NEET SS OBG

GYNAECOLOGY

2

CONTENT

CONGENITAL MALFORMATIONS OF THE UTERUS

Relevant anatomy

00:00:43

- In females : genital tract is formed by the paramesonephric ducts (mullerian ducts).
- In males : From Wolffian duct (mesonephric duct).
- Mullerian ducts(MD) are an invagination of coelomic epithelium (at 6 weeks) and grow downwards alongside mesonephric ducts enclosed in peritoneal folds that later give rise to broad ligament of the uterus.

In early intrauterine life, both mullerian duct and Wolffian duct are present in both the sexes, enclosed in broad ligament.

Remnants of the mesonephric duct (Wolffian Duct) :

- Epoophoron
- Para oophoron
- Gartner's duct

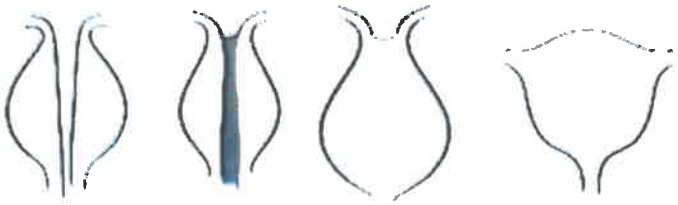
} contents of broad ligament

In females : mullerian duct grows d/t lack of Anti-Mullerian hormone (AMH) in intrauterine life.
In males, AMH is formed by the sertoli cells of the testis.

During Paramesonephric duct elongation, certain Homebox genes (HOX genes) in group 9-13 play an important role in development.

- HOX 9 : Fallopian tube.
- HOX 10, 11 : Uterus.

At 10 weeks : The two distal parts of MD approach in the midline and fuse to form uterovaginal canal/septa.
At 12 weeks : mesonephric duct regresses.



Stages of development

Both MD approach each other and fuse (Fusion begins from below upwards direction) → Septa is formed (Uterovaginal canal) → Septa dissolves and a single uterine cavity is formed by 20 weeks (from below upwards).

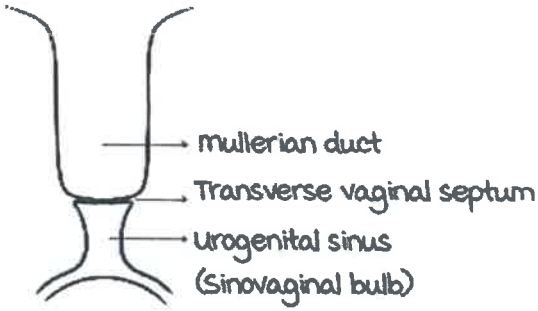
↓

Fundus becomes dome shaped

MD gives rise to :
- One side fallopian tube.
- 1/2 of uterus.
- 1/2 of cervix.
- 1/2 of upper part of vagina.

Vaginal development :
- Upper part (2/3rd or 1/3rd) : Mullerian duct.
- Lower part (1/3rd or 2/3rd) : Sinovaginal bulb part of urogenital sinus.

Transverse vaginal septa is formed by fusion which dissolves by 20 weeks forming a single vaginal canal.



Complications in a female with mullerian malformations :

Obstetric complications :
1. Recurrent pregnancy loss (RPL).
2. Abortion.
3. Preterm labor.
4. Malpresentations.
5. Ectopic pregnancy : Unicornuate pregnancy.

Gynaecologic complications :
1. Infertility.
2. Endometriosis.
3. Dysmenorrhea : Generalised (U/L dysmenorrhea : Unicornuate uterus)
4. Outflow tract obstruction : Hematometra.

NOTE : In young pubertal females with C/O endometriosis : Always rule out mullerian malformations.

m/c complaints in female with mullerian malformations : Obstetrics complications (RPL) > infertility.

1st Investigations : Incidental finding on USG (RPL) /HSG (infertility).
HSG is not IOC : It cannot differentiate between bicornuate & septate uterus as the outer contour & fundus of uterus cannot be visualised on HSG.

Hysterosalphingography (HSG) :

- A water soluble iodinated radioopaque dye is passed inside the uterus with the help of Leech-Wilkinson cannula (funnel shaped with transeverse serrations).
- Followed up with serial X-rays.

IOC of mullerian malformations : 3D USG.
Gold standard : MRI.
Last resort : Laproscopy + Hysteroscopy.
MC indication for doing surgery in mullerian malformations : RPL.

Class I : Mullerian Agenesis 00:16:57

Description : Both mullerian ducts are absent

- No Fallopian tube (distal part present).
- No uterus.
- No cervix
- No upper vagina (Generally complete vaginal agenesis)
- Ovaries are normal (develop from genital ridge)

Associated problems :

- Renal anomalies (30-50%) : Renal agenesis, Horse-shaped Kidney.
- Skeletal anomalies (10-15%).

