REPRODUCTIVE SYSTEM ANATOMY HISTOLOGY

D.HAMMOUDI.MD

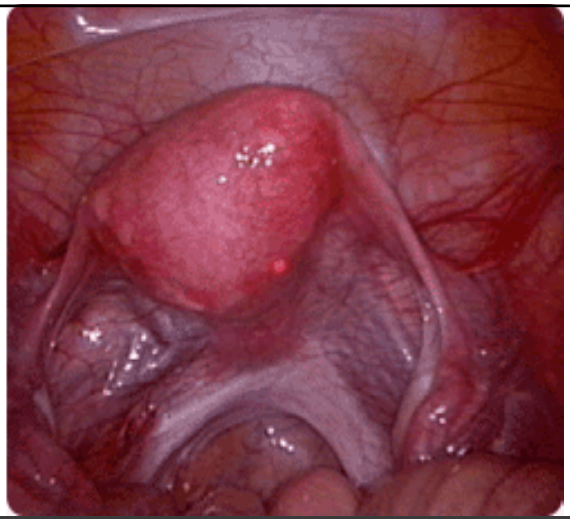
The primary organs of reproduction

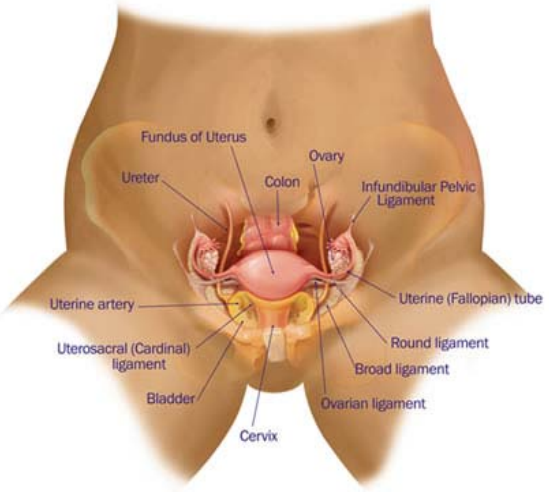
- **Ovaries**
  - All potential gametes are present at birth
  - Remain in the body cavity
- **Testes**
  - Not all potential gametes are present at birth
  - Do not remain in the body cavity

Features of reproductive system

Gonads

- produce gametes and hormones
- ducts to transport the gametes
- accessory glands and organs
- (secrete fluids)
- external genitalia





FEMALE REPRODUCTIVE

EXTERNAL GENTILIA

- The vulva refers to those parts that are outwardly visible
- The vulva includes:
- Mons pubis
- Labia majora
- Labia minora
- Clitoris
- Urethral opening
- Vaginal opening
- Perineum

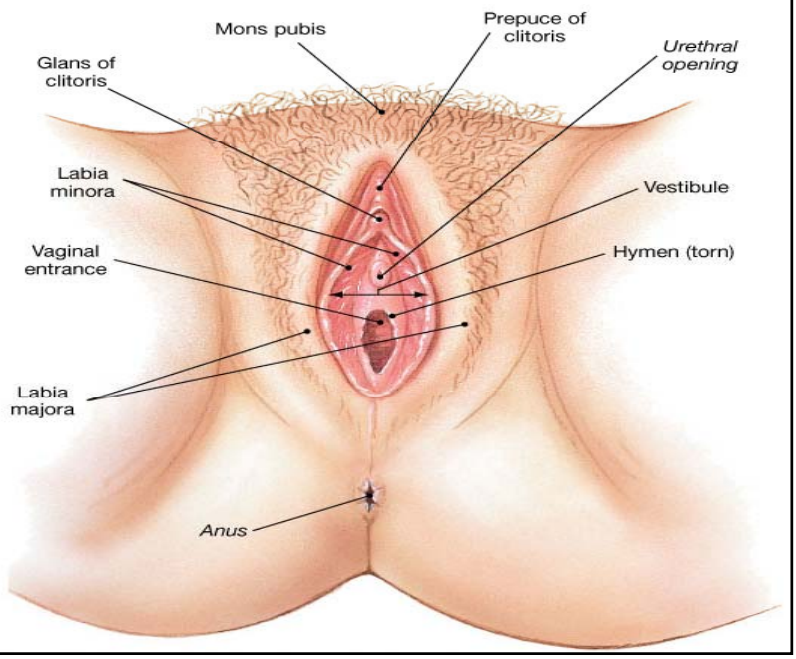
Individual differences in:

