knob like structure.

- If back is on left side (Occiput on left side) : LOA, LOT & LOP.
- If back is on right side (Occiput on right side) : ROA, ROT & ROP.

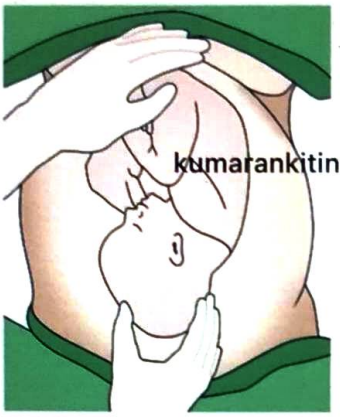


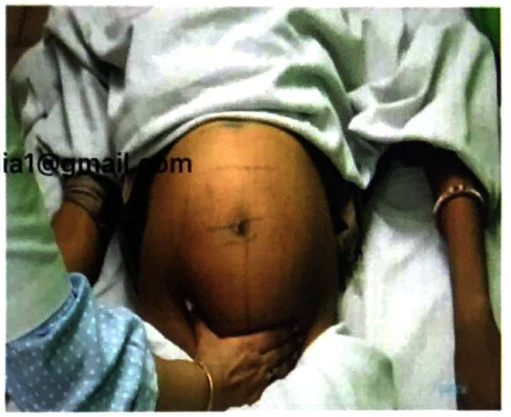
Third manoeuvre (Pawlik grip) :

Single hand over the pelvic region.

Tells us about the presentation.

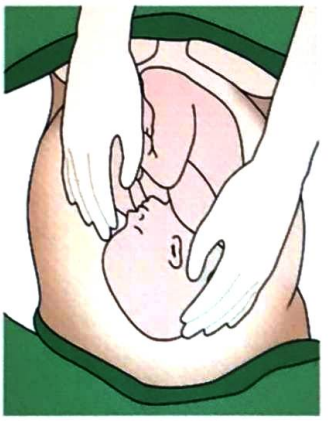
Cephalic presentation : Hard round globular structure.
move the head from side to side. ⟶ Ballotable ⟶
Head has not entered pelvis.





Leopold fourth manoeuvre 00:31:30

Fourth manoeuvre (Deep pelvis grip) :
Done by facing the feet of patient.
Now keep the hands parallel to inguinal ligament.
If hands are converging below the head of baby ⟶ Head has not entered the pelvis.
Deep pelvic grip confirms findings of third manoeuvre.

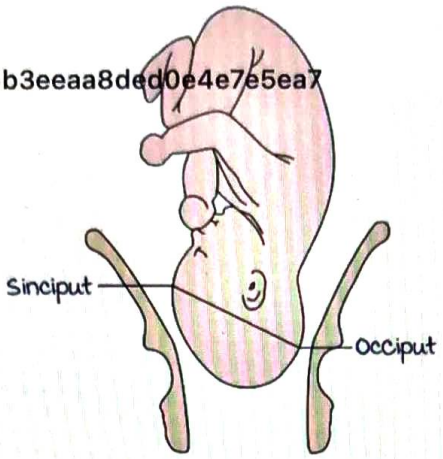


2 important bony prominences on fetal head :
Sinciput :

Part where frontal bones meet face.
Lies anterior to anterior fontanelle (diamond shaped).

Occiput :

Part below posterior fontanelle & foramen magnum.
Lies posterior to posterior fontanelle (triangular shaped).



Attitude :

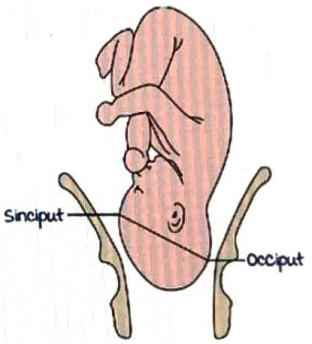
Relationship between different parts of fetus.

Most common attitude : Flexion.

Relationship between sinciput & occiput during fourth manouvre tells us about the attitude of the baby.

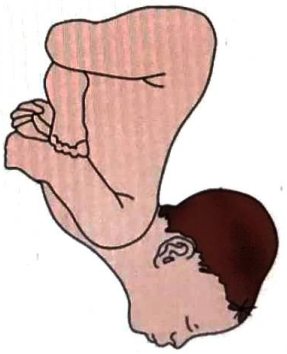
In well flexed head on per abdominal examination :

- Occiput : Lower level.
- Sinciput : Higher level (felt easily).
- Both are felt in opposite sides.



In extended head on per abdominal examination :

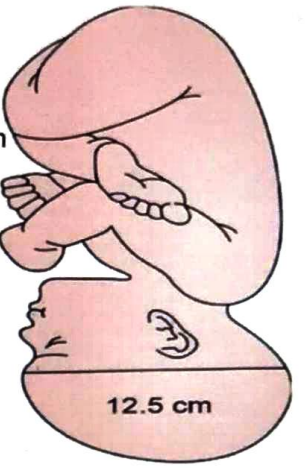
- Occiput : Higher level (felt easily).
- Sinciput : Lower level.
- Both are felt on same side.



Active space

In deflexed head on per abdominal examination :

Occiput & sinciput are at the same level.



Leopold 4th manoeuvre :

1. Confirms findings of third manoeuvre :
   - Presentation.
   - Head has enetred pelvis or not.
2. Attitude of fetus.

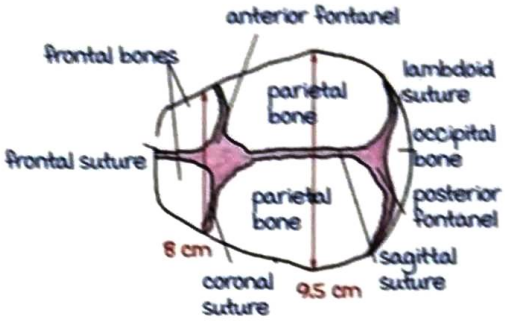
Active space

MECHANISM OF LABOR

Normal labor

00:00:25

Lie : Longitudinal
Presentation : Cephalic.
Presenting part : Vertex
Position : Left occipito-transverse (LOT) is m/c.
Denominator : Occiput.



7 cardinal movements :

movements which occur while fetus is traversing the maternal pelvis.

LOT position (shown from below) :

Sagittal suture in the transverse diameter of pelvis.

Posterior fontanelle to the mother's left.

First cardinal movement : Engagement

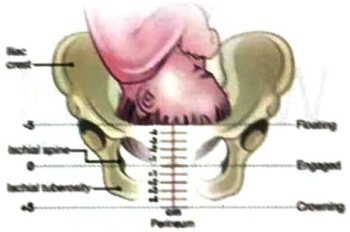
00:07:30

Engagement occurs when the largest transverse diameter of the presenting part has passed through the pelvic inlet or crossed the pelvic brim.

Time for engagement :

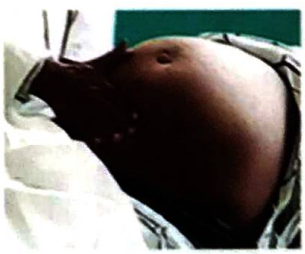
Primigravida : 38 weeks.

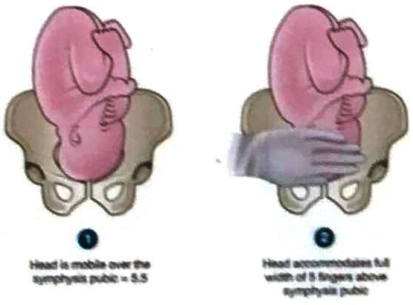
Multigravida : Onset of labor.



Clinically engagement may be ascertained by :

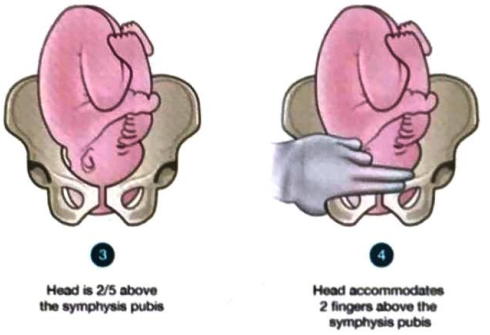
- Per abdominal examination : Palpate above the pubic symphysis : Arbitrarily divide the fetal head into 5 parts.



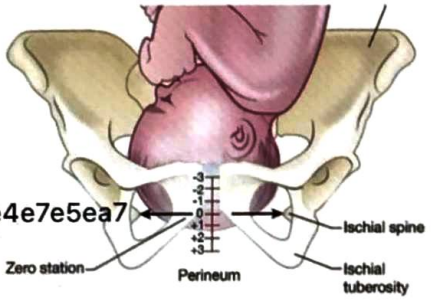


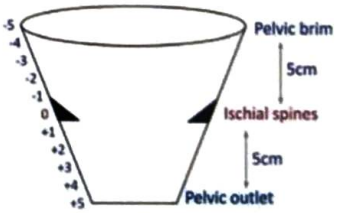
Active space

Per abdomen	Leopold 3	Leopold 4
5/5th of the head is palpable : 4 fingers + thumb can feel the fetal head	Head is ballotable It is free floating.	Fingers converge below the presenting part
4/5th : 4 fingers can feel the fetal head 3/5th : 3 fingers can palpate.	Head is not ballotable	Fingers diverge. Head is fixed : It has gone inside the pelvis, but not engaged
2/5th or less	Engaged	



- Per vaginal examination :
  Station : Position of fetal head with respect to ischial spine on P/V examination.





Leading point : Lower most part of fetal head.
Number represents distance from ischial spine in centimetres.
Example : Station – 3 : Head is 3 cm above ischial spine.
Engagement : Station of fetal head is 0 or below it.

Engagement confirms there is no cephalopelvic disproportion (CPD) at the level of inlet.

Synclitic and asynclitic engagement 00:26:38

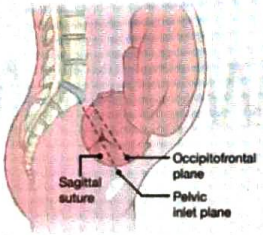
Synclitic engagement :

Sagittal suture of head of pelvis lies in transverse diameter of pelvis.

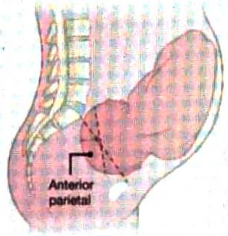
It is equidistant between pubic symphysis and sacral promontory.

Anterior asynclitism	Posterior asynclitism
Anterior parietal bone is felt first P/V. Sagittal suture deflected towards sacral promontory. A.K.A Naegele's obliquity. m/C in multiparous females. 	Posterior parietal bone is felt first P/V. Sagittal suture deflected towards pubic symphysis. A.K.A Litzmann's obliquity. m/C in nulliparous females 

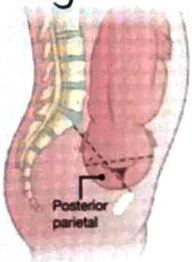
Normal



Anterior asynclitism



Posterior asynclitism



Active space

Engaging diameter

00:36:25

Transverse diameter	Antero posterior diameter
Always Biparietal diameter (9.5 cm).	Depends on degree of flexion of head. Well flexed head (vertex presentation) Suboccipitobregmatic diameter, 9.5 cm. Deflexed head : Occipito-frontal/ suboccipitofrontal diameter. Partially extended head (Brow presentation) : Mento-vertical diameter. Fully extended head (Face presentation) Submentobregmatic diameter

Engagement occurs with marked asynclitism in platypelloid pelvis.

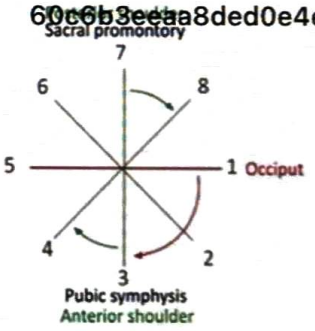
m/C cause of non-engagement of head in primigravida at term : Deflexed head/ Occipito-posterior position.

2nd m/C cause : CPD.

3rd m/C cause : Placenta previa.

Mechanism of labor

00:41:00



At onset of labor :

Occiput in LOT : Cardinal position 1.

Shoulders are in AP diameter :

Anterior shoulder (AS) at position 3.

Posterior shoulder (PS) at position 7.

7 Cardinal movements :

1. Engagement.
2. Descent.

   Most important factor for descent :

   Uterine contractions.
3. Flexion occurs simultaneously with descent.

In a well flexed head, the occiput touches the pelvic floor first.

4. Internal rotation :

   Anterior direction.

Occurs at the level of ischial spines.

According to Hart's rule : Part touching the muscle will move in the direction of the muscle fibres.

Occiput touches pelvic floor (Levator ani muscle)

↓

Elastic recoil

↓

Occiput rotates anteriorly

↓

Lies directly behind pubic symphysis.

Occiput rotates by 2/8 : Reaches direct occipito-anterior (DOA) position.

Shoulders rotate by 1/8 in the same direction (1/8 torsion on neck remains).

Shoulders lie in left oblique diameter (Position 4 and 8).

Crowning : Head of the baby stretches the perineum permanently and is permanently visible at the perineum.

Episiotomy is given during crowning.

5. Extension.

Head of baby delivered by movement of extension with further descent.

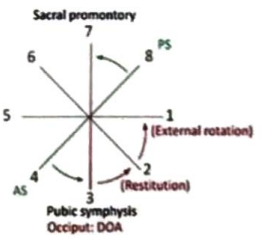
Occiput → Vertex → Brow → Face.

6. External rotation : Posterior direction.

Restitution : Head rotates posteriorly by 1/8 (Head of baby un-twists).

Shoulders rotate posteriorly by 1/8 : manifested as external rotation of head by 1/8.

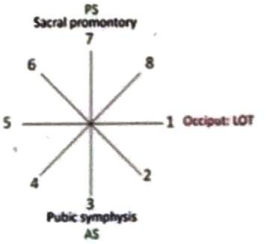
Total posterior rotation of head : 2/8.



Occiput : LOT (Face towards mother's right thigh).

Shoulder : AP diameter.

Anterior shoulder delivered followed by posterior shoulder



7. Expulsion : Entire body is then delivered by lateral flexion.

NORMAL LABOR

Initiation of labor

00:00:42

During pregnancy :

Uterus is growing in size : Hypertrophy and hyperplasia.

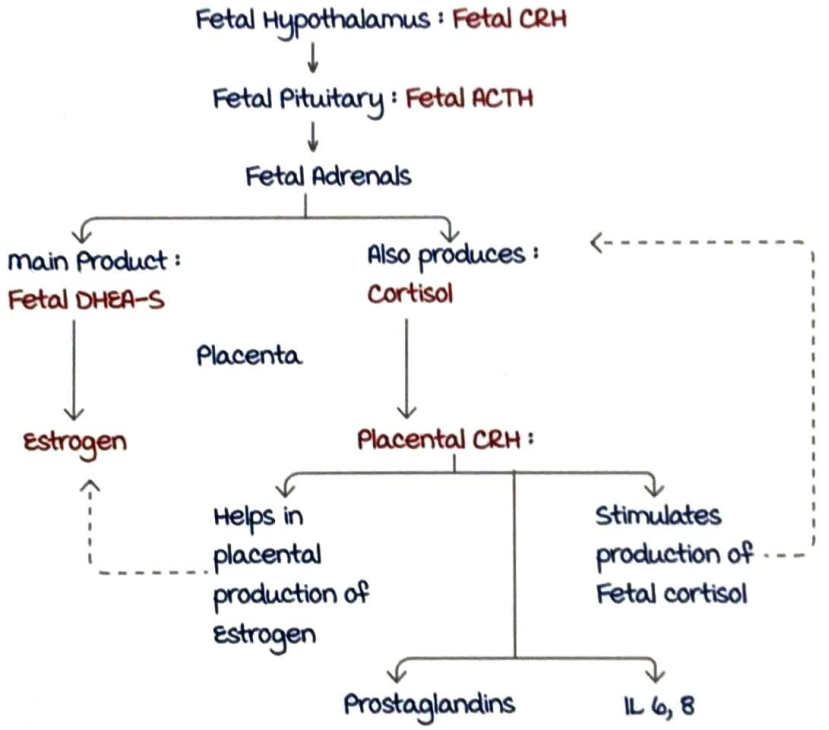
Uterus is quiescent due to progesterone.

Pregnancy is a Progesterone predominant condition.

During labor : Estrogen is predominant.

Fetal CRH is responsible for initiation of labor.

At term : Fetal hypothalamic pituitary axis matures.



Estrogen :

m/c estrogen in pregnancy : E_2 (Estradiol).

most specific estrogen in pregnancy : E_3.

main source of estrogen : Fetal DHEA-S.

(Dehydroepiandrosterone Sulfate).

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Active space

Placental CRH also acts on uterus :

- Decidua : Releases PGF - 2α.
- ↑Oxytocin receptors in uterus cause ↑intracellular Ca^{2+} hence↑ contractions.
- ↑ Estrogen receptors in uterus :
  - ↑ Stretch receptors in uterus.
  - ↓ Progesterone receptors on uterus.

Placental CRH releases PGE_2 from fetal membranes.

Oxytocin receptors and prostaglandins increase intracellular Ca^{2+}, therefore ↑ Contractions.

Prostaglandins :

- ↑Intracellular Ca^{2+} causes ↑ contractions.
- ↑myometrial gap junctions cause coordinated uterine contractions.
- Ripening (Softening) of cervix :
  - Increased water content.
  - Collagen breakdown.
  - Decreased dermatan sulfate.
  - Starts before true labor pain.
  - mediated by prostaglandins.

Events happening before onset of labor :

- Lightening/ welcome sign (After 36 weeks of pregnancy, height of uterus comes below xiphisternum, mother gets relieved from dyspnea & feels light).
- Cervix ripening.
- False labor pain.

For labor to proceed : 3Ps are required.

1. Passage : Pelvis
2. Passenger : Fetus.
3. Push : Uterine contractions.

Uterine contractions 00:19:05

They begin (Pacemaker) at Cornua (angle) of uterus (Right> Left).

Spread to entire uterus at 2 cm/ second.

Entire uterus is depolarised within 15 seconds.

Contractions are predominant over Fundus of uterus.

Intrauterine pressure (IUP)	
During Braxton Hicks contractions	< 8 mmHg
Contractions become palpable	10 mmHg
Contractions become painful and lead to dilatation of cervix	15 mmHg
Fundus cannot be indented (moderate contractions)	40 mmHg

Normal uterine contractions/ True labor pains :

Uterus contracts in a coordinated manner.

It leads to progressive dilatation of cervix.

It leads to descent of fetal head.

It has a polarity : Upper part of uterus (UUS) contracts and lower part relaxes.

Contraction spreads from upper part (fundus) to lower parts of uterus as it spreads, its intensity decreases.

Parameters of uterine contraction :

Pressure during relaxation (between contractions) :

Basal tone of uterus < 20 mmHg.

Peak pressure : 80 mmHg.

Blood flow is inversely proportional to pressure :

During contractions : Blood flow to fetus decreases.

During relaxation : Blood flow to fetus is restored.

Retraction : Uterine muscle fibre on relaxation becomes shorter than original length.

It leads to dilatation of cervix.

Adequate uterine contractions :

- 3 contractions in 10 minutes (Frequency).
- Each contraction lasts for 45 seconds (Duration).
- Pressure of 65 – 75 mmHg or 200 – 250 Montevideo (mv) units (Intensity).

Tachysystole : > 5 contractions in 10 minutes.

Active space

Hyperstimulation : Tachysystole can cause fetal distress (Period of relaxation decreased, blood supply to fetus is not restored).

Tachysystole can occur in spontaneous labor, but more often due to increased dosage of oxytocin while inducing labor.

Units for measuring intensity of uterine contraction :

- Millimetres of Hg (mm Hg).
- Montevideo unit : Intensity of uterine contraction (mm Hg) x number of contractions in 10 minutes.

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E.g 4 uterine contractions in 10 minutes and each one has intensity of 50 mmHg → Corresponds to 200 MV units.