NOTE : Hence in all cases of MRKH syndrome, intravenous pyelography (IVP) and skeletal X-rays must be done.

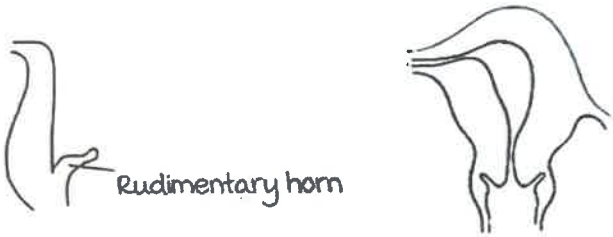
MRKH syndrome D/D : Androgen Insensitivity syndrome (AIS)

Obstetrical comlications :
- Primary amenorrhea.
- Infertility

MRKH : Mayer-Rokitansky Kuster Hauser syndrome.
MURCS : Mullerian agenesis, Renal anomalies, Cervical somites.

Class II : Unicornuate Uterus

00:20:52



Description : Only one side mullerian duct develops to form
- Fallopian tube : 1
- Uterus, cervix, upper vagina : 1/2

Other side either complete agenesis or rudimentary horn (communicating or non-communicating).

Associated problems :

Overall increased chances of :
- Endometriosis.
- Infertility.
- Ipsilateral renal anomalies (2nd m/c mullerian malformation associated with renal anomalies).

Non-communicating horn with active endometrium present :
- Cyclical u/L dysmenorrhea.
- u/L hematometra.

Obstetric complications :
- Increased spontaneous abortion.
- Increased preterm deliveries.
- If pregnancy occurs in rudimentary horn : Uterine rupture (prior to 20 weeks).
- Ectopic pregnancy in the rudimentary horn.

NOTE : mullerian malformation asscociated with increased risk of ectopic pregnancy : Unicornuate uterus.

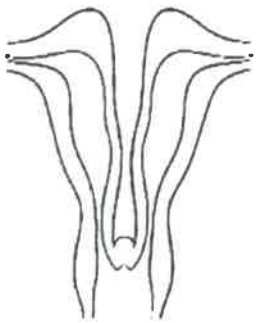
Normal uterus

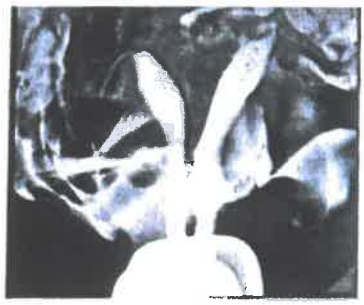
Unicornuate uterus

HSG in normal uterus	HSG in unicornuate uterus
• 2 FT (thin and tortuous) • Single uterus. • Single cervix. • Single vagina. • Bilateral spillage of the dye (can be used to check patency of tubes).	• Single FT (unicornuate uterus). • U/L spillage of dye. • Banana shaped uterus.

Communicating rudimentary horn should be obliterated to prevent ectopic pregnancy and uterine rupture in the horn.

Class III : Uterine Diadelphys 00:27:02

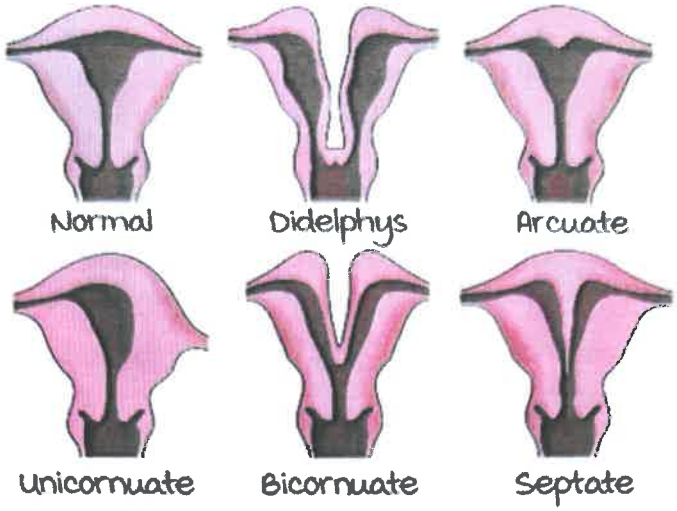




Description : Failed fusion of the paired mullerian ducts.

- Fallopian tubes, uterus, cervix, upper part of vagina : 2 in number.
- 2 Leech wilkinson canula needed to visualise the uterus.
- Good reproductive outcome when compared to other mullerian anomalies.