- Size
- Coloration
- Shape
- Of external gentalia are common

Female reproductive system

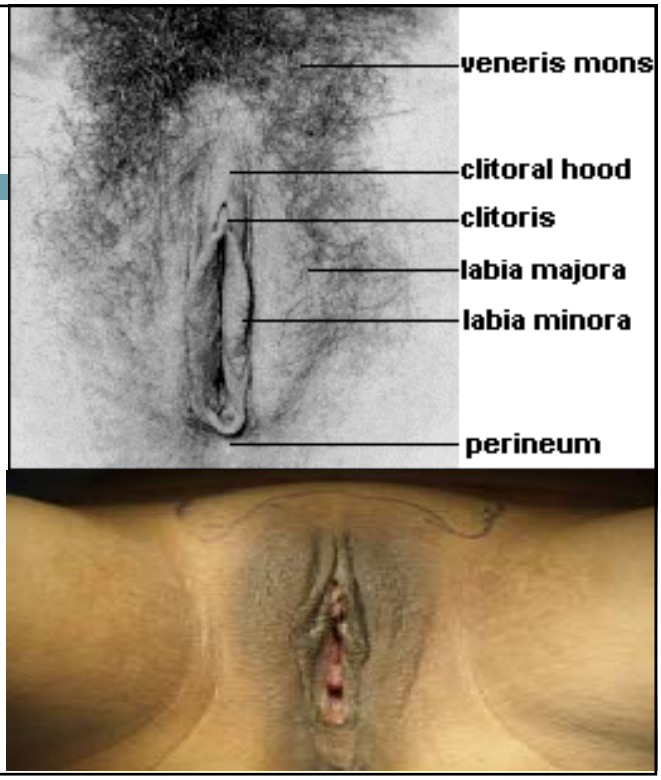
- **Ovaries**
- **Accessory organs**
  - **uterus**
  - **uterine (Fallopian) tubes**
  - **vagina**
  - **external genitalia**

The Female External Genitalia



External genitalia

- Vulva
  - Vestibule
  - Labia minora and majora
  - Paraurethral glands
  - Clitoris
  - Lesser and greater vestibular glands



MONS PUBIS

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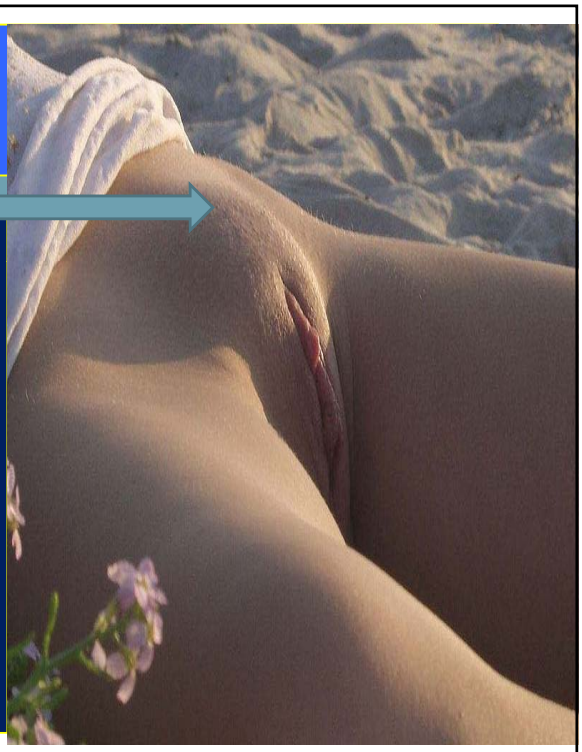
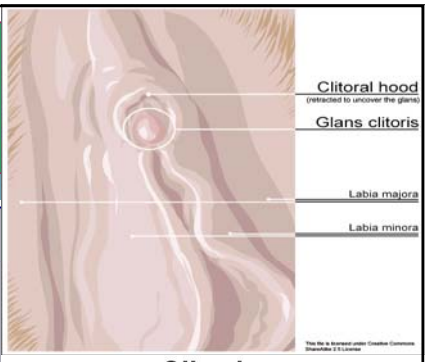
- The triangular mound of fatty tissue that covers the pubic bone
- It protects the pubic symphysis
- During adolescence sex hormones trigger the growth of pubic hair on the mons pubis
- Hair varies in coarseness curliness, amount, color and thickness