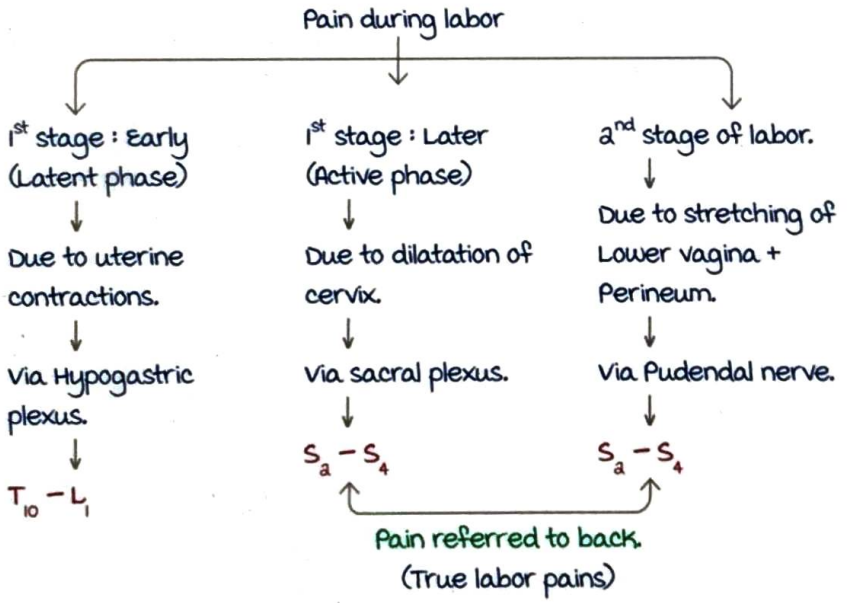
Pain during labor 00:41:22

Nerve supply :

Uterus : T 10 – L 1 via Hypogastric plexus.

Cervix and upper vagina : $S_2 - S_4$ via Pelvic (sacral) plexus.

Lower vagina and Perineum : $S_2 - S_4$ via Pudendal nerve.



Pain relief during labor 00:47:26

Parenteral drugs :

m/c used : Meperidine 50 – 100 mg, IM.

Promethazine 25 mg, IM.

Maximum effect is seen within 45 – 60 minutes.

Effect lasts for 4 hours.

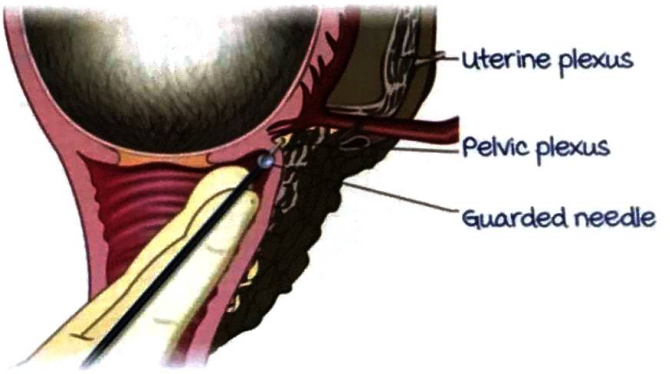
Active space

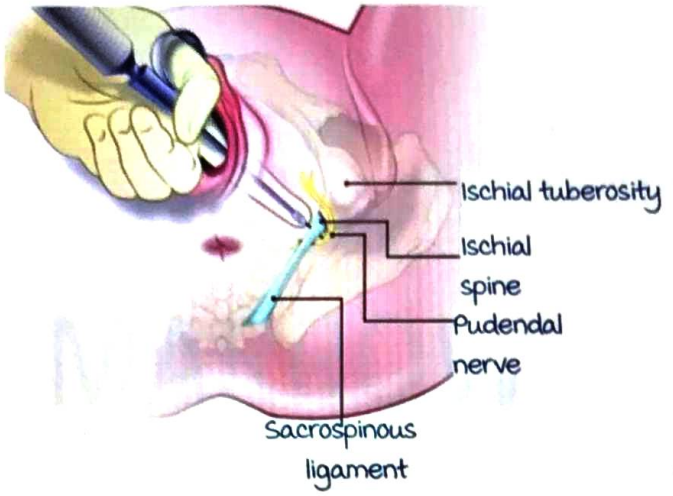
Increased risk of (IV) :

1. Aspiration.
2. Nausea & vomiting.
3. Respiratory depression.
4. Low APGAR score.

Especially if used in 2nd stage of labor.

Regional blocks	
Paracervical block	**Pudendal nerve block**
Block : Pelvic plexus carrying pain from cervix to spinal cord. Site : Lateral fornix of vagina: 2/ 4 O' clock or 10/ 8 O' clock. Do not give at 3/ 9 O' clock (Descending cervical artery). Needle : Spinal needle 22 gauge. Drug : Lidocaine • 1 % of 5 – 10 ml on each side. • Maximum : 250 mg or 25 ml (Total). Disadvantages : • Short acting (2hours) • 15% cases : Fetal bradycardia (Cervical artery injury → Vasospasm). • Blocks only pain from cervix (Cannot be used for 2nd stage). Uses : Pain relief in 1st stage of labor. Repair cervical tear.	Block : Pudendal nerve. Site : Ischial spine. Ligament pierced : Sacrospinous ligament. Drug : Same as paracervical block. It is better than paracervical block. Uses : • 2nd stage of labor pain relief. • Instrumental delivery. • Perineal/ vaginal tear repair. Not used in : • 1st stage of labor relief. • Cervical tear repair.





Neuraxial blocks (Epidural block) 01:00:41

It is the best block for painless labor.

Block : Upper level is T_{10}.

Sensory block and sympathetic block.

There is no motor block.

DOC : Bupivacaine 0.625 % – 0.1 %.

Higher concentration can lead to motor block which can halt uterine contractions and stop labor.

Can be used in both 1st and 2nd stages of labor.

Effects of epidural :

- Shortening of 1st stage of labor.
- Prolongation of 2nd stage of labor by 1 hour.
  If epidural is given, add 1 hour each to definition of prolonged labor and 2nd stage arrest as epidural normally prolongs the duration of labor by 1 hour.
- Does not increase chances of cesarean section.

Sympathetic block → Vasodilatation :

- Maternal hypotension.
- ↓ Placental perfusion → Transient fetal bradycardia.
  Treatment : IV fluids and place mother in left lateral position.
  Phenylepinephrine (If not relieved).

Contraindications :

Hypovolemia/ severe haemorrhage : Absolute Contraindication.

Increased ICT.

Local infection.

Severe thrombocytopenia (< 50,000).

Fixed cardiac output states (severe mitral stenosis/ Aortic stenosis) : Relative contraindication.

Epidural block is given in patients with heart disease as pain can precipitate heart failure.

Level of anaesthesia in caesarean section : T_4 (To block peritoneum).

Some patients may develop fever after epidural (cause unknown).

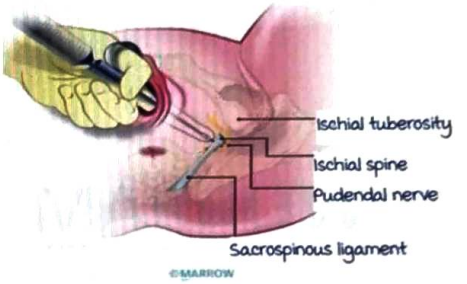
Q. The block shown in the image is used during :

A. 1st stage.

B. 2nd stage.

C. 3rd stage.

D. 4th stage.



Ans. Ischial spine is the landmark here and pudendal nerve lies very close to it. Pudendal nerve block relieves pain of stretching of perineum, which is seen in 2nd stage of labor.

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INDUCTION OF LABOR

Induction of Labor 00:00:10

Induction of labor : Initiating the process of labor in a quiescent uterus.
Augmentation of labor : Accelerating the process of labor in a uterus which is already contracting.
Spontaneous labor : Uterus by itself initiates the process of labor.

Indications for induction of labor 00:02:35

- Pregnancy induced hypertension : mild preeclampsia (37 weeks), severe preeclampsia (34 weeks), Eclampsia/HELP syndrome (Immediately).
- Premature rupture of membrane : Membranes rupture after 37 weeks but before the labor begins (Induce labor immediately).
- Preterm premature rupture of membrane : Membrane ruptured before 37 weeks (Induce labor at 34 weeks)
- Post term : Induce labor immediately.
- Abruptio placenta : Induce labor immediately.
- Chorioamnionitis : Induction of labor immediately.
- Oligohydramnios : Induce at 36 weeks.
- Oligohydramnios + IUGR : Induction at 34 weeks.
- Gestational diabetes : more than or equal to 39 weeks.
- In Rh Isoimmunization :
  1. Severe anemia (PSV in MCA > 1.5 MOM) : Induction at 34 weeks.
  2. PSV < 1.5 MOM or antibody titer less than (1 : 16) : Induction at 37 weeks.
  3. Indirect coombs test negative : Induction at 40 weeks.

Status of cervix should be checked before induction of labor : Bishop score.

Bishop score

00:08:47

They have 5 parameters as follows :

- Dilatation of the cervix.
- Position of the cervix.
- Effacement of the cervix.
- Station of the fetal head.
- Consistency of the cervix.

Modified Bishop score : Length of the cervix is checked instead of effacement of cervix.

Position of the cervix :

- Posterior : Score is 0.
- Mid : Score is 1.
- Anterior : Score is 2 (Favorable).

Consistency of cervix :

- Firm : Score is 0.
- Medium : Score is 1.
- Soft : Score is 2.

In position of cervix and consistency, the maximum score is 2.

Dilatation of cervix (most important parameter) :

- Closed (Not dilated) : Score is 0.
- 1-2 cms dilatation : score is 1.
- 3-4 cms dilatation : Score is 2.
- ≥ 5 cms of dilatation : Score is 3.

Effacement of cervix (Cervix becoming part of the uterus) :

- 30 % : Score is 0.
- 40-50 % : Score is 1.
- 60-70 % : Score is 2.
- ≥ 80 % : Score is 3.

Station of the fetal head :

Relationship of the leading point of the fetal head with the ischial spine.

Above the level of ischial spine, it is – station. If below the level it is + station.

Below the level of ischial spine : Engagement has occurred.

If below the level of ischial spine : Score is 3.

If at the level of ischial spine (0, -1 station) : Score is 2.

If the head is at -2 station : Score is 1.

If the head is above that : Score is 0.

Maximum Bishop score is 13.

If the score is ≥ 9 : Maximum success of induction of labor.

Score ≤ 5 : Poor score (Ripening of cervix should be done).

Modified Bishop score :

Length of the cervix :

- > 4 cms : Score is 0.
- 2-4 cms : Score is 1.
- 1-2 cms : Score is 2.
- < 1 cms : Score is 3.

Bishop score is most common as effacement of cervix can be assessed clinically.

Length of the cervix can be measured only using the USG.

Modified Bishop score is the most accurate score.

Drugs used in induction of labor 00:27:10

most commonly used drugs are the prostaglandin : PGE1 and PGE2.

PGE1 (misoprost) :

Dosage is 25mcg, can be used 4 hourly once, maximum number of doses is 6.

PGE2 (Dinoprostone) :

- Available as ciprem gel (administered intracervically).
- Dosage is 0.5mg, can be given 6 hourly once and the
- maximum number of doses that can be given is 4.

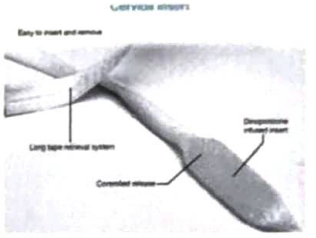
These drugs not only induce labor but also causes ripening of cervix simultaneously.
In patients with previous history of caesarian section, prostaglandin cannot be used.

Induction of labor is not contraindicated in heart disease patients & pregnant women with previous cesarean section.

Cervidil :

- Slow-release formulation of dinoprostone.
- Contains 10 mg of dinoprostone.
- Placed in the posterior vaginal fornix.
- Remove it after 12 hours or before if contraction arises.

Mifepristone/RU486 :



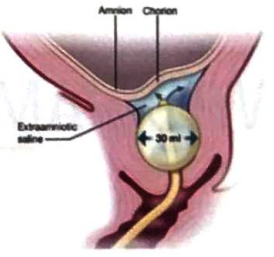
- Anti-progesterone.
- Dosage : 200mg per vaginally.

Oxytocin : Used both for induction and augmentation of labor.

Mechanical method

Foleys induction :
Foleys catheter is inserted into the vagina & the bulb is filled with normal saline (30–50 ml) & pulled down till it reaches the internal OS. It is also called as Trans cervical balloon catheter.

Extra normal saline pushed into the catheter enters into the extra amniotic space (Extra amniotic saline infusion).
Best method for induction of labor in patients with previous caesarian section.



Stripping of membranes :

- OPD procedure.
- Done during per vaginal examination, Sweeping and stretching of membranes.
- Releases prostaglandins.

Hygroscopic dilators :
Used for abortion more commonly, less common in induction of labor.

Contraindications of induction of labor :

- Severe CPD.
- Contracted pelvis.
- Transverse lie, Brow presentation, Face (mento posterior position).
- Fetal distress : Non assuring fetal heart rate.
- Placenta previa.
- Classical cesarian section.
- Previous 3 LSCS.
- Previous Hysterotomy.
- Previous myomectomy.
- Active genital herpes infection.

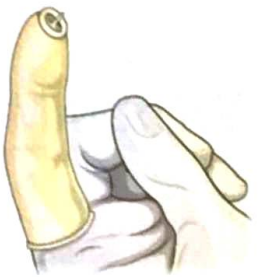
Drugs used for augmentation of labor 00:37:53

1. Oxytocin.

2. Artificial rupture of membranes :
Membrane is ruptured artificially.

- Kocher's forceps.
- 1 tooth on one side and 2 teeth on other side with presence of serrations.

Amnicots :
Small finger gloves with pointed tip.



Advantages :
Prostaglandins especially PGE_2 is released.
Increases contraction.
Color of amniotic fluid is checked for finding fetal distress (green color).
Decreases bleeding in placental abruption (contraction begins thus decreases bleeding).

Risk for ARM :

In a free-floating head, ARM can lead to cord prolapse.

Infection.

Trauma to the fetal head.

ARM contraindications :

Free-floating head.

HIV positive mother.

Active genital herpes infection in mother.

IUD of fetus.

In polyhydramnios

00:43:57

If ARM (amniotomy) is done, entire amniotic fluid comes out leading to sudden shrinkage of the uterus, leading to Abruptio placenta.

Instead of ARM, controlled rupture of membrane is done. Needle is guarded with the fingers and inserted in the mother's vagina and a very small hole is made in the membrane to allow the trickling of the amnion.

Q. A primigravida came to the labor room at 40 weeks + 5 days gestation for induction of labor. On per vaginal examination, the cervix is 1 cm dilated and 30% effaced. The vertex is at −1 station and the cervix is soft and posterior. What will be the modified bishop score for this lady?

A. 0.

B. 3.

C. 5.

D. 8.

STAGES OF LABOR, ABNORMAL LABOUR AND PARTOGRAM : PART 1

Prelabour

00:00:40

Period begins few days before the onset of true labor.

Events :

1. Lightening and shelving of the uterus.
2. Cervical ripening and softening.
3. Increased uterine contractility → False labor pain.

- At 36 weeks of pregnancy :

The head of fetus goes down in the pelvis.

↓

Height of the uterus falls down from xiphisternum to 2cm or so below it (At 40 weeks = Height is uterus same as 32 weeks + Flank fullness)

↓

mother experiences relief from respiratory discomfort.

↓

Lightening.

- There is also formation of lower uterine segment as head of the fetus descends to the pelvis

↓

Uterus falls forward + Flanks are full/distended.

↓

Uterine shelving.

- Cervical ripening :

There is and alteration in collagen structure and relative concentration of matrix metalloproteinases, proteoglycans and GAGs.

↓

The cervix becomes soft.

↓

Ripening.

Active space

- Increased uterine contractility occurs due to :
  1. Increased oxytocin.
  2. Increased gap junction proteins.
  3. Prostaglandins.

Increased uterine contactility leads to :

1. False labor pain.

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2. True labor pain.

	True Labor pains	False labor pains
1. Uterine contraction		
a. Nature	Regular rhythmic (On and off)	Irregular, continuous.
b. Progressive	↑Intensity, ↑ Frequency, ↑ Contraction.	-
2. Cervical dilatation.	Leads to progessive dilatation.	-
3. Site of pain.	Lower abdomen + Radiating pain to the thigh and back.	Localised to abdomen.
4. Show.	Blood + mucus discharge.	-
5. Bag of membranes.	Felt.	-
6. Relieved by.	Not relieved.	Relieved with sedation and enema.

Oxytocin → Produces rhythmic and regular contraction, and maintains polarity of the uterus → Can be used in induction and augmentation. Ergometrine on the other hand cannot be used as it doesn't maintain the polarity and cuts off blood supply to fetus.

True labor

00:09:35

Onset of true labor pain marks the onset of labor.
Pregnant female in labor → Parturient.
As per WHO recommendations → Parturients can have one

companion of her choice all throughout labor.

At the time of admission :

1. Note vitals of the patient.
2. Perform Leopold maneuvers.
3. Auscultate for FHS → using stethescope or doppler.
4. Per vaginal examination done to assess :
    a. Dilatation of the cervix.
    b. Effacement of the cervix.
    c. Position of the cervix.
    d. Station of fetal head.
    e. Status of membranes.

In case of active bleeding, P/V examination is contraindicated.

Following are not recommended by WHO at the time of admission :

1. Routine clinical pelvimetry for all pregnant females in labour.
2. Routine enema.
3. Routine CTG.
4. Routine pelvic shaving.

First stage of labor 00:13:02

Begins → Onset of true labor pains.

Ends → Full dilatation of cervix.

Events in first stage of labor :

1. Show.
2. Progressive dilatation of cervix :
    a. Uterine contraction.
    b. Hydrostatic pressure of amniotic fluid.
    c. Pressure of presenting part.
3. The fibres of the cervix thin out and are pulled up into the lower uterine segment → Shortening of cervix → Effacement of cervix.

Effacement may begin before the onset of labor but is completed in labor (in latent phase).

Effacement is expressed in % of the length of cervix that is taken up.

4. Formation of lower uterine segment (LUS) → Formed from isthmus (Non-pregnant → 0.5 cm).
   a. At term → 5 cm.
   b. In labour → 10 cm (due to taking up of cervix).

5. Descent of presenting part.
6. Formation of bag of membranes.
7. Rupture of membranes → Generally occurs towards the end of first stage of labor, when the cervix is nearly full dilated but may occur earlier.

Management of first stage of labor

1. Ambulation and maternal positioning :
   Early labor → Ambulation is allowed.
   Active labor → Lie down in left lateral position.

2. Oral intake :
   Gastric emptying time is delayed, therefore solid food is not recommended.
   Clear fluids should be given orally.
   IV fluids can be given.
   Females should remain well hydrated.

For C-section → Liquids restricted 2 hours and solids stopped 6-8hours before surgery.

3. Bladder function → Encouraged to void frequently.
4. Pain relief → Epidural analgesia.

With prolonged rupture of membranes and unknown GBS (group B streptococcus) status → GBS prophylaxis is recommended for all females if any of the following exists :
1. Rupture of membranes ≥ 18 hours.
2. Intrapartum temperature ≥ 38° C or > 100.4° F.

Monitoring :

Maternal :

1. Pulse and BP → Hourly.
2. Temperature → 4th hourly.
   If membranes ruptured for many hours or if temperature is raised → Hourly.
3. Uterine contraction → Noted every 30 mins for 10 mins with palm of hand.
4. P/V examination :
   Every 4th hourly.
   At the time of membrane rupture and head not engaged (chances of cord prolapse).
   If variable deceleration of CTG (chances of cord compression).

Fetal :

1. FHR auscultation :

Ist stage :

Low risk → 30 min.

High risk → 15 min.

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2nd stage :

Low risk → 15 min.