Obstetric complications : RPL, fetal growth restriction.



Class IV : Uterus Bicornuate 00:28:58

Description : Incomplete fusion of mullerian duct.

- Fallopian tube, uterus : 2
- Cervix : 1 or 2
- Always single vagina (because fusion occurs from below upwards.)

Bicornis unicollis : 2 uterus 1 cervix.

Bicornis Bicollis : 2 uterus 2 cervix.

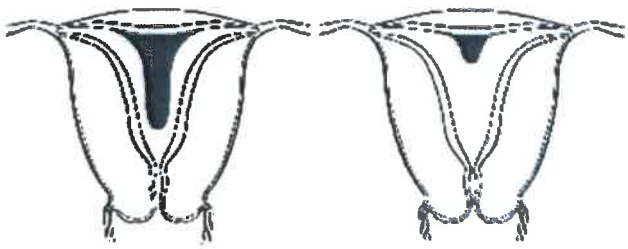
Distinguishing feature :

Normal fundus : Septate uterus

Depression on the fundus (divided) : Bicornuate uterus.

The two cannot be distinguished on HSG (Hence not IOC).

Class V : Septate Uterus 00:32:56



Complete septa Partial septa

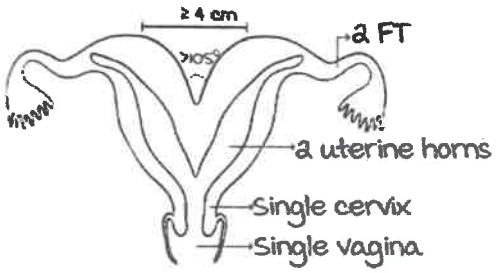
- Septate uterus results when both MD fuse, septa is formed but septa fails to resolve partially or completely.
- Outwardly, the uterus appears normal, but a septa is present inside the uterus

Bicornuate uterus vs septate uterus :

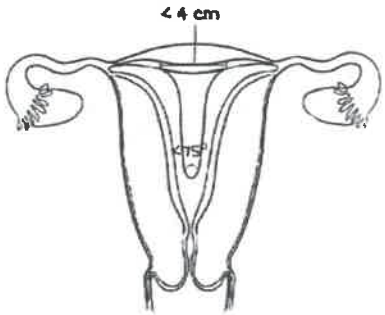
Should be distinguished by looking at fundus of the uterus (on USG).

On HSG :

	Bicornuate uterus	Septate uterus
External contour	Divided	Normal
Intercornual angle	> 105°	< 75°
Distance between 2 horns	≥ 4 cm	< 4 cm

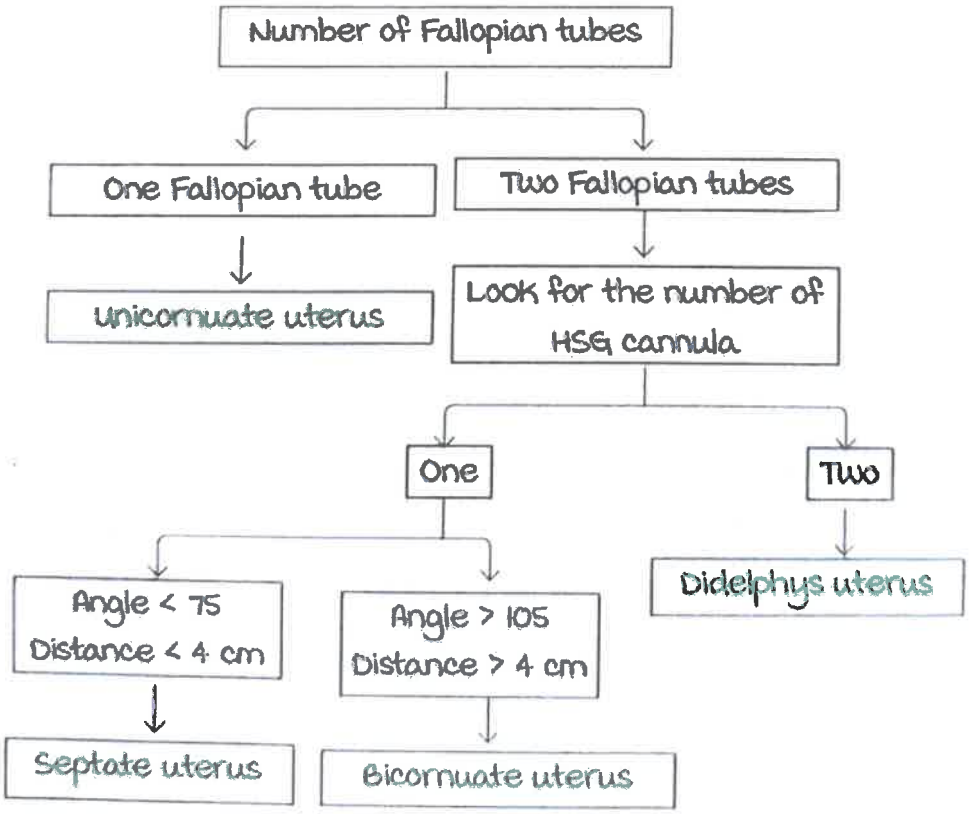


Bicornuate uterus



septate uterus

Algorithm to diagnose mullerian malformations :