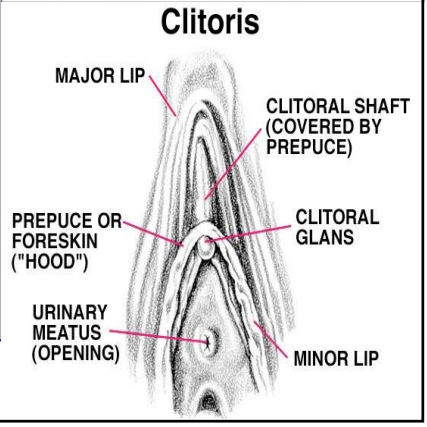


LABIA MAJORA

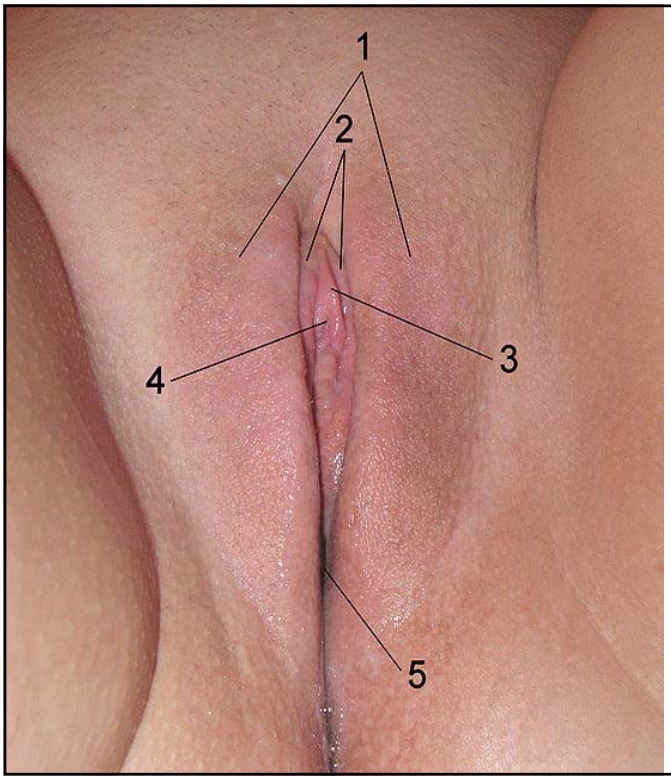
12

- Referred to as the outer lips
- They have a darker pigmentation
- The **Labia Majora**:
  - Protect the introitus and urethral openings
  - Are covered with hair and sebaceous glands
  - Tend to be smooth, moist, and hairless
  - Become flaccid with age and after childbirth