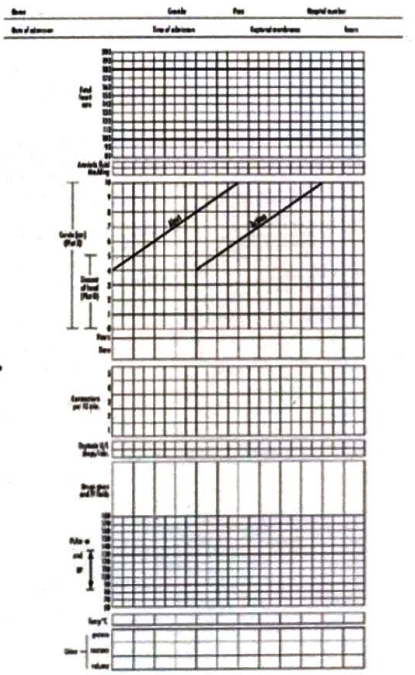
High risk → 5 min.

Partogram

00:24:05

Plotting of maternal and fetal conditions.

MC used → modified WHO partogram.



3 parts :

1. Top most part → Fetal condition.
   a. FHR represented with a dot, connect the dots.

Normal → 110–160 bpm.

Each square → 30 min.

Plotted every 30 min.

Active space

b. Status of amniotic fluid :

I → Intact.

A → Absent liquor.

C → Clear.

B → Blood stained.

M → Meconium stained.

Note time of ROM or ARM.

c. Moulding :

Overlapping of skull bones when resistance is encountered in maternal bony pelvis during labor.

Reduces skull diameter and facilitates delivery.

Occurs in the occipital-parietal and parieto-parietal sutures.

Grading :

1+ → Bones touch each other.

2+ → Bones overlap but can be separated.

3+ → Bones overlap but don't separate.

Physiological = +1.

Obstructed labor = +2, +3.

If moulding + slow progression of labor (dilatation < 1 cm/h) = CPD.

2. Middle part → Progression of labor →: Dilatation of cervix w.r.t. time → Cervicograph.

There are 2 diagonal lines → Alert and Action.

3. Bottom part → Maternal condition :

a. Contrations :

measured every 30 mins by placing palm of hand on uterus.

Number of contractions in 10 mins measured :

Each square represents 1 contraction, shade number of contractions /10 min.

Duration of contraction :

<20 s : 

20-40 s : 

> 40s : 

b. Oxytocin.

c. Drugs.

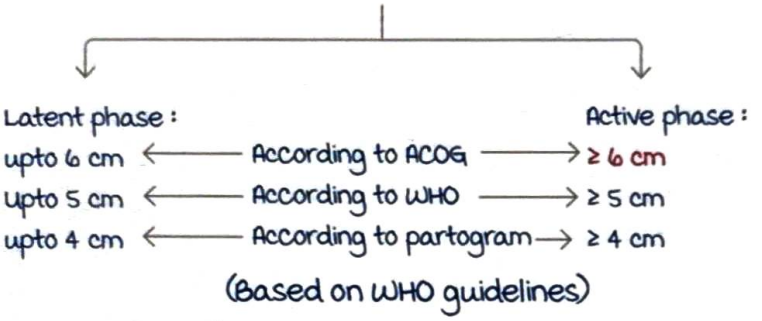
d. Pulse and BP, Temp.

e. Urine output → Protein, volume, acetone.

Respiratory rate, oral input and saturation → Not charted.

Phases of first stage

00:36:13



(Based on WHO guidelines)

Normal duration of latent phase :

< 20 h = Nulliparous.

< 14 h = multiparous.

Prolonged Latent phase :

≥ 20 hours = Nulliparous.

≥ 14 hours = multiparous.

Causes :

1. Occipito posterior position.

2. Unfavourable cervix.

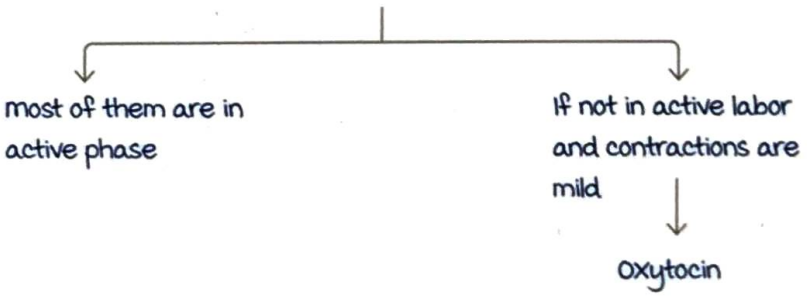
Differential diagnosis → False labor.

Management :

Best → Sedation with 8-10 mg morphine or 100mg pethidine

↓

Once female wakes up.



C-section is never done.

Q. A female at 37 weeks of gestation has mild labour pains for 10 hours and cervix is persistently 1 cm dilated but non

Active space

effaced. What will be the next appropriate management?

A. Sedation and wait.

B. Augmentation with oxytocin.

C. C-section.

D. Amniotomy.

Active phase :

Ends → Full dilatation of cervix,

Earlier → Active phase has 3 phases by Fredmann :

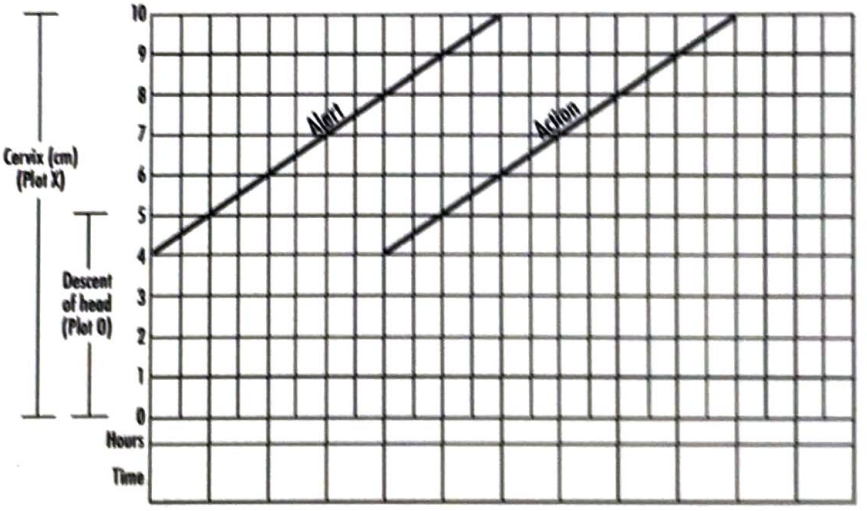
1. Acceleration phase.
2. Phase of maximum slope.
3. Deceleration phase.

Rate of dilation of the cervix :

1.2 cm/h = Nulliparous.

1.5 cm/h = Multiparous.

Hence WHO recommended earlier minimum rate of dilatation should be 1 cm and based on this finding → Partograph → cervicograph part was made.



WHO modified partograph in based on old recommendations and not new recommendations.

Active phase begins at 4cm dilated.

2 lines :

1. Alert line → Starts from 4 cm.

Drawn in such a manner that minimum rate of dilation is 1cm/hr

Duration between alert and action line → 4 hours.

Active space

In modified WHO partograph only active phase is represented.
Plotting begins in active phase.

2. Action line.

Dilatation of cervix is represented by 'X' axis.
Each big square is 1cm on x axis.
Time is represented on Y axis.
Each big square on Y axis → 1 h.

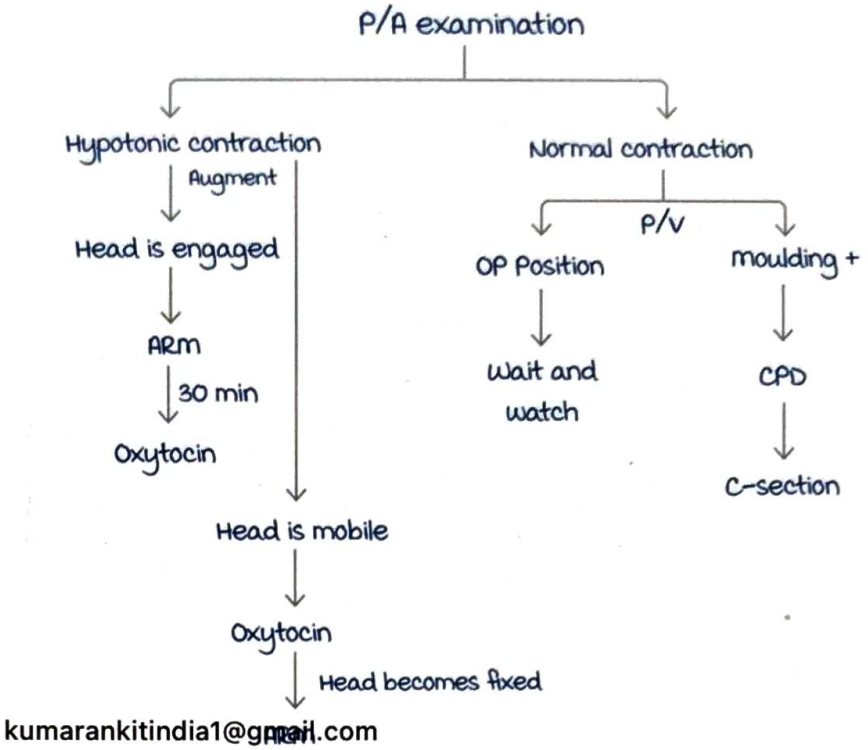
If progress of patient :
1. Left of alert line → Progress is normal.
2. Touches alert line or right of line → Get alerted, send patient to higher center.
3. Right of action line → Take action.

New recommendations of WHO :
Active phase begins at 5cm dilatation.
Progress in active phase < 1cm/h.

	Nulliparous	multiparous
mean duration	4 h (5.3 h)	3 h (3.8 h)
Doesn't exceed beyond	12 h	10 h

Abnormalities in active phase 00:57:34

1. Protracted active phase :
According to conventional criteria →
Slow progress of labor is = dilatation of cervix is < 1cm/h for minimum 4 h.
Causes :
1. Hypotonic uterine dysfunction.
(Adequate → 3 contractions in 10 min, lasting for 40-50s).
2. OP position.
3. Maternal obesity.
4. Epidural analgesia.
Examination → Perform a P/A and P/V examination.
P/A examination : For assessing the strength of contraction.



2. Active phase arrest :

It is defined as a condition where in a female with cervix ≥ 6cm dilation + membranes ruptured

+

a. No dilatation of cervix for 4 hours inspite of good uterine contractions (MVU ≥ 200).

OR

b. No dilatation cervix for 6 hours with inadequate contraction, with oxytocin administration.

Management : C-section.

Note : If fetal distress occurs, do not wait and watch, perform immediate C-section.

In active phase arrest : Partograph is a straight horizontal line or a plateau.

Second stage of labor

01:17:00

Begins → Full dilatation of cervix.

Ends → Delivery of fetus.

Main events :

1. Descent of fetus :
    1. Bearing down by mother.
    2. Uterine contractions.
2. Cardinal movements of labor.
3. Delivery of the fetus.

Management of second stage :

1. Position → MC used is the dorsal position with hips flexed, Knees flexed and abduction of thigh.
WHO recommends any position of choice including upright.

2. To prevent perineal tear : WHO recommends during the delivery of head.
    - Warm compress to be applied to perineum.
    - Perineal massage.
    - Guarding perineum.
    - Modified Ritgen maneuver →

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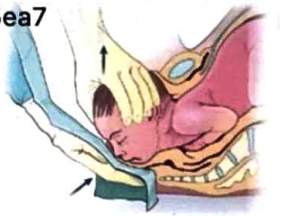


A sterile towel or pad is held in one hand and placed over perineum.
Other hand applies gentle downward pressure on the occiput to promote flexion and controlled delivery of the head (Thus ensures smallest diameter of the head passes through the outlet).
Once the occiput is born → Gentle pressure on head to extended it → Forehead, nose and mouth are then delivered.

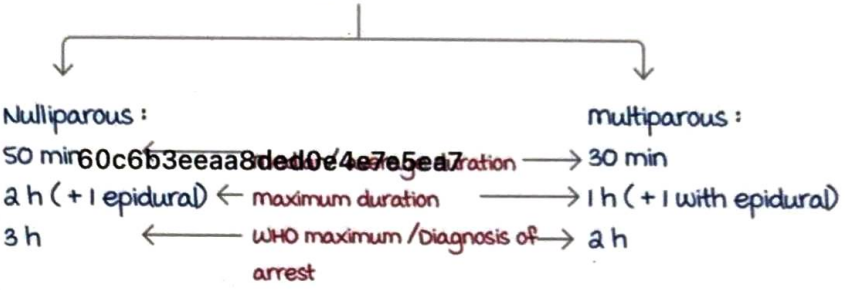
WHO doesnt recommend :
- Fundal pressure.
- Routine episiotomy in all females who are delivering vaginally.

Q. Which of the following is a recommendation of WHO in the management of the second stage of labor?
A. Manual perineal support and maintain the head in deflexion and deliver.
B. Warm compress to the perineum.

C. Mandatory episiotomy for all cases

D. Delivery should be conducted in the lithotomy position.

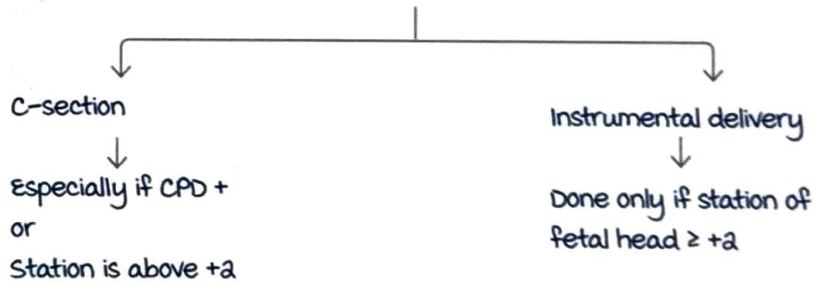
Duration of second stage :



As 2nd stage lengthens → Increased chance of maternal complications :

1. Chorioamnionitis.
2. Instrumental delivery.
3. Perineal trauma.
4. PPH.
5. C-section.

Management of second stage arrest 01:30:40



Incase of fetal distress :

1. If cervix is fully dilated, station above +2 → C-section.
2. If cervix is fully dilated, station at or below +2 → Forceps delivery.

Forceps and vacuum is applied only on a fully dilated cervix.

Forceps and vacuum is applied only when station ≥ +2.

In fetal distress, vacuum is not used.

3. If cervix is not fully dilated → C-section.

Active space

Obstructed labour

01:35:47

Clinical features :

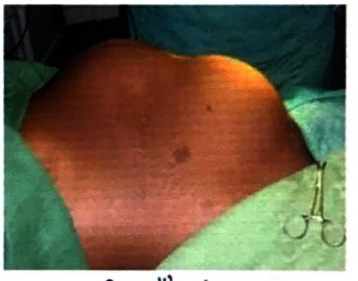
1. Dehydrated.
2. Exhausted.
3. Tachycardia.
4. Tachypnea.

On P/A the upper uterine segment :

1. Thick, tender and tonically contracted.
2. LUS → Thinned and stretched.
3. A depression/groove is created between UUS and LUS → Bandl's ring.
   This ring can be seen and felt abdominally.
4. FHS → Fetal distress.
5. Suprapubic bulge → As bladder is compressed between pubic symphysis and fetal head, can also cause hematuria.

P/V :

1. Hot and dry vagina.
2. Caput +.
3. Moulding +.
4. Hematuria +/−.



Bandl's ring

Management :

1. Always C-section whether the baby is alive or dead.
2. Never give oxytocin.
3. Correct dehydration and prevent sepsis, GBS prophylaxis if indicated.

Complications :

1. Rupture of the uterus.
2. After 7–14 days → Vesicovaginal fistula due to ischemic injury to bladder.

Most common cause of VVF :

1. In developed country → Hysterectomy.
2. In developing country → Obstructed labor.

VVF repair → within 3–6 months, time needed for the inflammation to subside.

Techniques :

1. Latzko technique.
2. Chassar moir technique.

A continuous bladder drainage must be done for at least 2 weeks post repair.

Sexual intercourse and P/V examination are contraindicated for 2 months. (not to have pregnancy atleast 1 year).

Earlier for obstructed labour with dead baby was managed by → Craniotomy.

Nowadays no destructive procedure is done.

Bandl's ring	Constriction ring/Schroeder ring
1. Retraction Ring.	1. Constriction ring.
2. Due to obstructed labour.	2. Due to injudicious use of oxytocin leads to localised spasm of uterus.
3. Between UUS and LUS.	3. Can be seen anywhere.
4. Seen in second stage.	4. Ist or 2nd stage.
5. Felt and seen P/A.	5. Felt P/V.
6. Maternal dehydration and fetal distress.	6. Mother and fetus are normal.
7. Fetal parts are not felt.	7. Fetal parts are felt.
8. Relieved by C-section.	8. Relieved by sedation if ring reappears the do a lower vertical C-section.

STAGES OF LABOR, ABNORMAL LABOR AND PARTOGRAM : PART 2

Third stage of labor 00:00:10

Begins after delivery of baby.
Ends with delivery of placenta.
Main event : Delivery of placenta (Schultz & Duncan method)

Signs of placental seperation :

- Gush of blood per vaginally.
- Suprapubic bulge.
- Lengthening of the cord (apparent and permanent).
- Height of the uterus increases slightly.

Surest sign of placental seperation : Placenta felt at vagina.
And best : Lengthening of the cord.

Human placenta is deciduate, i.e., it has to shed off after delivery.
Steps of active management of third stage of labor (AMTSL) is required because :
Duration of 3rd stage is decreased leading to decreased bleeding.
Which further reduces chances of PPH and decrease the chance of maternal mortality.

Duration of third stage : 60c6b3eeaa8ded0e4e7e5ea7
Passive management : 10–15 minutes.
Active management : 5–10 minutes.

If duration becomes ≥ 30 minutes : Prolonged 3rd stage of labor, which means retained placenta.

Active space

Active management of third stage of labor 00:05:16

AMTSL.

Given by WHO.

Done in all females in labor.

Best method to prevent PPH.

Component :

- Injecting uterotonic to mother after delivery of baby (most important step).
- Delayed cord clamping.
- Deliver placenta by controlled cord traction : Modified Brandt Andrews technique.
- Intermittent assessment of uterine tone.

60c6b3eeaa8ded0e4e7e5ea7

Earlier recommended step but now replaced is uterine massage (4th step earlier).

Now it is replaced by intermittent assessment of uterine tone.

Uterine massage is a part of treatment of PPH.

Step which is never included in AMTSL : Early cord clamping.

Q. All of the following are included in AMTSL except :

A. Injection of uterotonic after delivery of baby.

B. Early cord clamping.

C. Uterine massage.

D. Controlled cord traction.

Q. Not a part of AMTSL :

A. Injection of uterotonic after delivery of baby.

B. Delayed cord clamping.

C. Uterine massage.

D. Controlled cord traction.

Injection uterotonic should be given within 1 minute of the delivery of the baby or immediately after delivery of anterior shoulder of the baby.

Active space

Recommended uterotonics by WHO : Oxytocin 10 IU for AMTSL.

Route of administration : IM/IV infusion.

IV bolus should be avoided, can lead to hypotension and cardiac arrest.

Infusion is always made in electrolyte rich media (e.g., NS/RL and never in dextrose 5%).

In case of made with 5% dextrose it can lead to water intoxication.

Natural oxytocin :

Nona peptide.

Synthesized by para ventricular nucleus of hypothalamus and stored in posterior pituitary.

Synthetic oxytocin :

Octapeptide.

$T_{1/2}$ = 3–5 minutes.

	IM	IV infusion
Onset of action	3 minutes	Immediately
Duration of action	3 hours	1 hour

Mechanism of action of oxytocin :

- Calcium influx.
- Releases PGF – 2α from decidua.

Increased uterine contraction.

Characteristics are :

- Physiological contractions.
- Off and on character.
- Polarity of uterus in maintained.

Hence, oxytocin can be used during labour to augument contraction.

Actions :

Brings about physiological contraction :

- Induction of labor.
- Augmentation of labor.

- AMTSL
- PPH

} 1st line drug by WHO.

Also responsible for milk ejection.