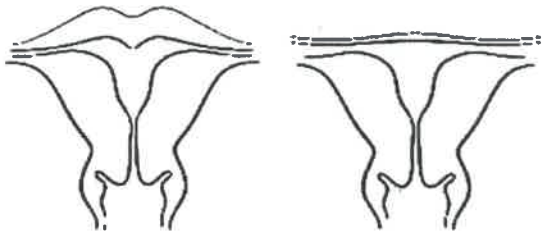
Bicornuate uterus

Septate uterus

	Bicornuate uterus	Septate uterus
Obstetric complications	• RPL (repeated pregnancy loss) • PTL (preterm labor)	m/C uterine anomaly leading to: • Ist trimister abortion • Infertility • possibly congenital malformations.
Surgery (In case of RPL)	Straussman metroplasty. Pregnancy planned after repair; deliver by C-section.	Hysteroscopic resection of the septum.

Class VI : Arcuate Uterus 00:42:06

Associated problem : Entire uterus is formed except there is slight indentation of fundus/flat topped uterus



Indentation of fundus Flat topped fundus

Overall best reproductive outcome in all mullerian malformations.

Class VII - Diethylstilbesterol (DES) induced reproductive tract abnormalities 00:42:45

DES is a synthetic non-steroidal estrogen which was prescribed to millions of pregnant females earlier.

Led to abnormal development of the reproductive tracts of daughters of the pregnant females :

- T-shaped uterus.
- Clear cell adenocarcinoma of the vagina and cervix (due to suppression of WNT-4 gene; HOX gene).
- Vaginal adenosis.
- Cervical collar.
- Genitourinary malformations.
- Fallopian tube abnormalities like absent fimbriae.

These females in adulthood showed :

- Earlier menopause.
- Increased risk of Breast cancer.

Males exposed to DES :

- Increased incidence of cryptoorchidism.
- Testicular hypoplasia.
- Hypospadias.
- Microphallus.
- Renal anomalies.

Note :

DES exposure does not lead to renal abnormalities in females.

Mx of Mullerian Anomalies 00:45:30

Surgical management
(Indication : RPL)

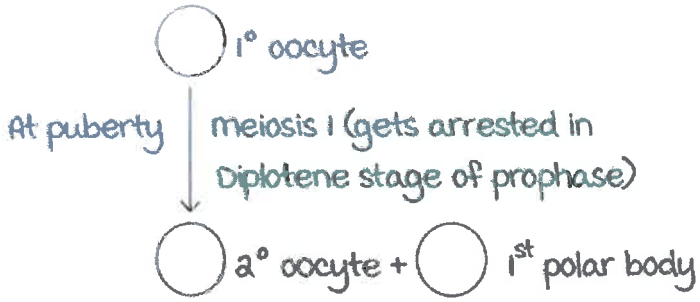
Bicornuate uterus :
Straussman metroplasaty.

Didelphyic uterus :
Unification surgery.

Septate uterus :
Hysteroscopic resection of septa (earlier John Thompkins metroplasty)

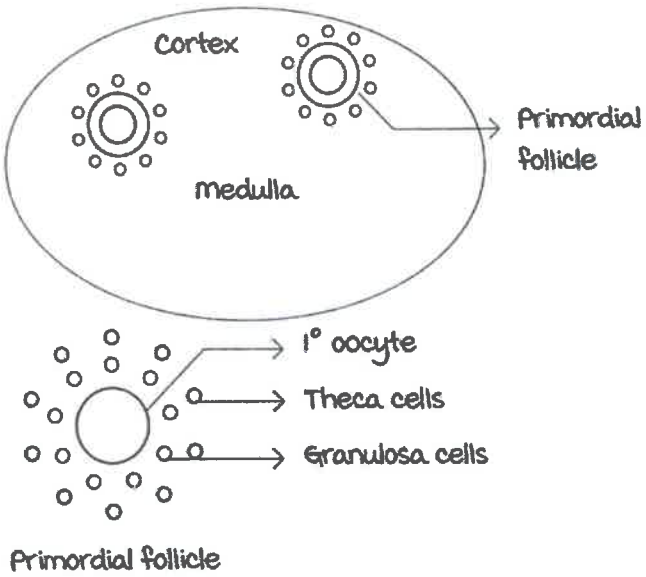
MENSTRUAL CYCLE

Oogenesis 00:01:24



Structure of Ovary :

Before puberty :



Number of follicles :

- Maximum : 5th month of intrauterine life (6-7 million).
- At birth : 1-2 million follicles.
- At puberty : 4-5 lakh follicles.