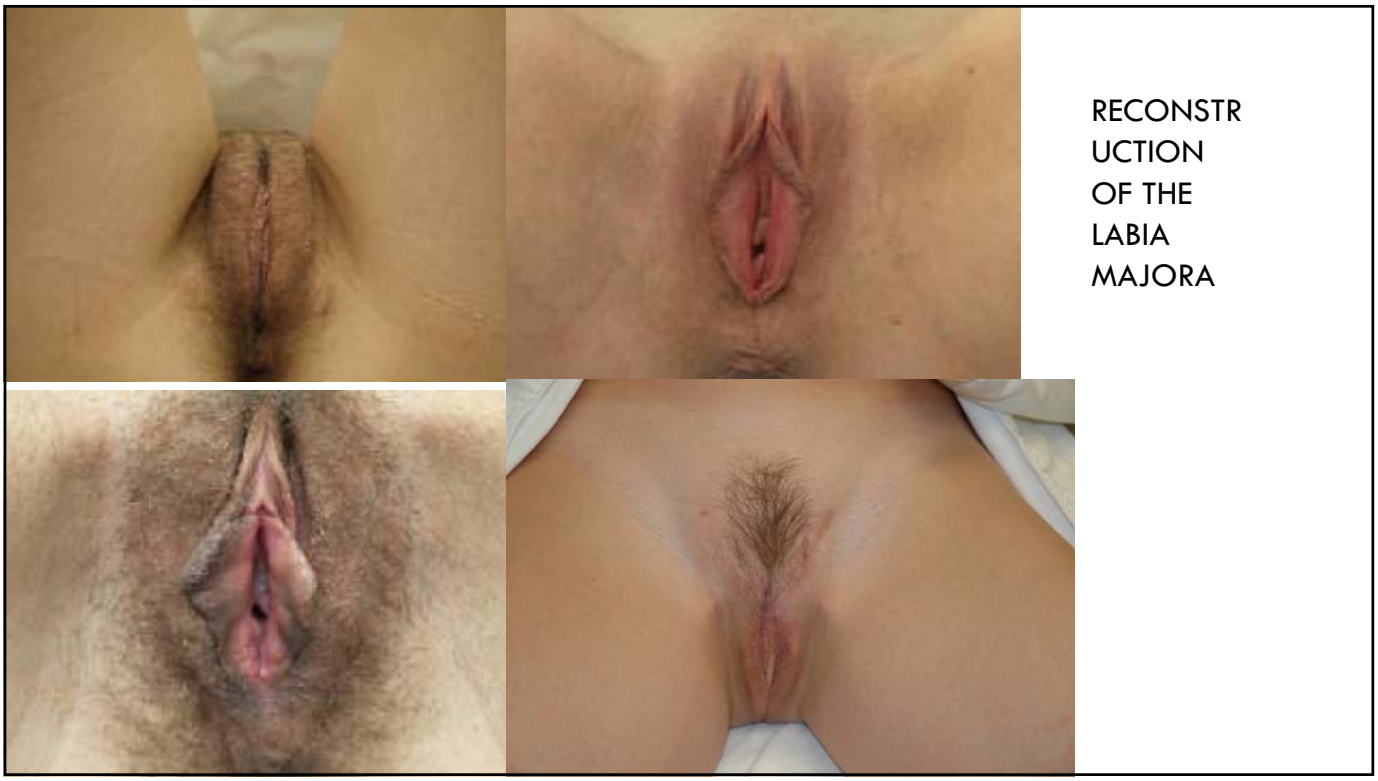




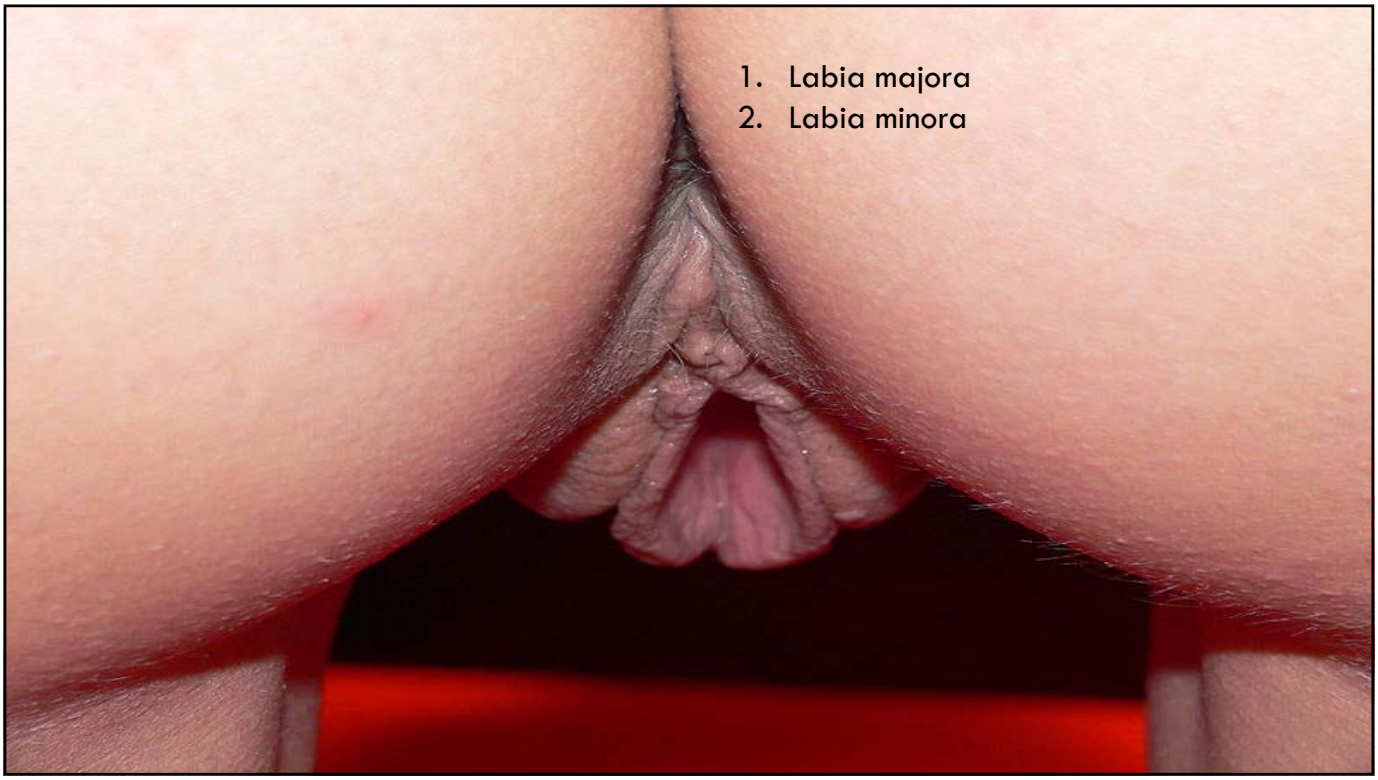
The distinction between the labia majora and minora is lost and the clitoris becomes buried under the fused prepuce. Reproduced with permission from Ridley, CM, Neill, SM (Eds), The Vulva, 2nd ed, Blackwell Science, Oxford 1999.