C/I :

If induction of labour in contracted pelvis and malpresentation (transverse lie, brow presentation).

Obstructed labour.

Renal disease : It can act on V_a receptor leading to fluid retention.

Hypovolumic states.

If oxytocin is not available : WHO recommends following steps for AMTSL/ to prevent PPH.

- methylergometrine.
- Syntometrine.
- Carbemetrine.
- misoprostol : PGE_1.

Not recommended by WHO for prevention of PPH but recommended by WHO for treatment PPH : Carboprost (PGF-2α).

Combination recommended by WHO to prevent PPH in high risk patients :

Oxytocin + methylergometrine = Syntometrine.

Oxytocin + Tranexemic acid injection = 1gm IV over 20 minutes).

Methylergometrine

00:17:02

Also known as methergin.

Dose : 0.2 mg IM.

Never be given : IV (Hypertension).

methyl ergometrine leads to tetanic contractions, no relaxation in between contractions and polarity is not maintained.

Hence, it cannot be used in antenatal period or during labor before delivery of baby.

Side effects : Hypertension.
Contraindications :
Mnemonics : TOPER.
T : After delivery of Ist twin.
O : Organic heart disease.
P : Pre eclampsia.
E : Eclampsia.
R : Rh negative females.
Relative contraindications : HIV + females on protease inhibitors : Hypertension.

Syntometrine 00:19:32

Fixed dose combination of oxytocin (5U) and methylergometrine (0.5 mg).

- Highly potent.
- Not readily available.
- Expensive.

Case : G2P1 delivered a 3.2 Kg baby boy. She has H/O PIH. To prevent PPH. DOC in this patient is oxytocin (Ist line).
If not available : Misoprostol.
Oxytocin injection is kept and stored at 2°-8° C.
Maintanence of cold chain of oxytocin is very important
AMTSL.

Carbetocin 00:21:16

Synthetic oxytocin analogue.
Octapeptide.
$T_{1/2}$: 85-100 minutes.
Dose : 100mcg slow IV (over 1 minute).

Misoprostol

00:21:38

PGE_1 analogue.

Available as : Tablet form : Oral/ Sublingual/ PV/PR.

- Water soluble.
- Heat soluble.
- Absorbed within 9-15 minutes.

$T_{1/2}$: 20-40 minutes.

Never given intravenously.

Oral and sublingual route have rapid onset of action but vaginal and rectal route have length duration of action and greater bioavailablity.

Dose of prophylaxis :

Older recommendation : 600 mcg.

Newer recommendation : 400-600 mcg.

S/E : Hyperthermia.

WHO recommendation : Advance misoprostol distribution to pregnant women for prevention of PPH

During ANC visits in the third trimester, misoprostol should ideally be provided to pregnant women as part of a safe delivery kit.

The following information should be given along with it :

- Clear, culturally appropriate instructions on its purpose.
- Dose - 400-600 micrograms oral tablet.
- Timing of use.
- Possible side effects and remedies for the same.
- Prompt recognition of danger sign.
- How to access health services.
- The importance of giving birth in a health facility.

Prospective research should be made a priority wherever antenatal distribution of misoprostol will be initiated.

The research should be done to evaluate the impact of introducing these programmes on maternal health outcomes and health service utilization.

2nd step in AMTSL

00:23:36

Delayed cord clamping : Clamping within 1-3 minutes of delivery.
Advantage : 80 ml of blood in cord, goes to neonate which prevents neonatal anemia.

Early cord clamping :
Cord clamping within 1 minute of delivery.
It is not a part of AMTSL as recommended by WHO.
There are certain conditions in which early cord clamping is done :

- Birth asphyxia.
- If neonatal resuscitation is needed.
- K/C/O congenital heart disease.
- If Rh negative female : Indirect coomb's test is negative (non iso immunized pregnancy).
- HIV + pregnant females (As per NACO guidelines but ACOG : Delayed cord clamping).

In case of Rh negative pregnancy : If indirect coomb's test is positive, where maternal antibodies are formed, early cord clamping is of no use : Delayed cord clamping.

In preterm infants.
In Covid 19 + patients.
In macrosomic babies.
In post term cases
} Delayed cord clamping

3rd step of AMTSL :
Delivery of placenta by controlled cord traction (modified Brandt Andrews technique).
It should be done by a trained birth attendant.

4th step of AMTSL : Intermittent assessment of uterine tone for 2 hours every 15 minutes.
If there is uterine atony, should be done more frequently.

Fourth stage of labor

00:31:06

1-2 hour period after delivery of placenta.

During 4th stage :

monitor :

- Uterine tone : Every 15 minutes.
- Pulse and BP : Every 15 minutes.
- Voiding : Within 4 hours after delivery.
- Temperature : Every 4 hourly initially and then every 8 hourly.
- After vaginal delivery, oral intake can be started after 2 hours.

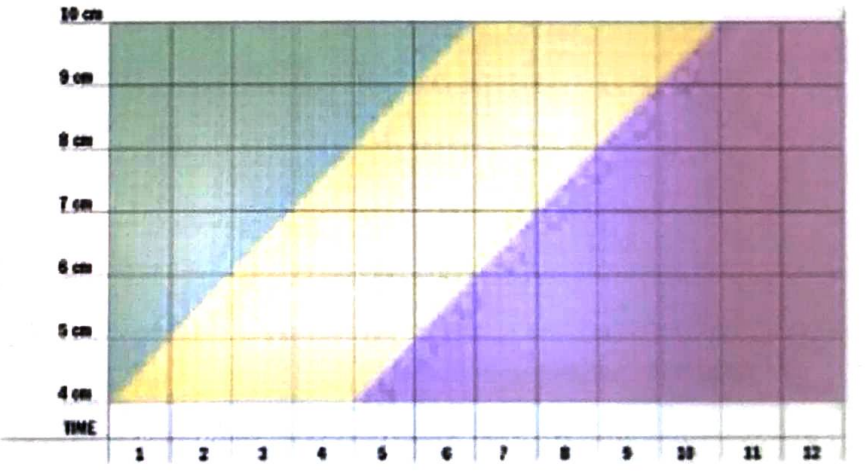
Watch for complications :

- PPH.
- Vulvar hematoma.
- Postpartum collapse.

Patient experiences physiological chills.

Partogram

00:32:37



Green : Progress is normal.

Amber : Alerted.

Red : Action required.

Ist partograph : Freidmann curve.

Latent phase plotted.

Active space

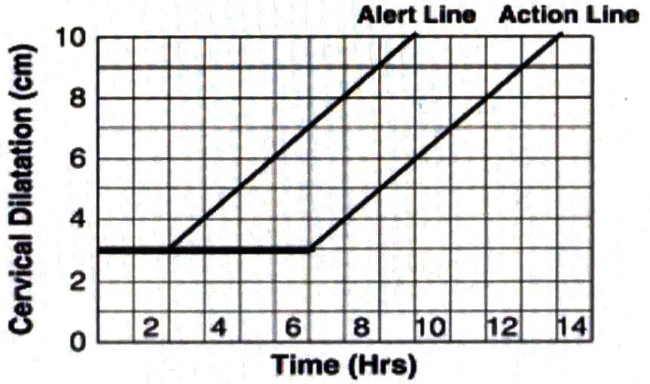
Active phase began at 3 cms.
Active phase is further divided into 2 stages.
No alert or action line.

The concept of alert line and action line was given by Phelpot and casette.

Q. Mrs AR G3 PILIA a full term pregnant female is admitted in labor. On examination, she has uterine contractions 2 in 10 minutes, lasting for 30–35 seconds. On P/A examination 3/5th of the head is palpable per abdomen. On P/V examination– cervix is 4 cm dilated, membranes intact. On repeat examination 4 hours later, cervix is 5 cm dilated, station is unchanged, and cervicograph remains to the right of the alert line. Which of the following statements is true?

A. The head was engaged at the time of presentation.
B. Her cervicographical progress is satisfactory.
C. Her cervicographical status suggests intervention.
D. On repeat examination, her cervicograph would have touched the action line.

Cervicograph part of partogram :

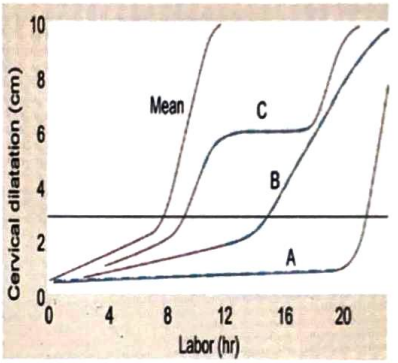


Active space

As per WHO : Only represent active phase.
Active phase begins at 4 cm dilatation at 0 hours.
Alert line corresponds to 1 cm/hr.
Dilatation has to happen till 10 cms.
i.e., the total duration is of 6 hours.

Action line should begin 4 hours after alert line.
Ends 4 hours later to alert line.
Ist mark on alert line.

Q. The following graph represents the stages of labor. Which of the following statements is true about the graph C?



A. Secondary arrest after progression of labor.
B. Prolonged active phase of labor.
C. Prolonged latent phase.
D. Normal labor in a primigravida.

For graph A : Prolonged latent phase.

Q. A 38 weeks primigravida presented to the labor room with minimal labor pains and contraction. On examination, the cervix is 2 cm dilated and 50% effaced. The heart rate of the patient is 86/min and blood pressure is 126/76 mm Hg. What should be done next? [AIIMS Nov 2016]

A. Induce labor by artificial rupture of membranes.
B. Give oxytocin to augment labor.
C. Sedate the patient by and give phenergan to decrease labor pains.
D. Observe the patient and wait for increase in uterine contractions.

Active space

Q. All of the following are true regarding partogram except: [AIIMS MAY 2016]

A. Right side of alert line indicates referral to FRU.
B. There is 4 hours difference between action line and alert line.
C. Each square in partograph equals to an 30 mins.
D. Partograph is to be plotted once the cervical dilation reaches 4 cms.

Q. When a patient in labor presents to us for the first time, where on the partograph will we plot the cervical dilation. [AIIMS Nov 2017]

A. Left of alert line.
B. Between alert and action line.
C. Right of action line.
D. Right of alert line.

Q. A midwife at a PHC is monitoring pregnancy and maintaining the partograph of pregnancy progression. At how much cervical dilation should the partograph plotting be started? [AIIMS May 2017]

60c6b3eeaa8ded0e4e7e5ea7

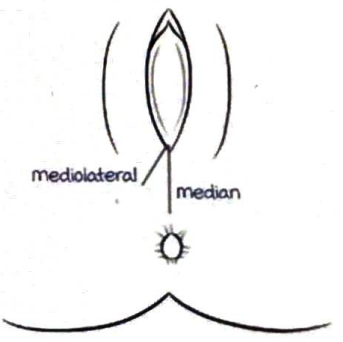
A. 2 cm.
B. 8 cm.
C. 4 cm.
D. 6 cm.

Episiotomy

00:48:46

Planned surgical incision given on perineum.
Not routinely recommedned by WHO.
2 types : median and mediolateral.

mediolateral episiotomy : made at an angle of 60°.
Range of 45-60°.



Active space

Advantages of median	Disadvantages of median
Less muscle fibres are cut Less bleeding Easy repair Quick healing Less dysparuenia	Can extend and involve anal sphincter.

Advantages of mediolateral	Disadvantages of mediolateral
Never involves anal sphincter.	more muscle fibres are cut more bleeding Difficult repair Delayed healing more dysparuenia

Indications for episiotiomy :

- Shoulder dystocia.
- After coming head of breech.
- Instrumental delivery.
- Macrosomia.
- Face to pubis delivery.

Structures cut in mediolateral episiotomy :

- Levator ani (Pubococcygeus + Ileococcygeus).
- Superficial transverse perinii.
- Deep transverse perinii.
- Bulbospongiosus.
- Pudendal nerve and vessels.
- Posterior vaginal wall.
- Subcutaneous tissue and skin.

Muscles not cut during episiotomy :

- Ischiococcygeus/ Coccygeus.
- Ischiocavernosus.
- Anal sphincters.

Episiotomy scissors

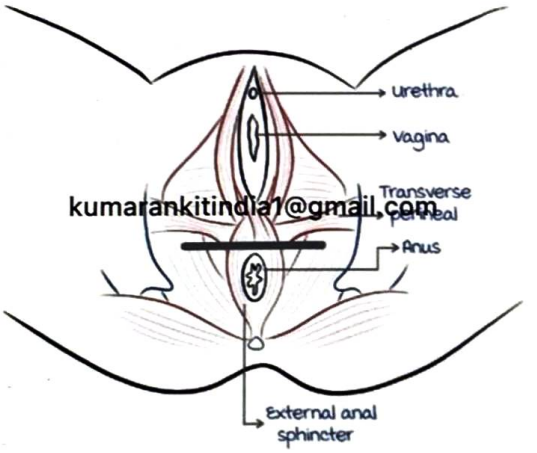
Steps to perform episiotomy :

Guard the head of the fetus and infiltrate local anesthetic at the forchette and 4–5 cm around it.

Guard head of fetus and cut mediolaterally at 60° with episiotomy scissors

Repair :
Suture material : Chromic catgut or Vicryl No 1.
All layers repaired with single suture, and repaired in three layers.

Mucosa : continuous sutures.
Muscle : Interrupted sutures.
Skin : Matress sutures.



COMPLICATIONS OF THIRD STAGE : PPH

Complications of third stage of labour 00:00:09

Post Partum Haemorrhage (PPH)

- Atonic.
- Traumatic :
    1. Cervical tear.
    2. Perineal tear.
    3. Vulval hematoma.
    4. Uterine rupture.

Uterine inversion.

Amniotic fluic embolism.

Retained placenta.

Post Partum Haemorrhage 00:01:02

- Obstetric emergency.
- MCC of maternal mortality in India → Haemorrhage.
- MCC of shock after delivery → PPH.

Definition :

Blood loss ≥ 500 mL after vaginal delivery.

OR

Blood loss ≥ 1000 mL after Caesarean section.

ACOG definition :

Blood loss ≥ 1000 mL.

OR

Bleeding associated with signs and symptoms of hypovolemia.

Clinical definition :

A fall in hematocrit > 10 % between admision and post partum period.

OR

Excessive bleed needing blood transfusion.

WHO definiton :

Blood loss of (500 to 1000) mL → PPH.

Blood loss of > 1000 mL → Severe PPH.

PPH

- Primary
  - Bleeding within 24h of delivery.
  - m/c type of PPH.
  - m/c type of 1° PPH → Atonic > Traumatic
- Secondary
  - Bleeding after 24h until 12w after delivery.
  - MCC of 2° PPH → Retained placental tissue.

Causes of PPH :

- Atonic Uterus.
- Trauma.
- Retained placental tissue.
- Bleeding disorders (DIC).

Risk factors for PPH

00:03:48

Risk factors for atonic PPH :

- Advanced maternal age (> 40 years).
- Multiparity.
- Obesity.
- Previous history of PPH.
- Present pregnancy → Placenta previa, abruptio placenta, PIH, placenta accreta spectrum.
- Overdistention of uterus → multifetal pregnancy, clots, polyhydramnios, large foetus.
- Intrapartum factors → Rapid labour/Precipitate labour (Entire process of delivery is complete within 3 hours), prolonged labour, augmented labour, chorioamnionitis.
- Use of general anaesthesia.
- Abnormal placentation (Placenta accreta spectrum).

Risk factors for traumatic PPH :

- Instrumental delivery.
- High parity.
- Tachysystole (more than 5 contractions in 10 minutes).
- Breech extraction.
- Obstructed labour.

Management of PPH

00:06:23

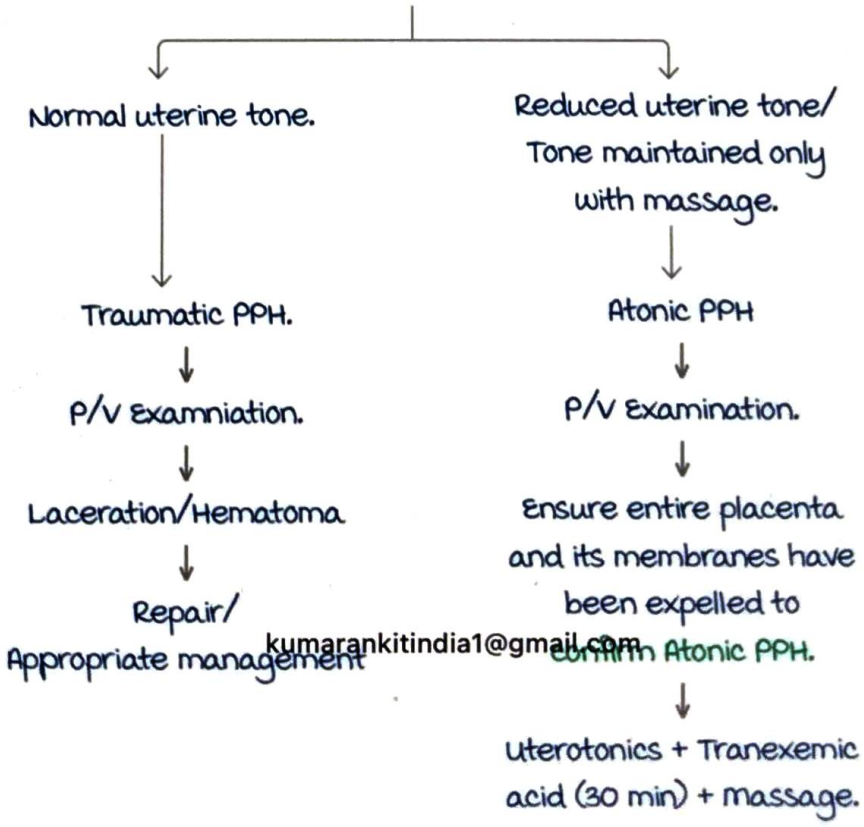
Maternal resuscitation :

- Massage uterus.
- Insert 2 large bore IV cannulae (16 G).
- Give 1000mL crystalloids.
- Place foley's catheter for fluid input-output charting.
- Investigations → CBC, Blood grouping & Rh typing.
- Arrange for blood and blood products.

Meanwhile, inform senior consultant and anaesthetist.

↓

Perform a per abdominal examination followed by per vaginal examination.



Uterotonics

00:10:39

Drug	Dose	Contraindication	Comments
Oxytocin	20 IU in 550 mL NS.	Not to be given IV bolus or infused with 5% Dextrose.	WHO → First line drug to prevent & treat PPH.
If Oxytocin is not available.			
methyl Ergometrine	0.2 mg IM. Repeat (2 to 4) hourly.	Mnemonic (TOPER) After delivery of first Twin. Organic heart disease. Pre eclampsia. Eclampsia. Rh negative pregnancy.	• IV infusion causes hypertension. • Severe hypertension is seen in HIV pregnant females using protease inhibitors.
Carboprost/ (PGF_{α}) Dinoprost/ Hemabate	250 µg IM. Repeated every (15–90) min for a maximum of 8 doses/2mg	Absolute → • Asthmatics. • Pulmonary HTN. • Suspected amniotic fluid emblism. Relative → • Pre eclampsia. • Renal disease. • Liver disease. • Heart disease.	Recommended by WHO for treatment, not prevention. Success rate 88% Side effects → Diarrhoea (mc). Hypertension. Vomiting. Fever. Flushing. Tachycardia.
Misoprost (PGE_1 analogue)	WHO → 800 µg Oral/Sublingual. ACOG → (600 to 1000)µg Oral/Sublingual/ Per rectal.	Previous caesarean section. Dinoprostone contraindicated in hypotensive patients.	Side effect → Dose-related hyperthermia. WHO doesn't recommend Carbetocin or Dinoprostone for PPH management. However, Dinoprostone is being used as a 20 g suppository P/V or P/R.

Tranexemic acid :

- Recommended by WHO for PPH management.
- Given within 3h of haemorrhage.
- Dose → 1 g added to 100 mL NS infused over (10 to 20) min @ 1 mL/min (Fast infusion may cause hypotension).

- If bleeding persists beyond 30 minutes of 1st dose OR Reappears after 24 hours → 2nd dose of 1 g is given.