Note :

Initial recruitment of follicles is hormone independent.

Role of FSH 00:08:55

At puberty, Hypothalamic Pituitary Ovarian Axis (HPOA) becomes functional.

Hypothalamus

Pulsatile manner ↓ Gonadotropin Releasing Hormone (GnRH)

Anterior pituitary

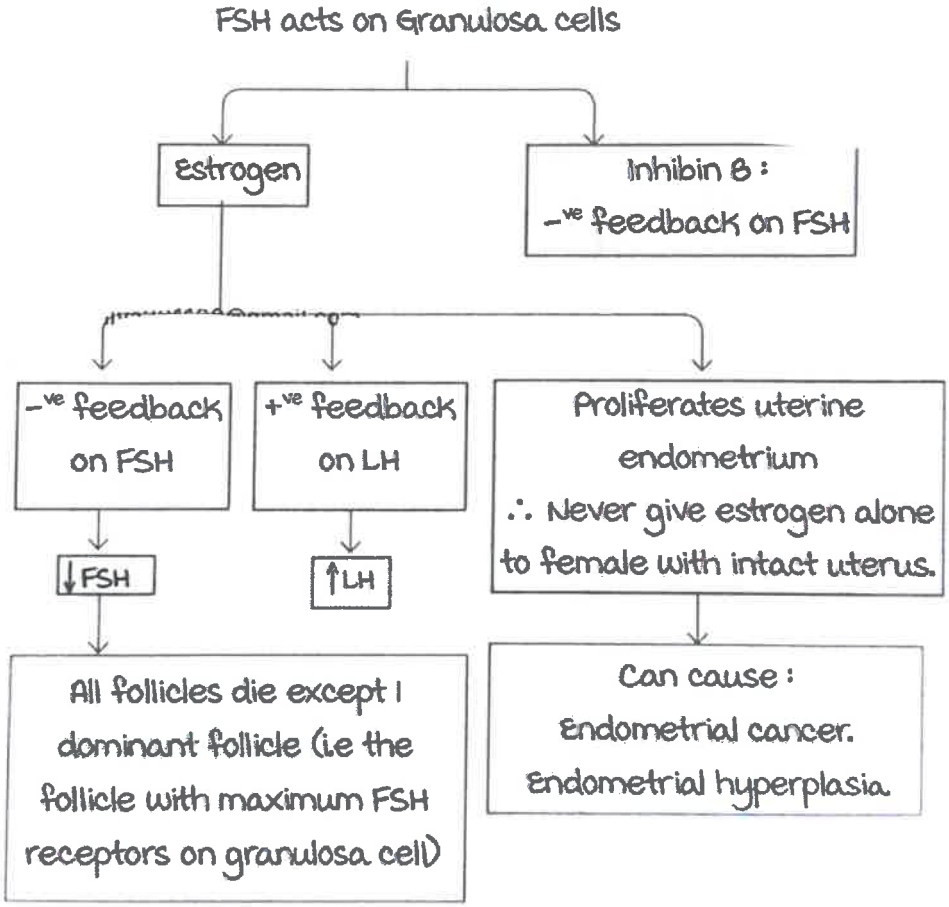
↓

FSH (Follicle Stimulating Hormone) release.

Functions of FSH :

- Prevents the follicles from undergoing atresia.
- Stimulates follicles.

Role of FSH :



Note :

FSH receptors are present on granulosa cells.

Granulosa cell tumour of ovary : Feminizing tumor.

Tumor marker for granulosa cell tumor of ovary : Inhibin B.

Role of LH

00:16:36

Estrogen has +ve feedback on LH.

↑LH

LH surge
(Sudden ↑ in LH)
- Initiated by estrogen.
- Estrogen : 200 pg x 48 hrs.

↓

meiosis I resumes.

↓ (Hormone dependent)

- Ovulation (1° oocyte → 2° oocyte).
- Follicle → Corpus luteum.

Acts on theca cells.

↓

Produce androgens.