1. Labia majora
2. Labia minora
3. Clitoral hood (foreskin)
4. Clitoral glans (under the clitoral hood)
5. Vagina



RECONSTRUCTION OF THE LABIA MAJORA



1. Labia majora
2. Labia minora

LABIA MINORA

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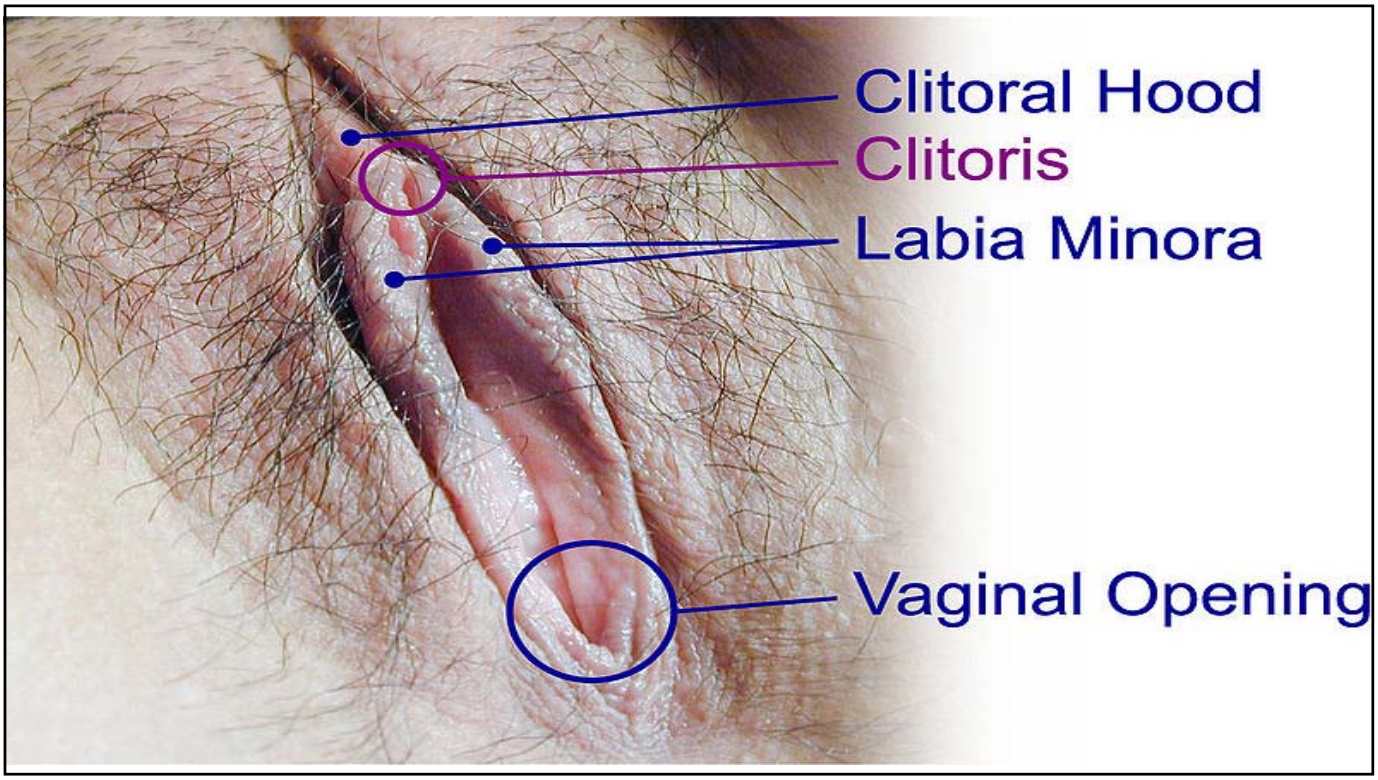
- Referred to as the "inner lips"
- Made up of erectile, connective tissue that darkens and swells during sexual arousal
- Located inside the labia majora
- They are more sensitive and responsive to touch than the labia majora
- The labia minora tightens during intercourse