Mechanical methods

00:16:56

All uterotonics and tranexamic acid are tried for a maximum period of 30 minutes.

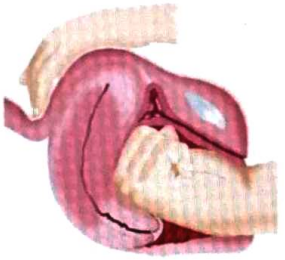
↓

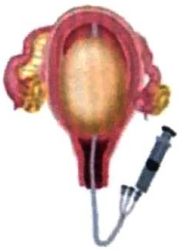
Bleeding failed to be controlled.

↓

Mechanical methods.

Mechanical methods :





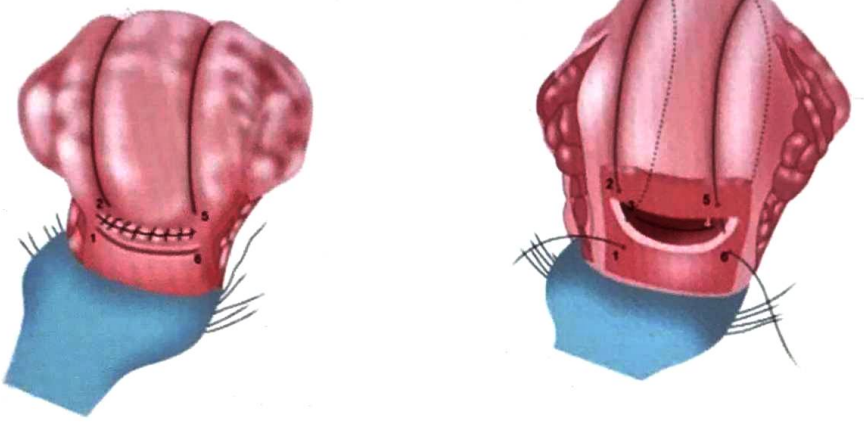
- Temporary methods (Bimanual compression of uterus, REBOA).
- Permanent method (Balloon tamponade method).
  Bulb filled with NS → Inflated bulb → Presses against the open venous sinuses → Controlled bleeding.
  1. Bakri balloon catheter >> Foley's catheter.
     (300 to 500) mL (60 to 80) mL
  2. Sengstaken-Blakemore esophageal catheter.
  3. Condom catheter.

If bleeding stops, balloon tamponade is removed after 12h.
Success rate of balloon tamponade → 85%

Uterine compression sutures 00:20:01

Mechanical methods.
↓
Bleeding failed to be controlled.
↓
Uterine compression sutures.

Uterine compression sutures :



- B Lynch sutures = Braces (MC).
  Sutures applied using Chromic suture no. 2 →
  Compression of the anterior & posterior uterine walls.
- Gunshella sutures.
- Cho square sutures.
- Hayman sutures (multiple vertical sutures).

Indications → Atonic PPH and DIC associated bleeding.
(along with blood transfusion)

Complications :

- Uterine ischemic necrosis with peritonitis.
- Uterine synechiae.
- Uterine wall defects.

Stepwise devascularisation

00:22:42

Uterine compression sutures.

↓

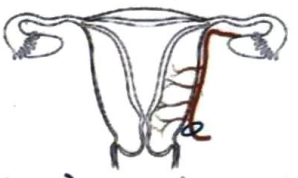
Bleeding failed to be controlled.

↓

Stepwise devascularisation.

Stepwise devascularisation :

- Surgical
- Angiographic embolisation.



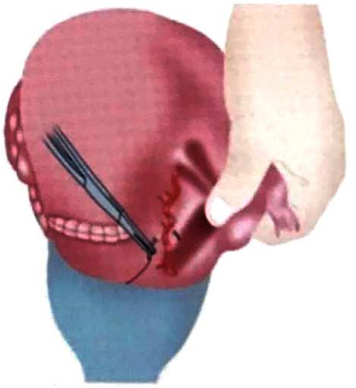
1. Uterine artery ligation (Unilateral/Bilateral)

   First branch of anterior division of internal iliac artery.

   Course → Crosses the ureter and enters the broad ligament to turn upward.

   Site of ligation → As the uterine artery turns upward in the broad ligament at the level of utero-vesical-peritoneal reflection.

   Suture → Polyglactin suture is used and should include a part of the uterine myometrium and then gone around the uterine vessel (O' Leary technique).



   Injury to ureter has to be avoided during the procedure as it's very close to the uterine artery at the ligation site.

2. Utero-ovarian vessel ligation :

   Anastomosing branches of uterine and ovarian vessels.

Assess hemodynamic stability

00:25:04

Stepwise devascularisation.

↓

Bleeding failed to be controlled.

↓

Assess hemodynamic stability.

Total hysterectomy → Both uterus and cervix removed.

↓

Vitals stable.

↓

Internal Iliac artery (anteror division) ligation.

- Site → 5 cm distal to the bifurcation of the common iliac artery to avoid involvement of posterior division..
- mode of action → Reduces pulse pressure by 85% in the arteries distal to it.

Fails →

Vitals unstable/ Family of patient is complete.

↓

Subtotal Hysterectomy.

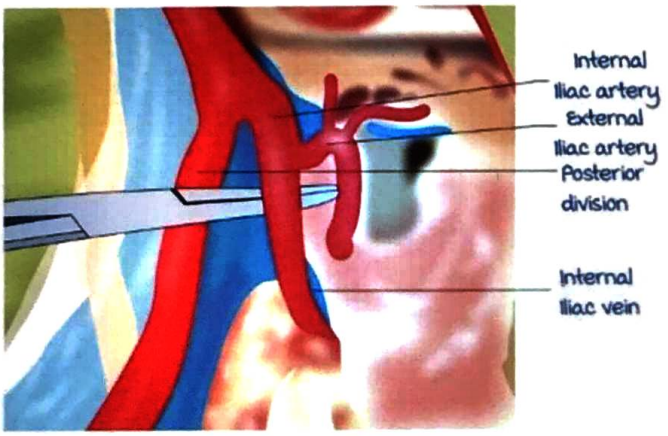
↓

Bleeding failed to be controlled

↓

- Pelvic packing.
- Umbrella packing.
- Parachute packing.

Subtotal hysterectomy → Uterus removed, cervix and vagina preserved → Coital function is unaffected.



Active space

Miscellaneous

00:29:55

Angiographic embolisation :

- Performed by an interventional radiologist.
- Fertility unimpaired → many cases of successful pregnancies have been noted following the procedure.
- Procedure can't be performed if the patient is already being operated upon and hemodynamically unstable.

Aortic Compression :

- Temporary method to control bleeding in PPH.
- Can either be performed manually or with the help of Resuscitative Endovascular Balloon Occlusion Of Aorta. (REBOA).
- If performed manually →

  Above the sacral promontory if the abdomen is open.

  OR

  Above the umbilicus if the abdomen is closed.

Method not recommended by WHO → Uterine packing.

OTHER COMPLICATIONS OF THIRD STAGE OF LABOR

Traumatic PPH

00:00:28

Bleeding from genital tract injuries.

Risk factors :

- Episiotomy/lacerations.
- Instrumental delivery.
- C-section delivery.
- Previously scarred uterus.
- Breech extraction.
- Obstructed labor.
- Tachysystole
- Shouder dystocia.
- High parity.

Clinical features of traumatic PPH :
Continuous steady trickling of blood +
P/A : Uterus is well contracted.
Or
Patient is in shock without external hemorrhage e.g., broad ligament hematoma or vulval hematoma.

management :

Initial management : Resuscitation with IV infusion + catheterisation.
P/A : Well contracted uterus – indicative of traumatic PPH.
P/V : Done with the patient in dorsolithotomy position, under good lighting and an assistant must be present to retract vaginal walls so as to locate the site of bleeding.

One of the most important causes of traumatic PPH is perineal tear.

Grading of perineal tear :

- Grade 1 : Tear involving vaginal epithelium or perineal skin only and corresponds to median episiotomy. No muscle damage.
- Grade 2 : Tear of perineal muscles. Corresponds to mediolateral episiotomy.
- Grade 3 : Involvement of anal sphincter.
  - 3a : Tear involving <50% of thickness of external anal sphincter.
  - 3b : Tear involving ≥ 50% of thickness of external anal sphincter.
  - 3c : Tear involving internal anal sphincter.
- Grade 4 : Tear involving anal epithelium or rectal mucosa.

Grade 3 and grade 4 : Complete perineal tear.

WHO recommendations to prevent perineal tear :

- Apply warm compress on the perineum.
- Perineal massage.
- Guarding of the perineum must be done.
- Follow modified Ritgen maneouver : Support the perineum with one hand and maintain the flexion of fetal head with other hand, so that smallest diameter of fetal head comes out first. Once occiput is delivered, then the head will be extended.

Not recommended by WHO : Routine episiotomy or giving fundal pressure.

Management of perineal tear :

1st and 2nd degree perineal tear is repaired like an episiotomy.

Done in labour room under LA.

Sequence : Vaginal mucosa ⟶ muscles ⟶ skin.

Management of 3rd and 4th degree (complete perineal tear)

Done in OT under epidural or GA.

Sequence : Anal mucosa (interrupted suture).

↓

Internal anal sphincter (end to end anastomosis).

↓

External anal sphincter → End to end anastomosis (MC)
→ Overlapping technique

Once the external anal sphincter is repaired; the vaginal mucosa, muscles and skin are repaired like 1st or 2nd degree tear.
Sutures used : 2-0 rapidly absorbing polyglactin suture or chromic catgut.

Important points after repair of complete perineal tear :

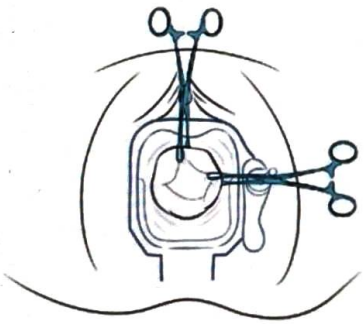
- Give laxatives for 3-4 days.
- Single dose of antibiotics to be given just prior to repair.
- Pregnancy should be avoided for 1 year ideally but atleast for 6 months after repair.
- In future, these females can have vaginal delivery. But if there is h/o ≥ 2 times injury to anal sphincter, delivery should be by C-section.

Cervical tear

00:08:44

MC location : 3 'o' clock position > 9 'o' clock position.

For diagnosis : Careful inspection using 2 sponge holding forceps, both forceps applied to hold the cervical lips at 2 cm from each other and moved in a clockwise direction.



management : If tear < 2cm & no bleeding : Left as such.
If tear > 2cm : Suture the tears starting from apex of the tear.

In case of extensive tear : Rule out retroperitoneal hemorrhage or peritoneal perforation with hemorrhage.

Vulval hematoma

00:10:19

Suspect vulval hematoma in any female after delivery complains of :

- Severe pelvic pain or pelvic pressure.
- Urinary retention/ inability to void urine.
- Signs of hypovemia.

Suspect hematoma especially after instrumental delivery or episiotomy.

Vulval hematoma can also occur spontaneously.

MC site of pelvic hematoma : Vulval hematoma which arise from vestibular bulb or pudendal artery (from inferior rectal, perineal or clitoral branches).

Vaginal hematoma arises from uterine artery.

O/E : Fluctuant, tender, tense swelling.

When there is no external bleeding but patient is in hypovolemic shock, emergency USG should be performed to look for broad ligament hematoma or retroperitoneal hematoma.

Management of vulval hematoma :

Small hematoma and bleeding ceases :

Expectant management with cool packs & analgesics.

Indication for surgical management :

1) Pain is severe.

2) Size of hematoma is increasing.

3) Shock develops.

Surgical management involves :

- Incision & drainage of clots.
- If any bleeder is present → Figure of 8 suture or Angiographic embolisation.
- Close the cavity of hematoma with mattress suture.

Retained placenta

00:13:38

If placenta is not expelled within 30 minutes of delivery of fetus ⟶ Retained placenta.

Reasons :

- Trapped placenta : Placenta is completely detached from uterus but not expelled because internal os has closed. All signs of placental separation present but placenta is retained inside the uterus.
- Placenta attached to uterus but doesnt invade myometrium.
- Placenta accreta spectrum (PAS) : Placenta invades the myometrium.

Trapped placenta :
Occurs due to mismanaged 3rd stage of labor.
Signs of placental separation present.
P/V exam : Lower pole of placenta maybe felt through the os.

management :
1st step : Empty bladder.
If uterus is relaxed : Give oxytocin ⟶ Uterine contraction helps in expulsion of placenta.
If uterus is contracted & internal os is closed :
No use of oxytocin.
Manual removal of placenta is done.

If placenta is attached to uterus but doesn't invade myometrium : Oxytocin + Controlled Cord Traction (CCT).
If this fails, manual removal of placenta is done.

Steps of manual removal of placenta :

- Under GA to relax the uterus.
- Antibiotics given.
- Patient should be in lithotomy position.
- Bring hand inside the uterus.

Active space

With slicing movement, detach placenta from the uterine wall.

↓

Remove the placenta with one hand.

↓

With the other hand, push the fundus up to prevent inversion.

↓

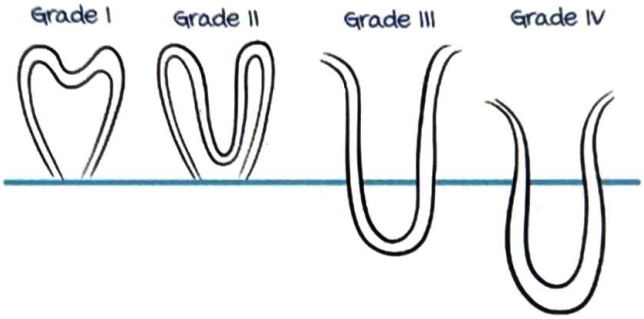
After removal, start oxytocin (20 IU in 500 ml of NS) to contract the uterus so as to prevent PPH.

Uterine inversion

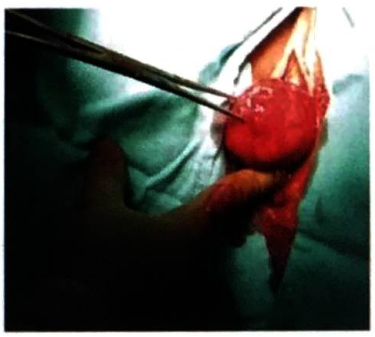
00:18:36

Prolapse of uterine fundus into the uterine cavity.
Etiology : Mismanaged third stage of labor → Applying controlled cord traction before complete separation of placenta from the uterus.

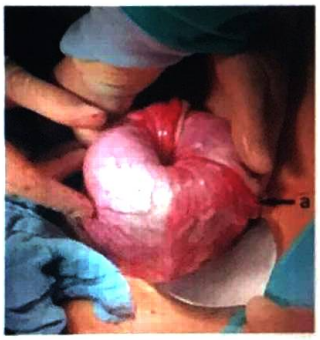
Grades of uterine inversion :



1st degree : Fundus descends into the cavity but not reached the level of os (dimpling of the fundus).
2nd degree : Fundus has reached the level of os i.e still inside the introitus.
3rd degree: Fundus protrudes out through the os.
4th degree : Entire fundus is outside the introitus.



Uterine inversion : Fundus comes out first.
Internal os is never seen.



Uterine prolapse : Whole of uterus + cervis comes out.
Internal os is seen

Inversion can be

- Acute : Occurs within 24 hours of delivery.
- Subacute : Occurs between 24 hours & 4 weeks of delivery.
- Chronic : Occurs ≥ 4 weeks of delivery.

Clinical features :

Mild to moderate bleeding.

Patient goes into shock : When the cord is pulled while placenta is still attached ⟶ Stretching of parasympathetic nerves ⟶ Neurogenic shock.

Hence, suspect uterine inversion when the patient goes into shock immediately following delivery.

Later, the patient goes into hemorrhagic shock (tone is lost once the uterus is outside) leading to maternal death.

MC cause of death in uterine inversion is due to hemorrhagic shock.

P/A : Uterine fundus not palpable or dimple felt over the fundus.

P/V : Uterine fundus can be seen protruding into vagina or entire uterus maybe seen outside the introitus.

Management :

Resuscitative measures + call for help.

Stop oxytocin infusion.

Attempt manual replacement of uterus (Johnson's method) using cupping technique.

No attempt to remove the placenta.

Part which came out first (fundus) is to be replaced last.

↓

If this fails, uterine relaxants are given and manual replacement is attempted again.

↓

If this fails, surgical methods are tried.

Theoretically, O Sullivan's hydrostatic method can be done but not used anymore.

1) Abdominal method : Do laparatomy ⟶ Huntington method of surgery is done.

If constriction ring is present at the level of cervix, it is cut through by Haultain incision.

Once uterine replacement is done (by any method), stop tocolytic, remove placenta and start oxytocin to prevent re-inversion.
Antibiotics should be given.
Use of vaginal surgeries like Spinelli surgery is not recommended anymore.

Amniotic fluid embolism

00:28:36

Occurs at the time of delivery or within 30 minutes of delivery.
Mechanism :
Breach occurs in maternal-fetal interface ⟶ Entry of amniotic fluid into mothers circulation ⟶ Activates systemic inflammatory response ⟶ Pulmonary vascular pressure increases ⟶ Heart failure ⟶ Respiratory failure ⟶ Activation of Factor VIII ⟶ DIC.

Clinical features :

Initially patient complains of breathlessness, tachypnea, cyanosis, altered sensorium.
If patient survives this stage, she may later develop DIC.

Diagnostic criteria for AFE :

- Clinical onset during labor or within 30 minutes of placental delivery.
- Abrupt onset of cardiorespiratory arrest or both hypotension & respiratory compromise.
- Overt DIC.
- No fever.

A patient goes into unexplained shock after delivery, it can be due to AFE.
AFE is a clinical diagnosis without any confirmatory lab test.
AFE is an obstetrical emergency which can lead to maternal mortality within 30–40 minutes.

Active space

Q. A pregnant lady has a cardiac collapse during the delivery. This is followed by profuse bleeding, cardiovascular collapse and history suggestive of DIC. What is the probable diagnosis? (NEET PG 2022)

A. Amniotic fluid embolism.

B. Peripartum cardiomyopathy.

C. PPH

D. Abruptio placenta.

E. Retained placenta.

Q. An intern conducts a delivery. Immediately after delivery mother experiences breathlessness, hypotension, tachycardia and collapses . P/v examination is normal and there is no excessive blood loss. Most probable diagnosis is

A. PPH.

B. Uterine inversion.

C. DIC.

D. Amniotic fluid embolism.

	PPH	Uterine inversion	Amniotic fluid embolism
Time of occurence	I° PPH within 24 hours of delivery	Acute : within 24 hours of delivery	At labor or within 30 minutes of delivery
Presenting feature	Excessive bleeding	Shock which is out of proportion to bleeding	Cardiac & repiratory failure (Reduced BP + breathlessness) Increased HR, cardiac arrest, coma DIC
P/A	Tone of uterus absent	Cup like depression below umbilicus	Normal
P/V	Bleeding +	Rounded mass filling vagina + bleeding	Normal

MALPRESENTATION : PART 1

Occipito-posterior malposition

00:00:25

Malposition : Longitudinal lie, Cephalic presentation, presenting part is vertex.
Position is 6 (ROP), 7 (DOP) or 8 (LOP).

Incidence of Occipito-posterior (OP) position at onset of labor is 10%.

In later stages of labor : 2% (Baby automatically rotates to Occipito-anterior).

m/C cause of OP position : Android pelvis.

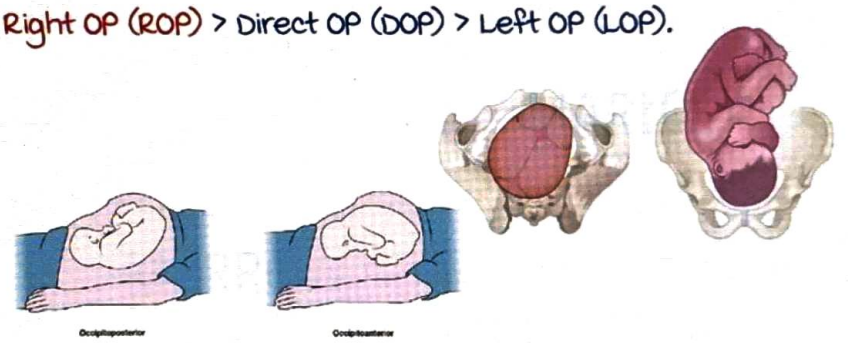
2nd m/C cause of OP position : Deflexed head.