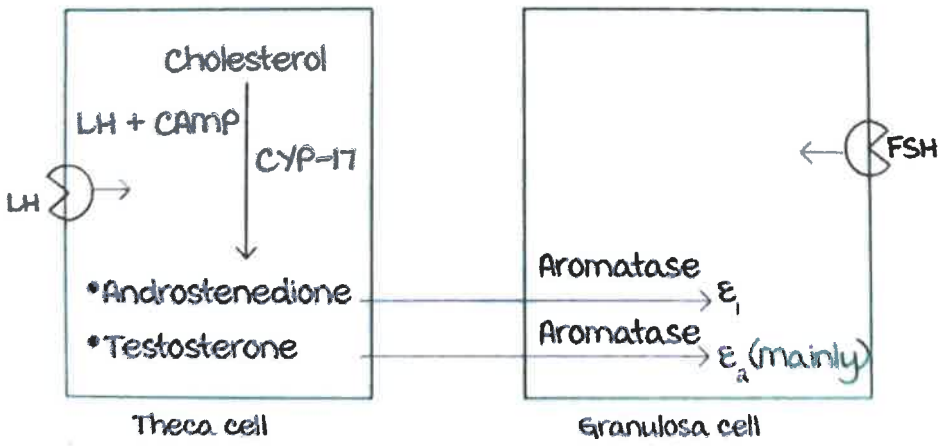
↓

In Granulosa cells, adipose tissue : Androgens → Estrogen (By aromatase enzyme).

Acts on granulosa cells.

Two cell two gonadotropin theory

00:24:38



Aromatase enzyme absent.
CYP 17 present.

Aromatase present.
CYP 17 absent.

Adipose tissue :

Androstenedione $\xrightarrow{\text{aromatase}}$ E_1.

Role of LH on granulosa cell 00:30:21

↑ LH

↓

Acts on Granulosa cell.

↓

Luteinization of cells.

↓

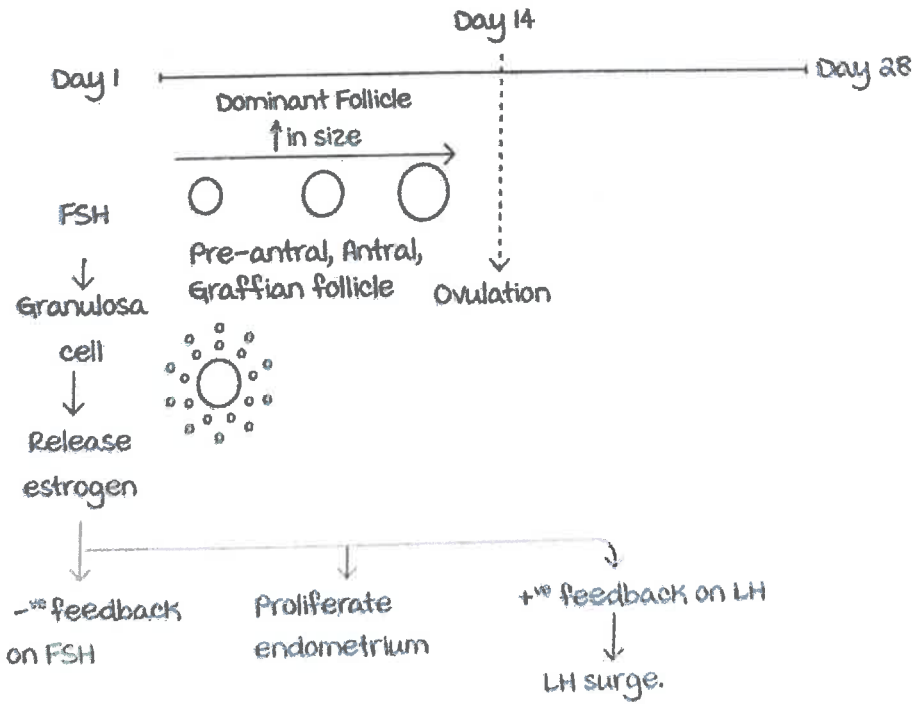
Small amount of progesterone release even before ovulation (at the time of LH surge).

↓

This low concentration of progesterone has $+^{ve}$ effect on LH, FSH.

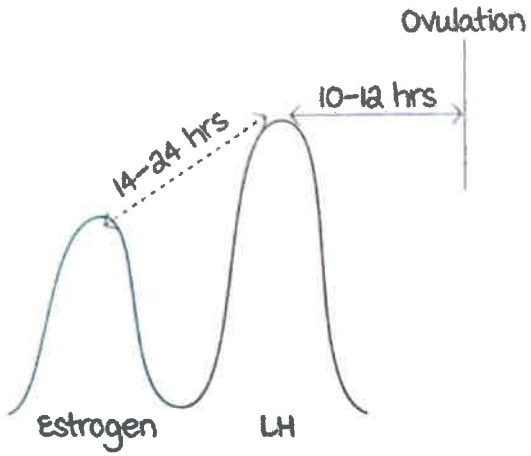
- In females, LH receptors are present on theca cell, granulosa cell.
- Progesterone appears earliest in menstrual cycle at LH surge (32 to 36 hrs before ovulation).
- There is LH and FSH surge before ovulation.