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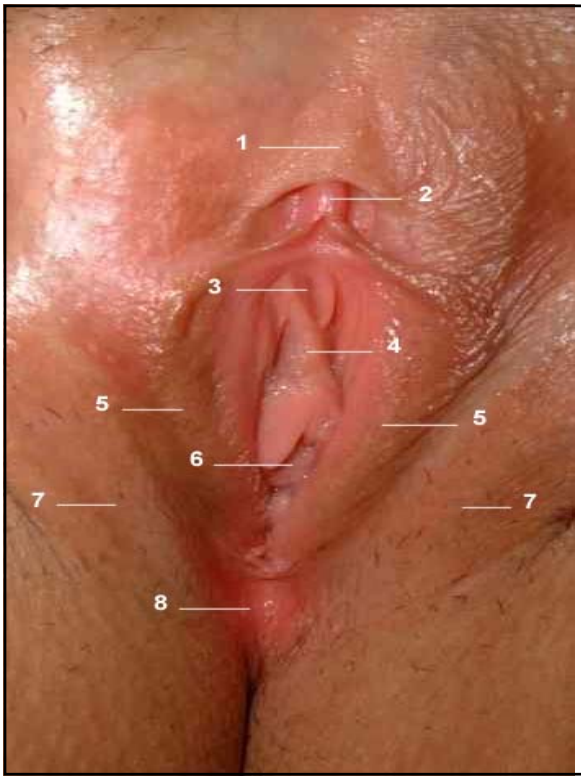
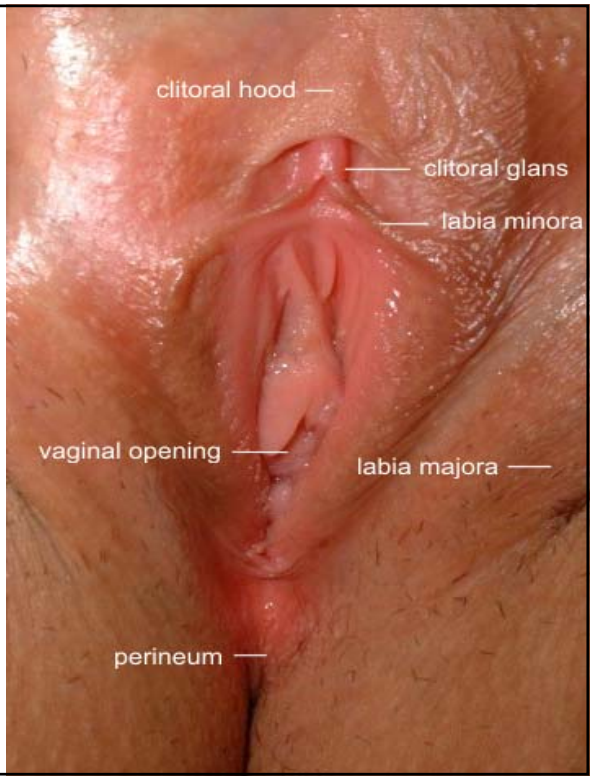
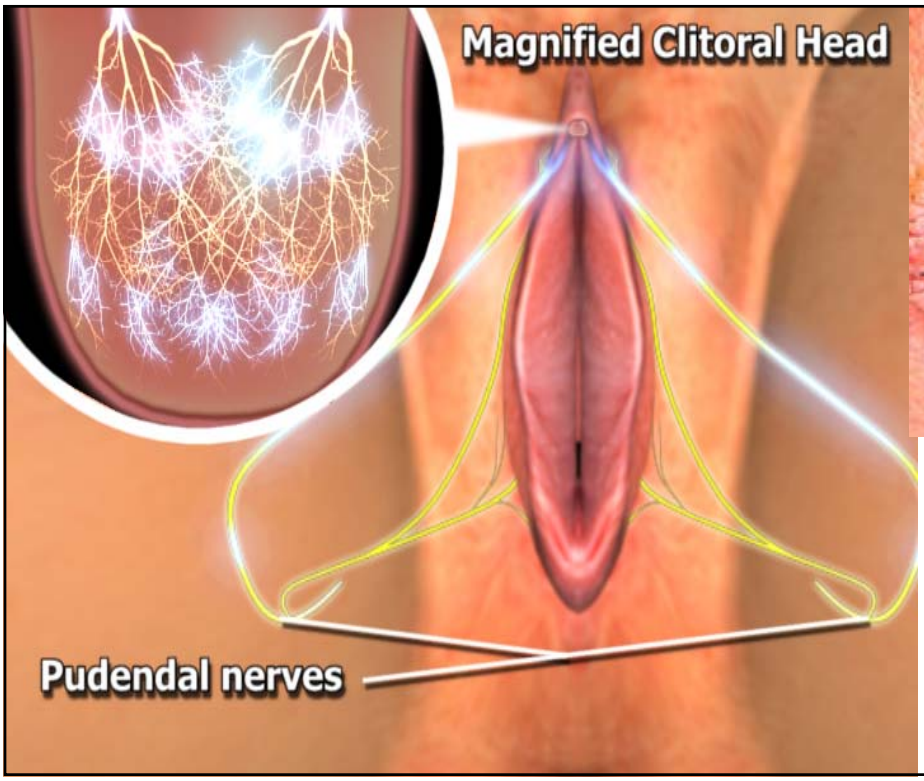
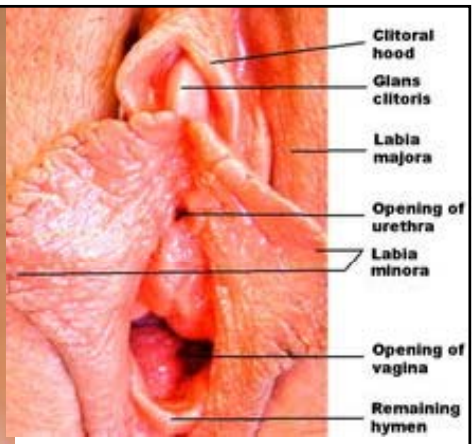
CLITORIS

- Highly sensitive organ composed of nerves, blood vessels, and erectile tissue
- Located under the prepuce
- It is made up of a **shaft** and a **glans**
- Becomes engorged with blood during sexual stimulation
- Key to sexual pleasure for most women
- **Urethral opening** is located directly below clitoris