OP malposition is more common in nulliparous females.

Malpresentations are more common in multiparous females.

Most common OP position :

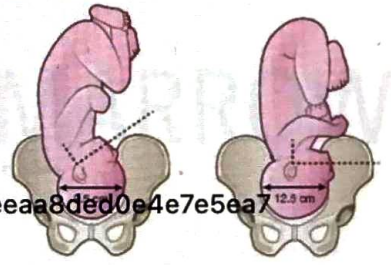
Right OP (ROP) > Direct OP (DOP) > Left OP (LOP).



Per-abdominal examination :

- Abdomen below the umbilicus looks flat.
- Fetal limbs are felt near the umbilicus.
- Anterior shoulder is away from midline.
- Fetal back is towards the flank.
- Fetal heart sounds heard more towards the flanks.

Engaging diameter :

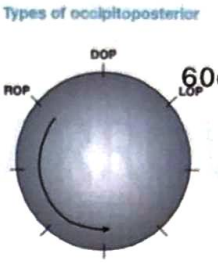


Deflexed :
Occipito-frontal : 11.5cm
or Suboccipito-frontal :
10 cm
↓
Delayed engagement.

Well flexed :
Suboccipito-bregmatic : 9.5 cm

mechanism of labour and possible outcomes in occipito posterior position :

1. In 90% cases : Normal delivery
   Complete forward rotation (most favourable).
   Head rotates through 3/8th of circle → DOA.
   When OP is diagnosed during labour : Wait and watch.
2. Incomplete forward rotation.
3. Posterior rotation.



Incomplete forward rotation 00:16:57

Baby rotates only by 1/8th of the circle.
ROP : Right occipito-transverse (ROT) and further rotation does not occur.
It occurs in :

- Android pelvis : m/c (Ischial spines are prominent).
- Big baby.
- Less liquor.

Deep transverse arrest :
Occurs at level of ischial spine.
m/c pelvis : Android pelvis.

Management :
Android pelvis : Caesarean section.
Other pelvis :

1. Caesarean section (Best).
2. Vacuum delivery (Can rotate head of baby, forceps cannot).
3. Manual rotation followed by forceps delivery.
4. Kielland forceps (Only forceps which can rotate head : Outdated).

Posterior rotation 00:25:20

Occiput rotates posteriorly and lies directly anterior to the sacral promontory : DOP/ persistent OP position.

Active space

m/C in Anthropoid pelvis (AP diameter more than transverse diameter).
Outcome in android pelvis : Face to pubes delivery.
Vaginal delivery when face is towards pubic symphysis and occiput towards sacral promontory.
m/C complication : Complete perineal tear.
Thus it is an indication for episiotomy.

Outcome in any other pelvis :
Baby will not deliver and remains in that position for > 30 minutes → Deep sacral arrest.
Management : Caesarean section.

Transverse lie

00:31:55

Lie : Transverse.
Presentation : Shoulder.
Denominator : Acromion process.
m/C position : Dorso-anterior.
m/C cause : Prematurity
m/C cause at term : Placenta previa
Most often foetus with transverse lie spontaneously rotates during pregnancy and becomes cephalic/ breech.
Examination :

- Height of uterus is less than Period of gestation.
- Leopold manoeuvre : Fundal grip and deep pelvic grip are empty.

Highest chances of cord prolapse are with transverse lie.

External cephalic version

00:35:51

If transverse lie at term : Attempt External cephalic version :
It is done per abdominally.
Baby is rotated to make it cephalic.
Used in transverse lie and breech presentation.

USG is done before doing external cephalic version to confirm:

- Lie of baby
- Adequate liquor.
- Single pregnancy.
- Absence of gross anomalies.

Anaesthesia is not required.

Tocolytics are used to relax the uterus.

DOC : Terbutaline 0.25mg S/C, 30 minutes before procedure.

In Rh negative females : Give Anti D injection.

No routine induction of labor after ECV.

Should be done under continuous fetal monitoring

If fetal distress/ bradycardia occurs during the procedure :

- Stop the procedure.
- Revert the baby to the normal position.
- Immediate caesarean section.

Pre requisites and contraindications for ECV 00:42:14

Pre-requisites for ECV	Absolute contraindications for ECV
Period of gestation ≥ 36 weeks : Usually done at 37 weeks (Less chances of reversion). Liquor should be adequate. 60c6b3eeaa8ded0e4e7e5ea7 membranes should be intact. Can be done in early labor (latent phase) if membranes are intact. Singleton pregnancy Fetal heart rate should be normal on CTG. No contraindication for vaginal delivery.	Oligohydramnios. Ruptured membranes. Active phase of labor. Twin/ multifetal pregnancy. Abnormal fetal heart rate on CTG. Placenta previa/ contracted pelvis. Uterus/ fetus grossly anomalous.

Relative contraindications of ECV :

- PIH.
- Heart disease in mother.
- IUGR.
- Previous LSCS.

Active space

If ECV successful in 1st attempt : Wait for spontaneous labor (Do not induce)

If ECV fails : It can be retried on another day, one more time.

If 2nd attempt is successful : Induce labor with oxytocin drip.

If 2nd attempt fails : Schedule an elective caesarean at 39 weeks.

If ECV fails twice/ is contraindicated/ patient comes with transverse lie during active stage of labor :
Managed by caesarean section (No mechanism of labor).

Management of transverse lie/ shoulder presentation/ neglected shoulder presentation and hand prolapse during labor : LSCS (Whether baby is alive or dead).

Hand prolapse/ neglected shoulder presentation 00:55:54

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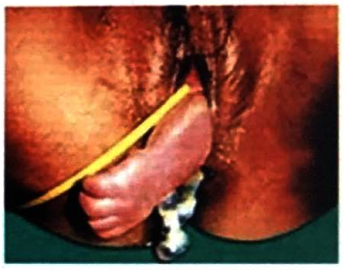
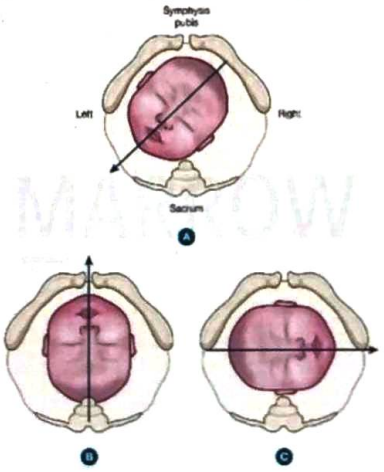
All features of obstructed labor are seen (Bandl's ring seen).
Management : Caesarean section (Whether baby is alive or dead).
No role of destructive procedures (decapitation/ evisceration).



Face presentation 01:00:10

Lie : Longitudinal.
Presentation : Cephalic.
Presenting part : Face.
Abnormal attitude : Complete extension (Normal flexion of fetal head).
Denominator : Mentum.
M/C position : Left Mento-Anterior (LMA).



A : Right Mento-Posterior : Chin faces posteriorly.
B : Mento-anterior: Chin faces anteriorly.
C : Left Mento-transverse.

Risk factors :

Any factor which prevents flexion of baby's head :

1. Tight multiple loops of cord around the neck.
2. Anterior neck mass.

Face presentation is m/c in multiparous females.

m/c pelvis : Platypelloid pelvis.

m/c cause : Anencephaly.

Management :

Mento anterior	Mento posterior
m/c position : Left mento-Anterior. Engaging diameter : Submentobregmatic (9.5 cm). Vaginal delivery is possible. Head is delivered by movement of flexion.	Only caesarean section possible. No mechanism of labor. If patient presents in early labor : Wait and watch.

Delivery occurs by flexion only in breech & face presentation.

Brow presentation

01:13:28

It occurs in partial extension of head.

Bony landmarks on per vaginal examination :

1. Anterior fontanelle (Diamond shaped)
2. Supraorbital ridges.

Engaging diameter : mento-vertical diameter (Longest : 14cm).

Denominator : Frontal bones

No mechanism of labor

Only management : Caesarean section

If brow presentation in early labor : Wait and watch.

MALPRESENTATION : PART 2

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Breech

00:00:10

MC malpresentation : Breech.

In breech :

- Lie : Longitudinal.
- Presentation : Podalic/ Breech.

Incidence of breech :

At 28 weeks : 25-28%.

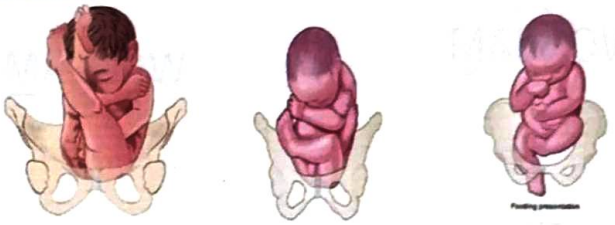
At 34 weeks : Baby spontaneously rotates - 5%.

At term : 3-4%.

MCC of Breech : Prematurity.

MCC of recurrent Breech : Uterine malformation.

Types of Breech :



Hip flexed Knee Flexed	Hip flexed Knee extended	Thigh extended Knee flexed	Thigh extended Knee extended
Flexed/ Complete breech	Frank Breech	Knee presentation	Footling breech
P/V : Heel +Buttocks +Genitalia (m) + Anal	P/V : Buttocks +Genitalia(m)+ Anal	P/V : Knees felt.	P/V : Feet is felt.
MC in multigravida	Least chances of cord prolapse. MC in Primigravida	Chances of cord prolapse ↓ C-Section	Maximum chances of cord prolapse ↓ C-Section

MC variety of Breech : Frank Breech.

LC variety of breech : Complete breech.

Overall maximum chance of cord prolapse :

Transverse lie > Footling breech > Knee presentation.

If the head of the fetus is extended in breech :

Stargazer Breech → C-Section.

Management of Breech

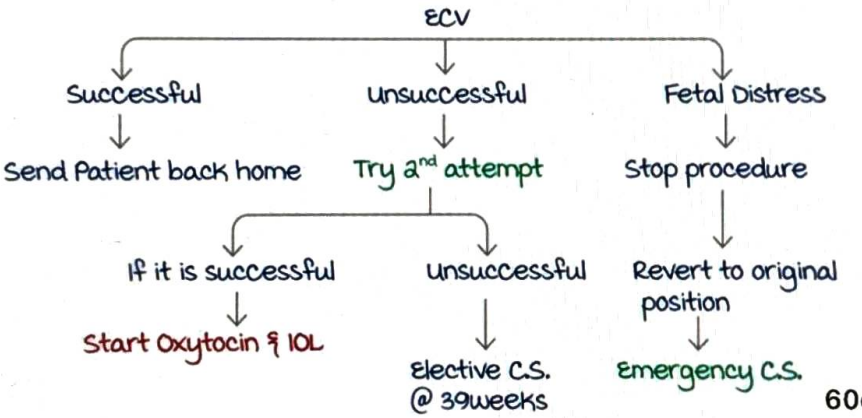
00:12:54

Management at term :

Active space

USG :

- To confirm the diagnosis.
- To assess type of breech : Footling, Knee breech and stargazer breech.
- Rule out :
  Gross Congenital Anomalies (15% chances of breech).
  Hyperextension of neck.
- Estimate fetal weight (ECV is C/I if weight ≥ 4Kgs in breech).
- Check for pre-requisite for ECV.
  If the breech patient comes in pregnancy at >37 weeks and No C/I to ECV
  ↓
  Do ECV in OPD at >37 weeks.
  Contraindications for ECV : Footling breech, Knee presentation & Stargazer Breech.



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Mode of delivery 00:16:33

Cesarean section is the preferred mode of delivery.

Vaginal delivery – Assisted Vaginal delivery :

- Can be done.
- Not a contraindication.
- Has a risk of fetal hypoxic injury as head is last part to be delivered and can get stuck.
- Should be done in centers where facility for Cesarean section is available.
- Done under supervision of Senior doctor.
- Weight of baby <4Kgs.

Active space

Absolute Indications for cesarean in breech delivery

00:19:36

1. Footling/ Knee/ Stargazer breech.
2. Preterm breech (C-Section done if weight < 1500g)
3. Breech with a post-maturity or baby weight >4kgs.
4. Twin with 1st breech.
5. Breech with a previous C-Section.
6. Breech with any other complications of pregnancy like PIH, Placenta previa.
7. Breech score 3 or less.
8. Primi with Breech is a Relative indication.

Assisted Breech Delivery

00:22:32

Lie : Longitudinal.
Presentation : Podalic.
Denominator : Sacrum.
MC position : LSA (Left Sacro- Anterior).
Induction of labor should be avoided.
Augmentation of labor by oxytocin or ARM should be avoided.
Any delay in 1st stage or 2nd stage of labor should be taken as CPD → C-section.
In breech :
Patient can go into C-section anytime → Nil orally

↓

Give IV Fluids.

Patient should be lying as much as possible, Ambulation can lead to rupture of membranes and cord can prolapse.
Do continuous FHR monitoring by Cardiotocogram.

Mechanism of breech delivery

00:28:50

1st part to get delivered in breech is Buttocks.
Engaging diameter : Bitrochanteric diameter (10cm).
In RSA position : Buttocks engage in right Oblique diameter.
Engagement : When the bitrochanteric diameter crosses the pelvic inlet. With descent, Anterior buttock touches the Levator ani muscles.

↓

Levator Ani will rotates the buttock 1/8th of circle anteriorly clockwise directly behind the Pubic symphysis.

↓

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Buttocks lie in AP diameter (from RSA, sacrum goes to RST)

Breech is the only exception where denominator (Sacrum) doesn't lie directly behind the pubic symphysis during delivery.

When Buttocks distend the perineum. i.e climbing up of the perineum

↓

Give episiotomy.

Maneuvers used in breech delivery 00:40:10

For delivery of Buttocks :

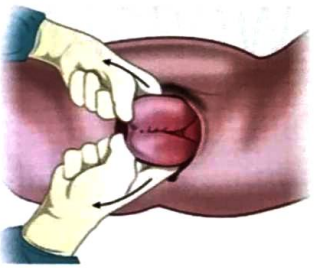
- Delivery of buttocks occurs spontaneously.
- Only if spontaneous delivery of buttocks is not occurring :

Groin Traction (in flexed breech)

(or)

Pinard maneuvers (Unlocking the popliteal fossa in frank breech)

Groin Traction :



Savage Technique :

Once baby is delivered till the level of shoulder, wrap a towel around baby's lower body to prevent cord exposure.

↓

Then proceed for Shoulder delivery

Shoulder delivery 00:46:10

Engaging diameter : Bis acromial diameter- 13cms (lie along right oblique diameter of pelvis).

↓

Shoulder comes into Anteroposterior diameter (Shoulder turns clockwise 45°)

Active space

Anterior shoulder gets delivered first followed by posterior.

If Shoulders aren't in AP diameter :

1. Hold the back of the baby and turn the shoulders in the AP diameter.
2. most of the times, delivery happens spontaneously after this maneuver.
3. If not, Lovsets maneuver.

Lovsets maneuver : Rotate the baby so that the posterior shoulder becomes anterior and the delivery happens.
Deliver the anterior shoulder in same manner.

Delivery of head in breech delivery

00:49:29

Since the head is the last part to be delivered : After-coming Head of breech.

1. Delivery of head in flexed position

↓

Allow the baby to hang on its own weight.

↓

When the nape of neck is visible : Give suprapubic pressure (Promotes flexion of neck)

↓

Hold the legs of the baby & turn it towards mother's abdomen

↓

Head of the baby gets delivered : Burns Marshall Technique.

2. Bracht Technique :
   Same like burns marshal technique but do not let the baby hang by its own weight.
3. Mauriceau smellie veit technique :
   Let the body of the baby rest on the hand

↓

Fingers of left hand on either side of cheeks

↓

Right hand : One finger each on either shoulder of baby, middle finger on occipital protuberance.

↓

Shoulder traction and malar flexion.

4. Delivery of head by forceps :

Piper's forceps : Best way of delivering after coming head.

Long forceps.

Perineal curve also K/a reverse pelvic curve (only forceps with perineal curve).

- After coming head lies along the Left oblique diameter of pelvis. Buttocks and shoulder lie in same oblique diameter while head in opposite oblique manner.
- While rotating the baby, back should always be anterior.

Normal position in breech – Dorsoanterior (back facing the pubic symphysis)

↓

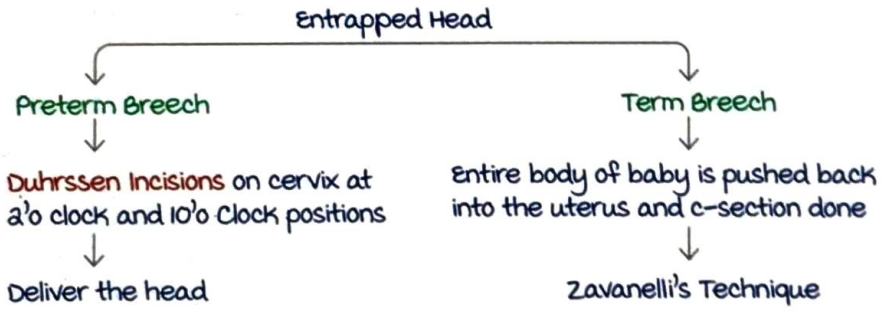
In dorso Posterior breech (back of baby facing sacrum)

↓

Delivery of the head is done using "Prague's maneuver".

Entrapped Head

01:02:15



MCC of death in breech : Intracranial Hemorrhage.

Other complications : Fetal asphyxia.
Hypoxic ischemic encephalopathy.
Abdominal injury of fetus.

Case :

Twin pregnancy in which 1st twin : Vertex
2nd twin : Transverse lie.

1. Vaginal delivery of 1st twin.
2. Patient is shifted to OT and under GA : Internal podalic

version is done → Breech delivery.

3. All maneuvers to deliver all parts by obstetrician without any maternal support.

↓

Breech Extraction.

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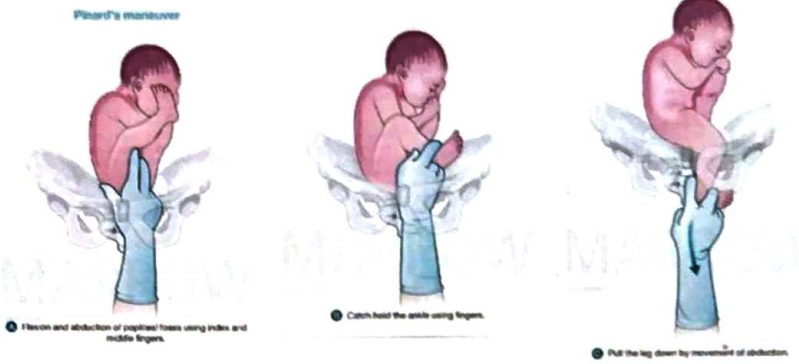
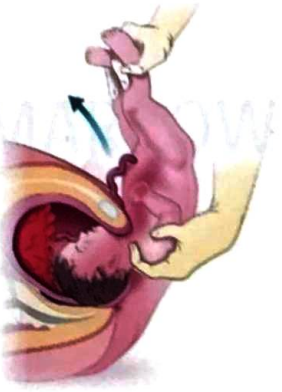


Burns Marshal Technique:

Mauriceau Smellie Veit technique :

Prague's manuever :



Active space

INSTRUMENTAL DELIVERY

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Indications & pre-requisites 00:00:50

Indications :

- Prolonged 2nd stage of labor (station of fetal head ≥ +2).
- Fetal distress (station of fetal head ≥ +2).
- To cut short the 2nd stage of labor (known as prophylactic use of forceps or vacuum) as in maternal exhaustion, heart disease/PIH patient.