Follicular/Proliferative phase of menstrual cycle 00:35:40



- Ovarian cycle is initiated by FSH.
- Size of follicle, just before ovulation : 18 to 20 mm.
- For LH surge to occur, Estrogen levels : 200 pg x 48 hours.

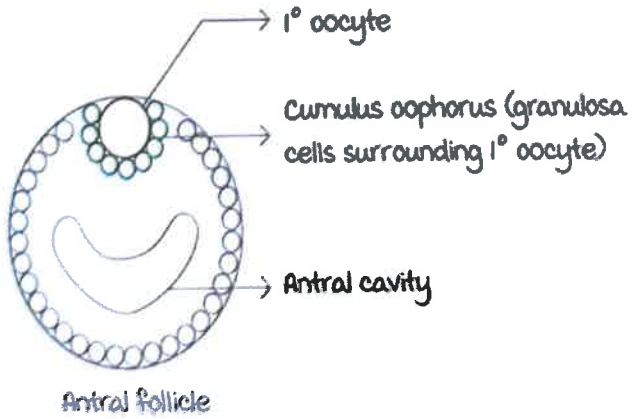
- LH surge $\xrightarrow[24 - 36 \text{ hours}]{32 - 36 \text{ hours}/}$ Ovulation.
- LH peak $\xrightarrow{10 - 12 \text{ hours}}$ Ovulation.



- Time interval b/w estrogen peak to LH peak : 14–24 hours
- Time interval b/w estrogen peak to ovulation : 24–36 hours.
- LH surge :
  - Initiated by estrogen.
  - maintained by both estrogen & progesterone.
- Ovulation is due to LH surge only.
- Meiosis I is resumed due to LH surge (32–36 hours before ovulation).

Ovulation

00:48:42



Normally :

- Antral cavity fluid : Estrogen + growth factor + LH.
- LH appears in the antral cavity fluid only towards mid cycle.

Anovulation :

If LH appears in antral cavity fluid early in the cycle :

- Leads to atresia of follicle.
- Decreases the mitotic activity of granulosa cells which leads to Anovulation.

Secretory phase of menstrual cycle 00:53:02

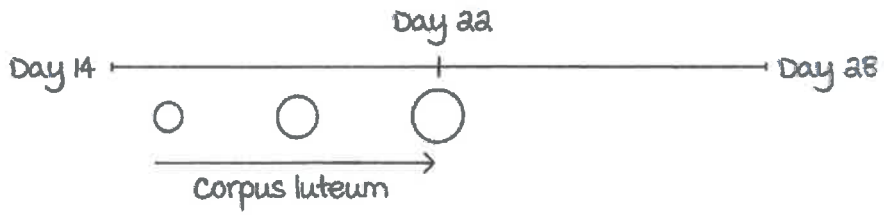
1° oocyte → 2° oocyte.

Follicle → Corpus luteum.

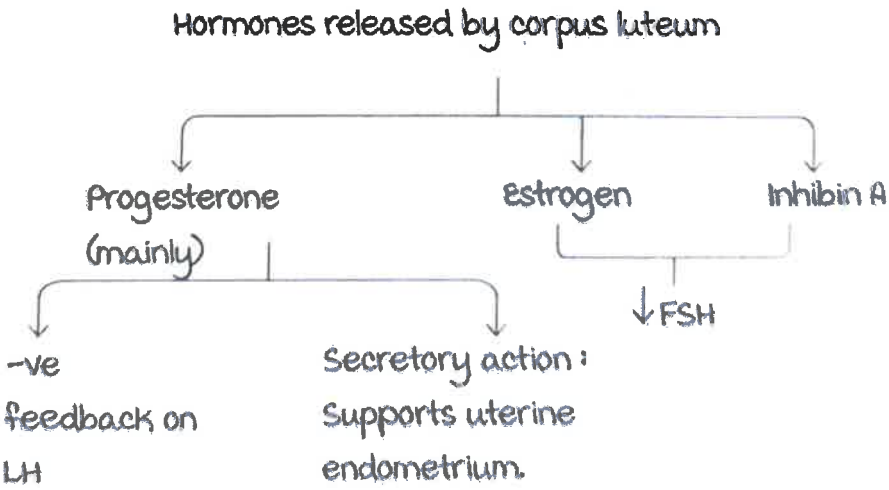
LH : Maintains corpus luteum in a non pregnant female.