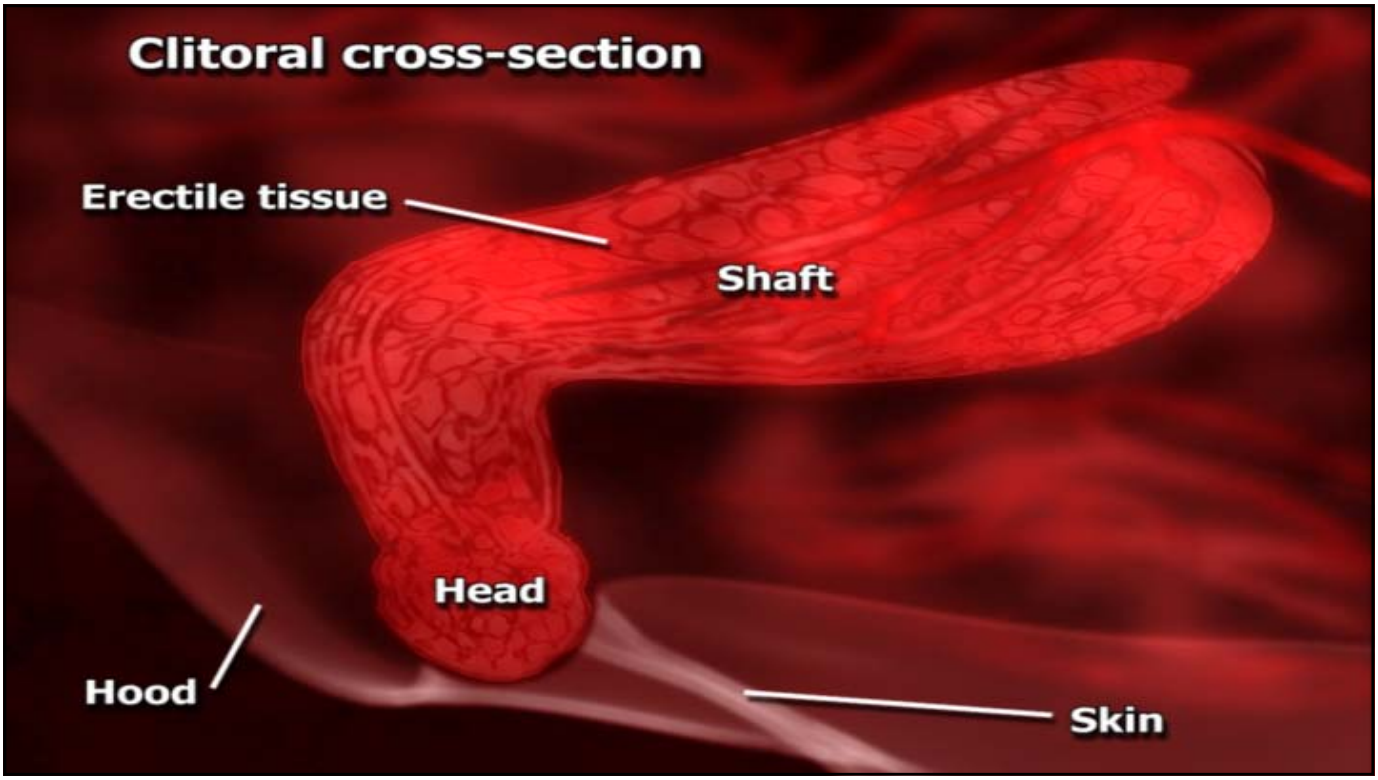


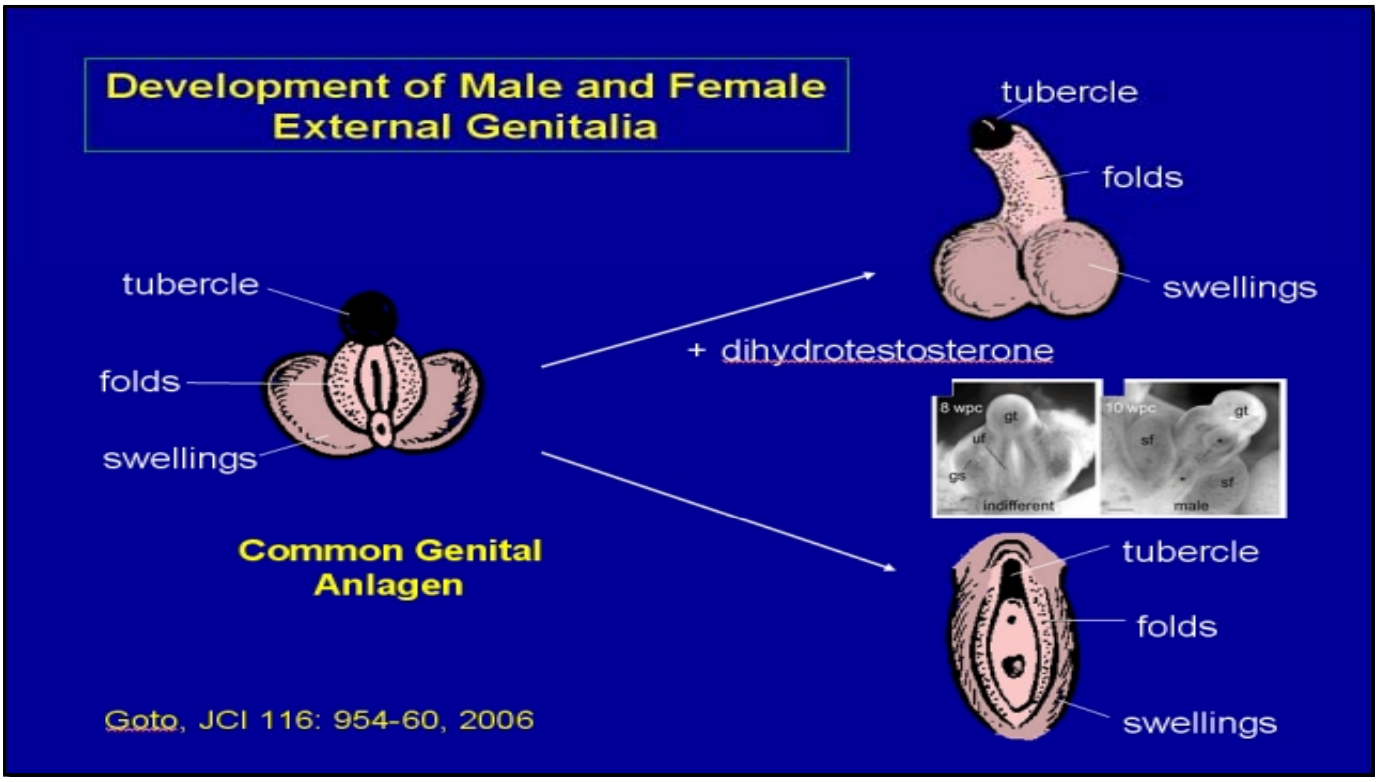