Pre-requisites :

- Take consent and give episiotomy.
- Cervix : Fully dilated.
- Head :
  Should be engaged.
  Station of fetal head ≥ +2.
  Head should be rotated (direct occipito-anterior/ posterior position) i.e., sagittal suture should be AP diameter or, maximum rotation should be 45° on either side.
- Pelvis :
  No contracted pelvis.
  No CPD (cephalopelvic disproportion) : Never apply instruments in CPD.
- Uterus : Should be contracting.
- Bladder : Should be empty.

Types of instrumental delivery 00:12:15

Forceps delivery : All the pre-requisites should be fulfilled.
Vacuum delivery : Can be applied even if the cervix is ≥ 6cm; can be used in non-rotated head.
Conditions where vacuum is contraindicated, but forceps is used :

- Preterm babies.

Active space

- Delivery of intrauterine dead baby.
- After coming head of breech.
- Face presentation in mentoanterior position.

Vacuum is used only in vertex presentation.
Condition where forceps is preferred over vacuum : Heart disease in mother.

Absolute contraindications for instrumental delivery :

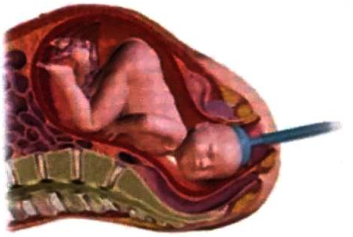
- CPD.
- Inadequate pelvis.
- Known bony deformities of fetus e.g., osteogenesis imperfecta.
- Known coagulopathy in fetus.
- HIV +ve mother.

Vacuum delivery

00:22:26

Silastic cups :

- Softer.
- Less traumatic.
- Easy to apply.
- Shapes : Bell shaped or, mushroom shaped.



Silastic cups are attached to suction machine :

- Initial pressure generated : 0.2 Kg/cm^2
- Maximum pressure generated : 0.8 Kg/cm^2 or 600mmHg.

The criteria is that the pressure can be generated in 2 minutes, so vacuum can be used in fetal distress.

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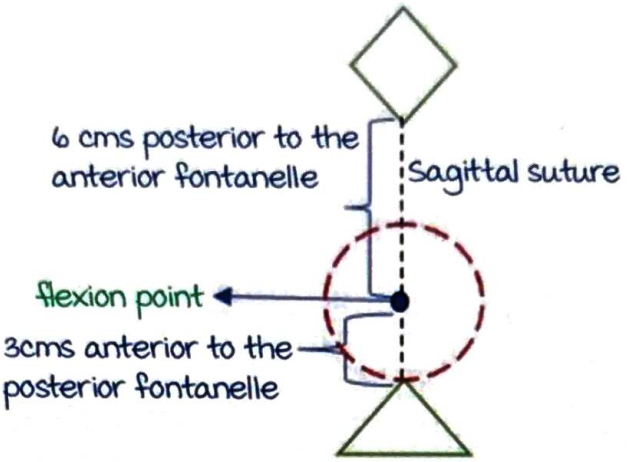
Correct application of vacuum :
Centre of the cup should be at 'flexion point' on the sagittal suture.



The cup commonly used has a diameter of 6cms.

When correctly placed, edge of cup touches the posterior fontanelle.

Distance between centre of cup & anterior fontanelle : 6cms.

Distance between edge of cup & posterior fontanelle : 3cms.

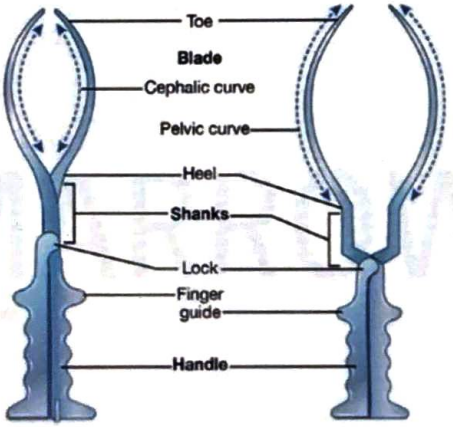
If the cup is anteriorly placed : It can lead to extension of the head.

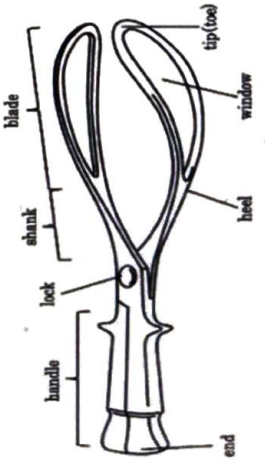
Newer vacuum device – omnicup :

- It has an inbuilt pump to create vacuum.
- Smaller in size.
- It is disposable.
- It is portable.
- It can be used for both OA/OP deliveries.

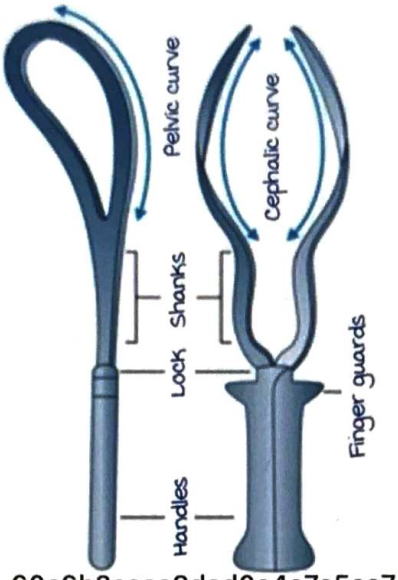
Forceps (forceps delivery) 00:33:11

Parts of forceps :





Active space



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Advantages of fenestration of the blade :

- Makes it light.
- Less trauma.
- Less compression on baby head.

Lock of the blade :

- English lock : Has 2 sockets (one in each handle); most common; always left blade is introduced first.
- Sliding lock.

Sliding lock

English lock

Identifying the left and right forceps :

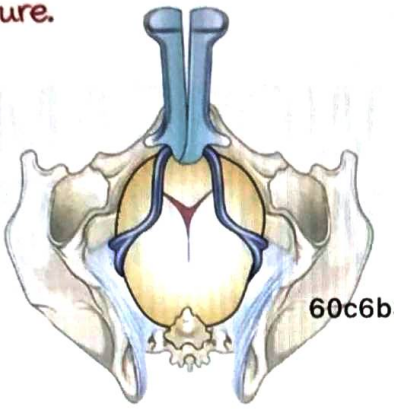
- The term 'left & right' are used with respect to the mother.
- Correct placement/holding : Pelvic curve should be faced upwards.
- In correctly held position, the socket of one of the blades will be upwards & the other will be downwards.
- Left forceps : The socket will be facing upwards in correctly held position.

Active space

- Right forceps : The socket will be facing downwards in correctly held position.

Identifying the correctly applied forceps :

- Lock will close properly.
- The 2 blades after application will be equidistant from sagittal suture.



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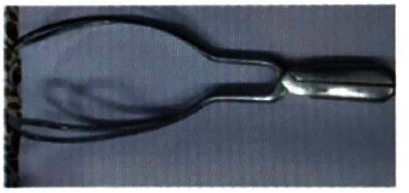
Various types of forceps

00:48:53

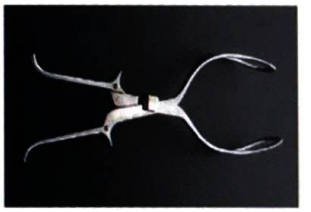
Wrigley forceps :

- Outlet forceps.
- Short and light forceps.
- Total length is 27.5cms.
- Shank is 2.5cms.



Kielland forceps :

- Long forceps.
- The only forceps which can rotate the head of fetus.
- It's a rotational forceps (outdated).
- It has a sliding lock.



Pipers forceps :

- Long forceps with English lock.
- It is the longest forceps.
- Used for delivering the after coming head of breech.

Tucker Mc Lane forceps :

- The only forceps with solid blade.

Active space

Forceps application :

- Low forceps application :
  Station of fetal head ≥ +2, but has not reached perineum.
  Most forceps are low forceps.
- Outlet forceps application :
  Head on perineum.
  Scalp is visible at introitus.
  Skull on pelvic floor.

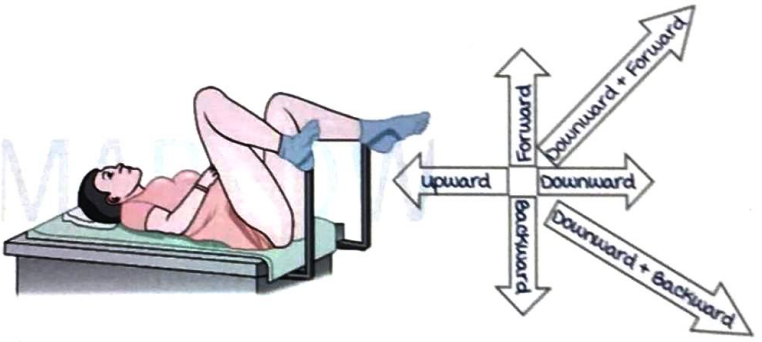
Ideally for applying outlet forceps sagittal suture should be in AP diameter.

Mid cavity forceps application : Applied when head of fetus is at 0/+1 station.

High forceps application : Used when head of baby is above ischial spine.

Mid cavity & high forceps applications are not done nowadays.

Direction of pull when applying forceps 00:56:11



- Ideal position of patient : Lithotomy position.
- Direction of pull is based on maternal abdomen.

Direction of pull in low forceps application :

- 1st pull – downward + backward.
- 2nd pull – downward.
- 3rd pull – downward + forward.

Direction of pull in outlet forceps application :

- 1st pull – downward + backward.
- 2nd pull – downward + forward.

Traction force applied :

- Primigravida – 16 to 18Kgs
- Multigravida – 12 to 13 Kgs.

In a correctly applied forceps, the diameter along which the forceps will be applied : Occipito mental diameter of fetal head.

Complications of forceps & vacuum delivery 01:03:40

Forceps delivery	Vaccum delivery
more of maternal injury.	more of fetal injury.
Fetal complications : • Facial nerve palsy. • Brachial plexus injury. • Corneal injury.	Fetal complications: • VIth nerve palsy. • Shoulder dystocia. • Cephalohematoma. • Subgaleal haemorrhages. • Retinal injury.

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Failed forceps/vacuum delivery :

- Defined as 3 failed trials to deliver the fetus head.
- Management : Cesarean section.

MCQs :

Q : A Primigravida has been in 2nd stage of labor for 2 hours. The head is fully engaged in vertex position and head is at perineum. The cervix is fully dilated, the membranes are absent. The sagittal suture is placed in the transverse diameter. She is getting good uterine contractions but her bearing down efforts are poor. The FHR is dropping to 90 beats per min and not picking up. What is done next?

A. Forceps vaginal delivery.
B. Vacuum vaginal delivery.
C. Allow bearing down for one more hour.
D. Cesarean section.

Active space

Q : A Primigravida has been in 2nd stage of labor for 2 hours. The head is fully engaged in vertex position, at (+2) station. The cervix is fully dilated, the membranes are absent. The sagittal suture is placed in the anteroposterior diameter. She is getting good uterine contractions but her bearing down efforts are poor. The FHR is dropping to 90 beats per min and not picking up. What is done next?

A. Counsel for instrumental delivery.
B. Counsel for cesarean section.
C. Allow bearing down for one more hour.
D. Oxytocin augmentation.

Q : Vacuum is not applied in :

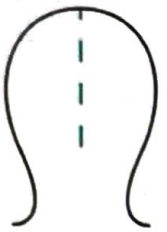
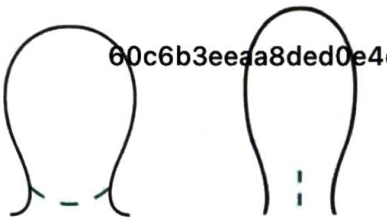
A. Persistent occipitoposterior position.
B. Maternal Heart disease.
C. Maternal exhaustion.
D. Preterm fetus.

Q : Forceps should not be used in :

A. Twins.
B. After coming head of breech
C. Post maturity.
D. Hydrocephalus.

CESAREAN SECTION

Types of Cesarean Section Incision 00:00:35

Classical Cesarean section [CCS]	Lower Segment Cesarean section [LSCS]
Incision on upper uterine segment. 1. Sanger's Incision.  Upper segment : Thick & contractile part. Disadvantages : • Bleeding is more • Repair is difficult • Healing not that good • Risk of rupture in subsequent pregnancy : 4–9%.	Incision on lower uterine segment. 1. Kerr Incision (MC). 2. Kronig/ De- Lee Incision.  MC done : Lower transverse incision (curvilinear). • Stretches during labor. • Non-contractile part (relatively). Advantages : 1. Bleeding is less 2. Repair is easy 3. Healing is better 4. Fewer chances of rupture in next pregnancy : 0.2–0.9%.

In almost all cases LSCS is done.

VBAC (Vaginal delivery after cesarean section)/Trial of scar :

- After LSCS due to an indication other than the contracted pelvis.
- Previous history of 1 LSCS.
- Previous history of 2 LSCS.

Previous history of 3 or more LSCS → Cesarean section.

In case of classical Cesarean section (even if previous history of 1 CCS) → Cesarean section (No VBAC).

Indications of Classical Cesarean section :

When access to lower segment is difficult :

- Lower uterine segment is adhered to bladder.
- Severely contracted pelvis.
- Cancer cervix.

When there is a morbidly adherent placenta attached to the lower segment (placenta previa).

Lower segment is not formed (early preterm cesarean).

To deliver in case of a transverse lie (midline incision is better).

Kronig Incision :

Indication : Constriction ring.

Chances of uterine rupture : 1–7%.

VBAC cannot be tried.

Can cause bladder injury if incision extends.

Anaesthesia & Robson Classification 00:14:18

Preferred : Spinal Anaesthesia (T4).

Indications for general anesthesia :

- Severe fetal distress.
- In certain heart conditions :
  - S : Intracardiac shunt.
  - H : HOCM.
  - E : Decreased ejection fraction (Severe AS/AR).
  - P : Pulmonary hypertension.
- In severe pre-eclampsia : If umbilical doppler shows → AEDF (Absent end-diastolic flow) : Cesarean section at 34 weeks.

  REDF (Reversed end-diastolic flow) : Cesarean section at 32 weeks.

Robson Classification :

Given by WHO.

Also known as 10 point classification.

Used by various institutes to compare the rates of cesarean sections and indications of cesarean section.

5 Parameters used :

1. Parity : Primigravida.
   Multigravida without previous history of cesarean section.
   Multigravida with the previous history of cesarean section.
2. Gestational age : Term or Preterm.
3. Presentation : Cephalic/Breech/Transverse lie.
4. No. of fetus : Single/multifetal.
5. Spontaneous labor/Induced labor.

10 groups : Based on 5 parameters.

Group 1 :	Primigravida, Term, Cephalic presentation, Single fetus, and Spontaneous labor.
Group 2 :	Primigravida, Term, Cephalic presentation, Single fetus, and Induced labor.
Group 3 :	Multigravida (without p/h of CS), Term, Cephalic presentation, Single fetus, and Spontaneous labor.
Group 4 :	Multigravida (without p/h of CS), Term, Cephalic presentation, Single fetus, and Induced labor.
Group 5 :	Multigravida (with p/h of CS).
Group 6 :	Primigravida with breech.
Group 7 :	Multigravida with breech.
Group 8 : Group 9 : Group 10 :	M : Multifetal pregnancy. T : Transverse lie. P : Preterm fetus.

Active space

Steps of Cesarean Section : Skin, Muscle, & Sheath

00:22:50

Before cesarean :

Consent.

Foley's catheterization.

Antibiotic prophylaxis :

Elective : 60 mins before cesarean.

Emergency : ASAP.

DOC : Cephalosporin (Cefazolin 2g i.v single dose)

Or

β Lactam antibiotics.

- In allergic patients : Clindamycin + Gentamicin (single dose)

Generally single dose of antibiotics needed but if :

1. If blood loss ≥ 1500 mL.
2. Duration of surgery ≥ 3hrs

↓

Antibiotics needed in the postoperative period also.

Part preparation : Shaving is not recommended.

Position of the patient : Supine with 15° left lateral tilt of table.

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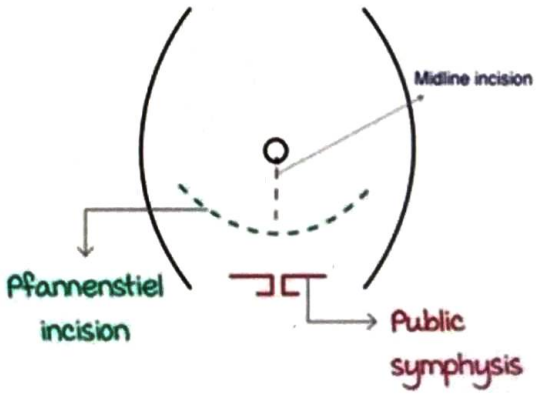
Place a wedge under the right hip.

↓

To avoid : IVC compression/Supine hypotension syndrome



Procedure →

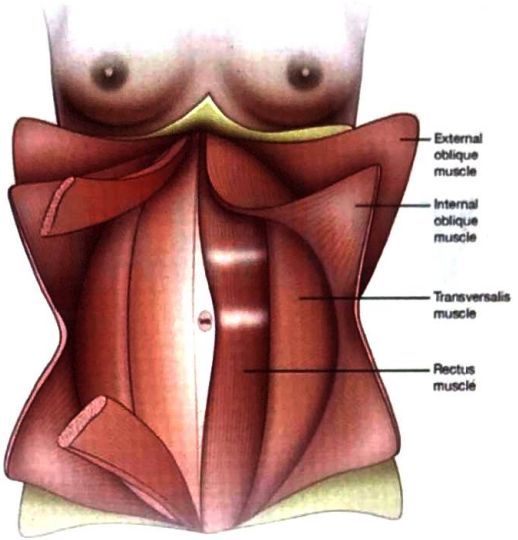
1st incision : Skin incision.

1. Midline incision.

a. Lower transverse abdominal incision :

Pfannenstiel incision.

- Preferred.
- 2cm above pubic symphysis.
- Landmark : Just above the pubic hairline.



Muscles of abdomen :

(Anterior to posterior)

External oblique muscle.

Internal oblique muscle.

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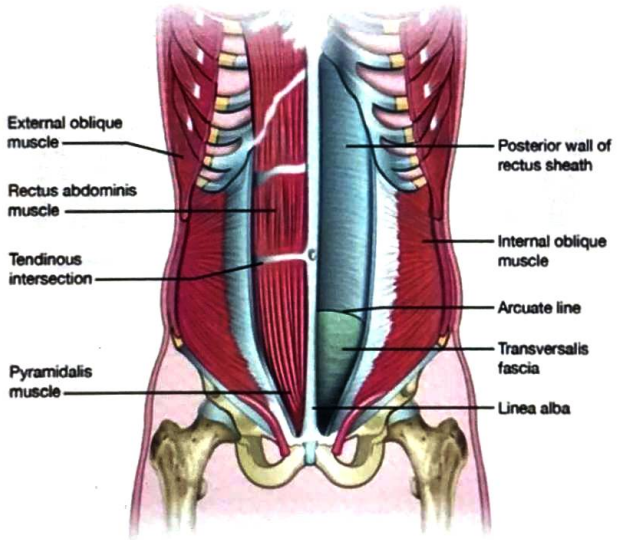
Transversalis muscle/Transversalis abdominis.

Fascia transversalis.

Rectus muscle : Below the anterior rectus sheath.



Rectus Sheath & Arcuate line 00:30:20

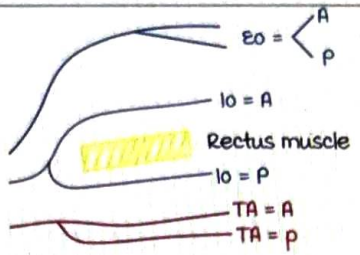
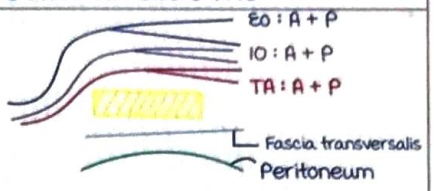
Rectus sheath :

Formed by aponeurosis of external oblique [EO], internal oblique [IO], and transverse abdominis [TA].