Corpus luteum :

- Corpus luteum starts growing under the effect of LH.
- Day 22 of cycle/8 days after ovulation :
  Attains maximum size and activity.

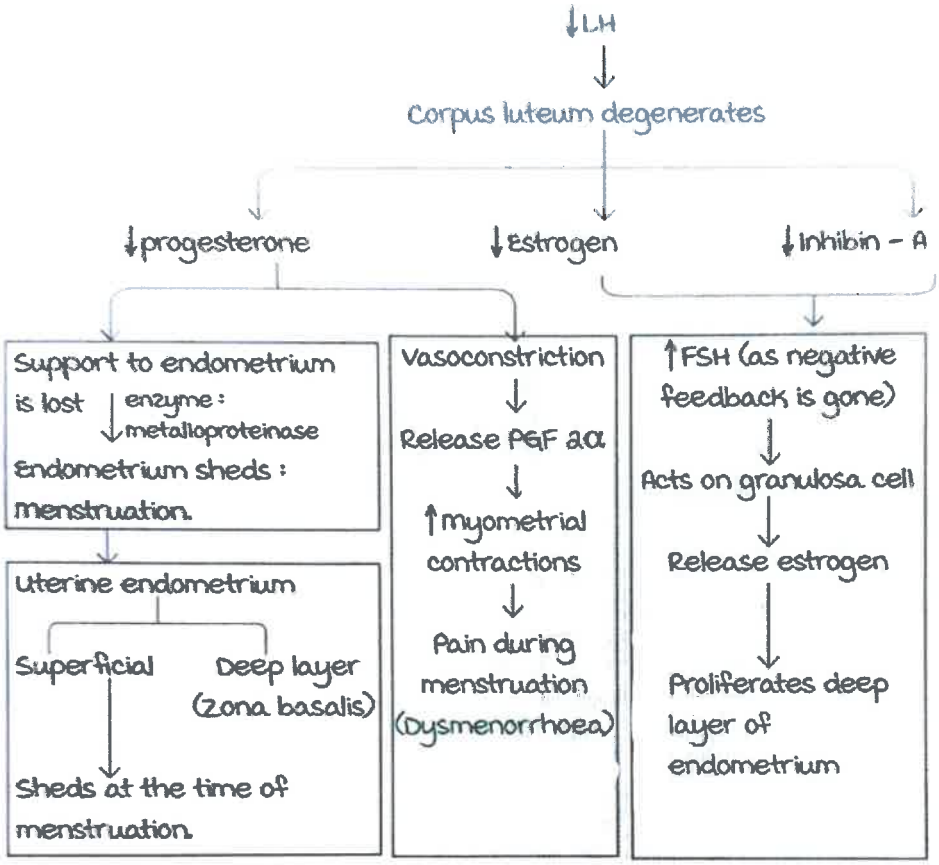


Hormones produced by corpus luteum 00:56:36



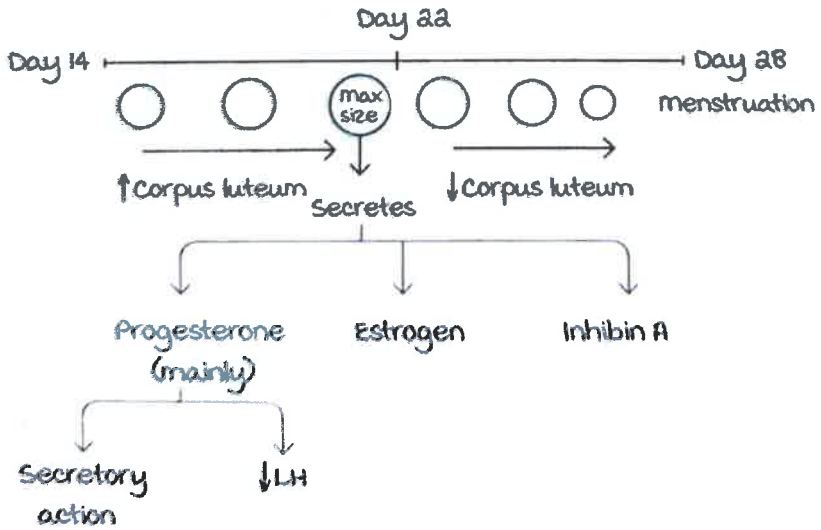
Progesterone	Low concentration	↑ LH, ↑ FSH.
	High concentration	↓ LH, ↓ FSH.

Corpus luteum degeneration 01:01:42



Note :

Deep layer is responsible for regeneration of entire endometrium in next cycle.



2nd half of menstrual cycle : Luteal/Secretory phase