Each aponeurosis has two lamellae : Anterior & posterior.

Rectus sheath has a superior and inferior epigastric artery.

Composition :

Above arcuate line	Below arcuate line
	
Anterior rectus sheath : • External obliques (ant & post lamellae) • Internal oblique (ant lamellae) Posterior rectus sheath : • Internal oblique (post lamellae) • Transverse abdominis (ant & post lamellae)	Anterior rectus sheath : • External obliques (ant & post lamellae) • Internal oblique (ant & post lamellae) • Transverse abdominis (ant & post lamellae) Posterior rectus sheath : • Fascia transversalis • Peritoneum (Parietal)

Arcuate line :

Situated midpoint between umbilicus & pubic symphysis.

In a Pfannensteil incision : Anterior rectus sheath (thick).

↓

Rectus muscle

↓

Posterior rectus sheath (fascia transversalis & peritoneum)

↓

Abdominal cavity.

Nerves : Direction in anterior abdominal wall is transverse.

- In midline incision : Do not cut the nerves.
- In Pfannenstiel incision : Not likely to injure the nerve unless the incision is extended very laterally.

Blood vessels : Superior & inferior epigastric artery.

- In midline incision : Very little chance of injury.
- In Pfannenstiel incision : more chances if incision is given higher up.

Ilioinguinal & Iliohypogastric nerve :

Sensory nerves.

Both of them perforate rectus sheath just lateral to rectus muscle → Supply anterior abdominal wall & skin.

Iliohypogastric nerve : Supplies skin over the suprapubic area.

Ilioinguinal nerve : Rectus sheath

↓

Penetrate inguinal canal

↓

Come out of superficial inguinal ring

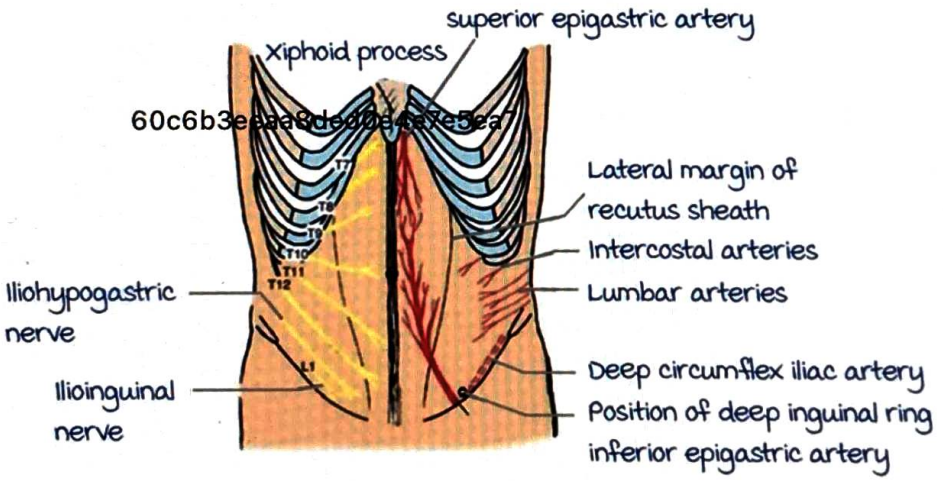
↓

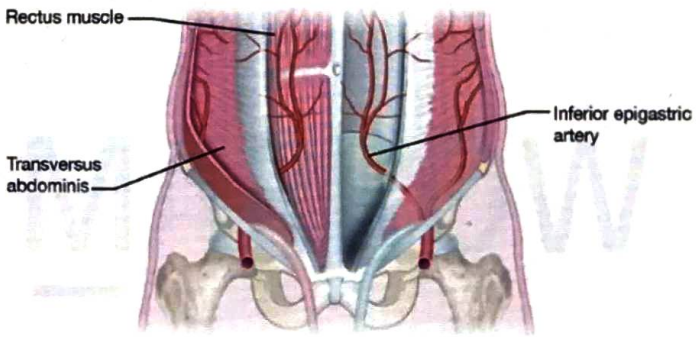
Supply skin over mons pubis, upper labia majora, and upper medial thigh.

In transverse incision : Might injure these nerves if the incision is too lateral.

↓ if injured

Females have a loss of sensation in the areas supplied by these nerves.





Active space

Inferior epigastric artery :

Do not cut the rectus muscle : It automatically separates.

Incision on the rectus sheath should be given lower down (inferior epigastric artery present upwards).

If an inferior epigastric artery is injured and not repaired → Can lead to hematoma formation.

Midline vs Pfannensteil skin incision

00:42:15

Midline skin incision.	Pfannensteil skin incision.
Quick entry. more exposure. Less bleeding. Minimal nerve damage. Wound dehiscence more as less blood supply.	Cosmetically better. Stronger. Preferred.
Cosmetically not good. ↓ Not preferred.	

Steps of Cesarean Section : Procedure

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Cut skin

↓

Cut subcutaneous tissue

↓

Reach rectus sheath

Skin : Pfannensteil incision (2cm above pubic symphysis)

↓

Subcutaneous tissue : Cut.

↓

Anterior rectus sheath : Small incision with scalpel.
Extend incision with fingers/scissors
(Tip should be pointed upwards)

With back end of the scalpel separate the sheath from rectus abdominis muscle.

↓

Rectus abdominis muscle : Need not cut the muscle.
Mid-line aponeurosis (due to attachment of sheath).
Cut the midline aponeurosis first : muscle separates automatically.

↓

Posterior rectus sheath : Fascia transversalis easily separated with fingers.
Parietal peritoneum : Cut it a little higher (lift with help of forceps & cut in the center).

↓

Retract the bladder.

↓

Visceral peritoneum : Identify the loose fold of peritoneum.
Lift and incise
Extend with help of scissors (Tip should be pointed upwards).
Do not go very laterally : Uterine vessels might be injured.

↓

Lower uterine segment : Small incision with scalpel.
Put finger and extend (to decrease the chances of injuring the baby).
Extend incision with the help of scissors with a finger in place.
Do not go very laterally : Uterine vessels might be injured.

Or

Extend uterine incision with fingers only.

↓

Head of the baby visible : Remove retractor.
Deliver the head of the fetus keeping in mind to maintain flexion of the fetal head.
fundal pressure : To help in the final descent.

↓

Check cord around the neck : Remove cord (if around neck) & then deliver head of baby.

↓

Head of baby → Anterior shoulder → Posterior shoulder → Entire body.

Management of 3rd stage of labor :

Same in cesarean and vaginal delivery.

- Delayed cord clamping.
- Remove placenta by controlled cord traction.
- Give oxytocin injection.

Placenta delivered.

↓

Baby handed over.

Closing the uterus and moving upwards :

Uterus : Hold the angles (by Green armytage/Allis forceps).

Closure of uterine incision : Single layer/double layer.
Single-layer is quicker. Continuous sutures.

↓

Do instrument/sponge count. Field is made clear. Hemostasis has been maintained. All suction has been done before closing the abdominal wall.

↓

Check tubes and the ovaries are fine.

Steps of Cesarean Section : Closure 00:54:44

Peritoneum : May close (to reduce risk of adhesions) or may not.

↓

Rectus abdominis : Not closed.

↓

Rectus sheath : Continuous sutures.

↓

Subcutaneous tissue : Not closed.

↓

Skin : With interrupted/subcutaneous sutures or use staplers.

↓

Do Vaginal toileting & then apply occlusive dressing over skin.

Video & General points 00:59:06

General points :

- Elective cesarean section-time for non-medical reasons : 39 weeks.
- Ideal gap between cesarean section and next pregnancy : 18 months.
- Minimum gap between cesarean section and next pregnancy : 6 months.

Type I Cesarean section : Time you decide to do an emergency cesarean section to the delivery of the fetus < 30 mins.

Previous Cesarean section Pregnancy 60c9b3eeaa8ded0e4e7e5ea7 01:14:15

High-risk pregnancy.
Risk of complications : Can lead to →

1. Abortion.
2. Ectopic pregnancy (d/t adhesions).
3. Preterm delivery.
4. Morbidly adherent placenta.
5. Uterine rupture.
6. PPH

Active space

Delivery in a case with previous history of CS :

VBAC can be done if :	Vaginal birth not done if :
Maximum 2 LSCS in past. Adequate pelvis. No diabetes, macrosomia, post-term pregnancy (in current pregnancy). No malpresentation in present pregnancy. Indication of past cesarean : Non-recurrent indication.	≥3 LSCS in the past. Contracted pelvis. CPD, diabetes, macrosomia, post-term pregnancy present (in current pregnancy). Malpresentation in present pregnancy. Cesarean done for contracted pelvis (recurrent indication).
Tried at higher center with : • Facility for emergency cesarean section. • Facility for blood transfusion.	Lower centre.
No other uterine scar of complete thickness. No history of extension of scar into upper segment.	Hysterectomy/Myomectomy scar. Classical cesarean section. Kronig incision. T-shaped incision.
No history of uterine rupture in the past.	History of uterine rupture in the past.

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Previous CS was done for Macrosomia : VBAC can be tried. (If no macrosomia in current pregnancy).

Previous CS was done for Breech : VBAC (No breech in current pregnancy).

Previous CS was done for fetal distress and present pregnancy has twin/PIH : VBAC can be tried but chances of VBAC success are less.

Success of VBAC : 74%.

Chances of success of VBAC increased : If there is previous history of vaginal delivery (even a single vaginal delivery).

IOL (induction of labor) : Is not contraindicated in the previous cesarean section.

Monitor :

1. Partograph monitoring : Continuous CTG monitoring.
2. IOL : mechanical method by Foleys catheter.
   Prostaglandins are contra-indicated.
3. Cut short 2nd stage of labor by instrumental delivery.
4. Monitor uterine scar integrity every 30 mins.
   ↓ if tender
   Impending uterine scar

Signs & Symptoms of impending uterine scar rupture

01:32:53

Impending scar rupture = Scar dehiscence (serosal layer is intact).

Scar dehiscence ≠ Scar rupture (serosal layer is ruptured).

Sign & symptom of scar dehiscence/impending scar rupture :

Maternal : Tachycardia.
Vaginal bleeding.
Haematuria.
Per abdomen examination : Supra-pubic tenderness & uterine contractions present (absent in scar rupture).
No shock or free fluid present.

Most consistent finding : Abnormal fetal heart rate
(1st : Fetal tachycardia).

Management : Stop VBAC → Immediate cesarean section.

VBAC = Trial of scar.

VBAC ≠ Trial of labor (done in patients of CPD without previous history of cesarean section).

Active space

missed the signs of impending rupture → Uterine rupture occurred.

Signs & Symptoms of Uterine Rupture 01:37:25

Maternal : Shock present.

Free fluid present in peritoneum.

On p/a examination : No uterine contraction felt.
Fetal parts felt superficially.

On p/v examination : Profuse vaginal bleeding.
Profuse haematuria.
Loss of station of fetal head.
(baby recedes back into the abdomen).

Management : Resuscitation

+

Exploratory laparotomy : Remove placenta and baby.

+

Repair uterus.

↓ if not possible.

Hysterectomy.

PUERPERIUM

Introduction 00:00:09

Definition : Period after childbirth.

Now called as 4th trimester (ACOG Guidelines).

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4th trimester : Period following childbirth & upto 12 weeks after that.

Puerperium : Till 4 to 6 weeks after delivery.

Post natal visits recommended by ACOG :

- Initial visit : 3rd week.
- Final visit : 12 weeks.
- Between this time : Number of visits depends on need.

Post natal visits recommended by GOI :

4 post natal visits :

- First visit : 1st day after delivery.
- Second visit : 3rd day after delivery.
- Third visit : 7th day after delivery.
- Fourth visit : 6 weeks after delivery.

Anatomical & Physiological changes :

Organ/ site	Change	Important points
Uterus		
Immediately after delivery.	At the level of umbilicus. Has a consistency of a cricket ball. ↓ Fundal height decreases by 1 cm/day (1 finger breath per day).	Weight of uterus : 1000 g. 2 days after delivery : Fundal height will be 2 finger breaths below the umbilicus.

Active space

After 1 week. After 2 weeks After 4 weeks	Midway between umbilicus & pubic symphyis. Not palpable. Involution complete.	Weight of uterus : 500 g. Weight of uterus : 300 g. Weight of uterus : 100 g. Process of involution occurs due to the decrease in size of muscle fibers & not their number. Sonographically, uterus returns to pre pregnant state by 8 weeks. Involution is faster in nulliparous than multiparous.
Lower Uterine segment	Contracts & becomes isthmus.	
Cervix	10 cm dilated after delivery. ↓ Remains 2 to 3 cm dilated for few days after delivery & then contracts.	
External OS	Multiparous : Transverse slit. Nulliparous : Pinpoint/circular.	

Endometrium	During pregnancy, placenta produces progesterone which supports endometrium (Decidua). After delivery, placenta is delivered. ↓ Decreased progesterone. ↓ Support to decidua lost. ↓ Decidua shed (lochia).	Lochia : Shedding of decidua after delivery. Components : • Decidua. • Blood. • leucocytes. • Exudates. Sequence : Lochia rubra. ↓ Lochia serosa (≥ 4 days). ↓ Lochia alba (≥ 10 days). Average duration of lochia discharge : 24 to 36 days.
Placental site involution	Takes 6 weeks time. Immediately after delivery, placental size = size of palm. By the end of 2nd week, becomes 3 to 4 cm in diameter.	

Ovarian function

00:06:50

1. In partially /Not breast feeding female :
   - Menstruation returns by 6 to 8 weeks.
   - Ovulation occurs by 5 to 11 weeks (mean : 7 weeks).
   - Earliest by 28 days.

2. In breast feeding females :

- Ovulation & menstruation are delayed.
- Risk of pregnancy in breast feeding females : 4% /year.

Rule of 3 :

- Contraception in partially /not breast feeding female :
  Advised by 3 weeks after delivery.
- Contraception In breast feeding females :
  Advised by 3rd month after delivery.

Normal changes in females after delivery :

1. Marked leucocytosis (Not more than 25000/microliter).
2. Marked thrombocytosis.
3. Increase in granulocytes.
4. Relative lymphopenia.
5. Absolute eosinopenia.
6. Hemoglobin & hematocrit decreases.
7. Increased fibrinogen of pregnancy is maintained first week postpartum.
8. During pregnancy :
   Sodium & potassium retention → Post partum diuresis.

Return of parameters back to normal :

1. Blood volume : 1 week after delivery.
2. Cardiac output : 10 days after delivery (In initial 24 to 48 hours ,it is elevated).
3. GFR : 2 weeks.
4. Dilated ureter & renal pelvis : 2 to 8 weeks.
5. Urinary retention is common.
6. Weight loss :
   Weight loss of 5 to 6 kg (Immediately after delivery) + subsequent weight loss of 2 to 3 kg (due to postpartum diuresis).

Clinical scenario 1 :

A multiparous female after delivery complaints of pain in abdomen. The pain is similiar to uterine contraction and increases during breast feeding.

Diagnosis : After pains.

Active space

- Due to uterine contractions which occur at intervals after delivery.
- Seen in multiparous females.
- Increases with suckling of breast due to release of oxytocin.
- Decrease in intensity and becomes mild by day 3.
- Females with postpartum uterine infection : Pains are severe and persistent.

Clinical scenario 2 :

During post natal visit, on day 7 after delivery, uterus was felt 2 finger breadth below umbilicus. Patient also complaints of excessive uterine bleeding. USG was advised which showed enlarged uterus with tubular hypoechoic areas in myometrium.

Diagnosis : Sub involution.

- Due to
  - Incompletely remodelled spiral arteries.
  - Retained placental fragments.
  - Infection.
- Complaints of excessive uterine bleeding or prolonged lochia.
- On bimanual examination, Uterus is bigger than expected.
- Differential diagnosis : Retained placental products.
- Investigation of choice : Pelvic USG.
  - Thick endometrium with vascularity in it : Retained placental products.
  - [illegible] hypoechoic areas in myometrium : Neovascularization & dilated vessels i.e subinvolution due to incompletely remodelled spiral arteries.
- Management :
  - Uterotonic drugs.
  - If it fails , then curettage done :
  - Carries the risk of developing Asherman's syndrome.

Active space

Monitoring in postpartum period

00:15:00

All females who are undergoing delivery are monitored for 2 hours after delivery.

In these 2 hours, every 15 minutes :

- Intermittent assessment of uterine tone.
- Blood pressure & pulse rate.

Temperature :

- Every 4 hours for first 8 hours and then every 8 hours.

Female is orally allowed : 2 hours after vaginal delivery.

Female should void within 4 hours after delivery.

↓

If not, do USG.

↓

Residual volume > 200 ml and patient unable to void.

↓

Catheterize for 24 hours.

Discharge :

- Uncomplicated vaginal delivery : 48 hours of delivery.
- Caeseran section : 96 hours after caeserean.

Sexual activity can be resumed by 2 weeks after delivery.

Contraindications of breast feeding :

1. Maternal causes :
   - Drug abusers.
   - Uncontrolled alcoholic.
   - Active/ untreated TB.
   - Active herpes infection with lesion on breast.
   - Undergoing breast cancer treatment.
   - On drugs like cyclophosphamide,cyclosporine, doxorubicin, methotrexate & mycophenolate.
2. Infant causes :
   - Galactosemia.

Breastfeeding is not contraindicated in :

- Covid 19 infection.
- HIV +ve patients (NACO guidelines).
- Hepatitis B + ve : If infant has received immunoprophylaxs.
- Herpes Simplex : If no breast lesion present.
- After gadolinium MRI.

Puerperal pyrexia 00:18:33

Definition :

Temperature (oral) ≥ 38°C or 100.4°F on 2 days within first 10 days of delivery excluding first 24 hours.

most important risk factor : Caeserean section.

Therefore a single dose of pre operative antibiotics is recommended in all females undergoing LSCS.

Microbiology : Polymicrobial.

Pathogenesis :

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Micro organisms in cervix & vagina.

↓

Risk factors : C section, PROM, Prolonged labor, multiple vaginal examination.

↓

most important cause:

Infection of placental site (last to involute).

OR

Wound infection : Uterine incision infection.

↓

Endometritis :

- Fever.
- Tachycardia with parallel rise of fever.
- Midline lower abdominal pain.
- Uterine tenderness.

↓

Spread to :

- Myometrium.
- Parametrium.
- Pelvis/ Peritoneum.
- Bloodstream : septicemia.

Investigations :

- Increased WBC (15000 to 30000) : normal during puerperium.
- Blood culture : Depending on patients condition.
- Endometrial culture : Not done.

Management :

- Mild endometritis following vaginal delivery :
  Oral amoxiclav + oral metronidazole.
- Infection following caeserean section :
  IV Ampicillin + Gentamycin.

When is afebrile for 24 hours : switch to oral antibiotics.

Most persistent fever after childbirth caused by : Genital tract infections.

First 24 hours are exuded : generally low grade fever present and resolves.

If fever ≥39°C within first 24 hours : Group A streptococcal infection.

Breast fever :

- Occurs in non breast feeding female due to breast engorgement.
- Rarely ≥ 39°C.
- Lasts < 24 hours.

Obstetric neuropathy 00:22:56

Female after vaginal delivery :

1. Complaints of burning sensation, numbness, tingling over upper outer thigh, lateral hip pain.

Nerve involved ↓

Lateral cutaneous nerve of thigh.

most common nerve injured during vaginal delivery.

No motor fibers involved : No motor deficit.

2. Complaints of weakness of quadriceps muscle (sparing the adductors) & Sensory loss over anterior and medial thigh.

↓

Femoral nerve.

2nd most common nerve injured during vaginal delivery.

3. Complaints of foot drop :

↓

Peroneal nerve.

Due to prolonged squatting.

Due to palmar pressure during fundal pressure.

Most common nerve injured after caeserean section :
ilioinguinal nerve & iliohypogastric nerve.
Most common nerve injured during McRobert's manouvre :
Lateral cutaneous nerve of thigh.