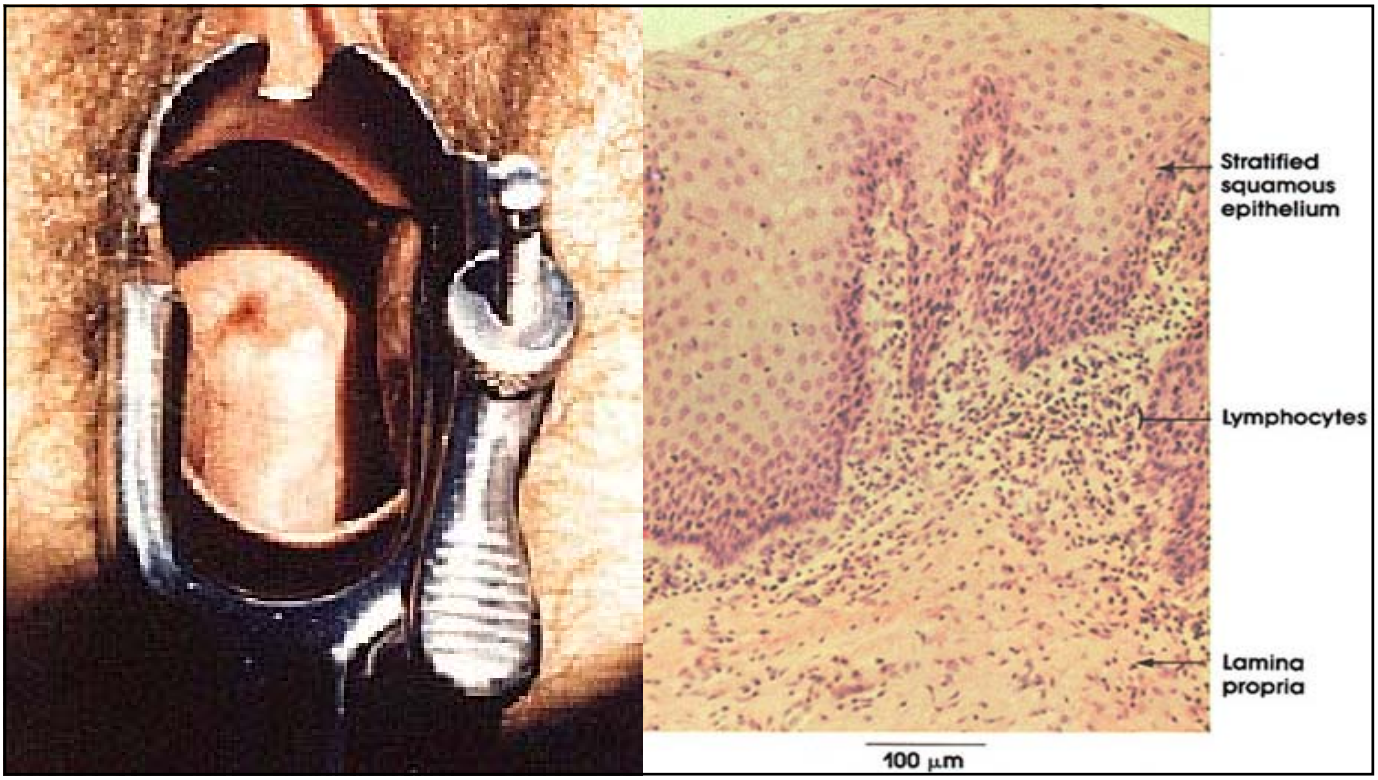


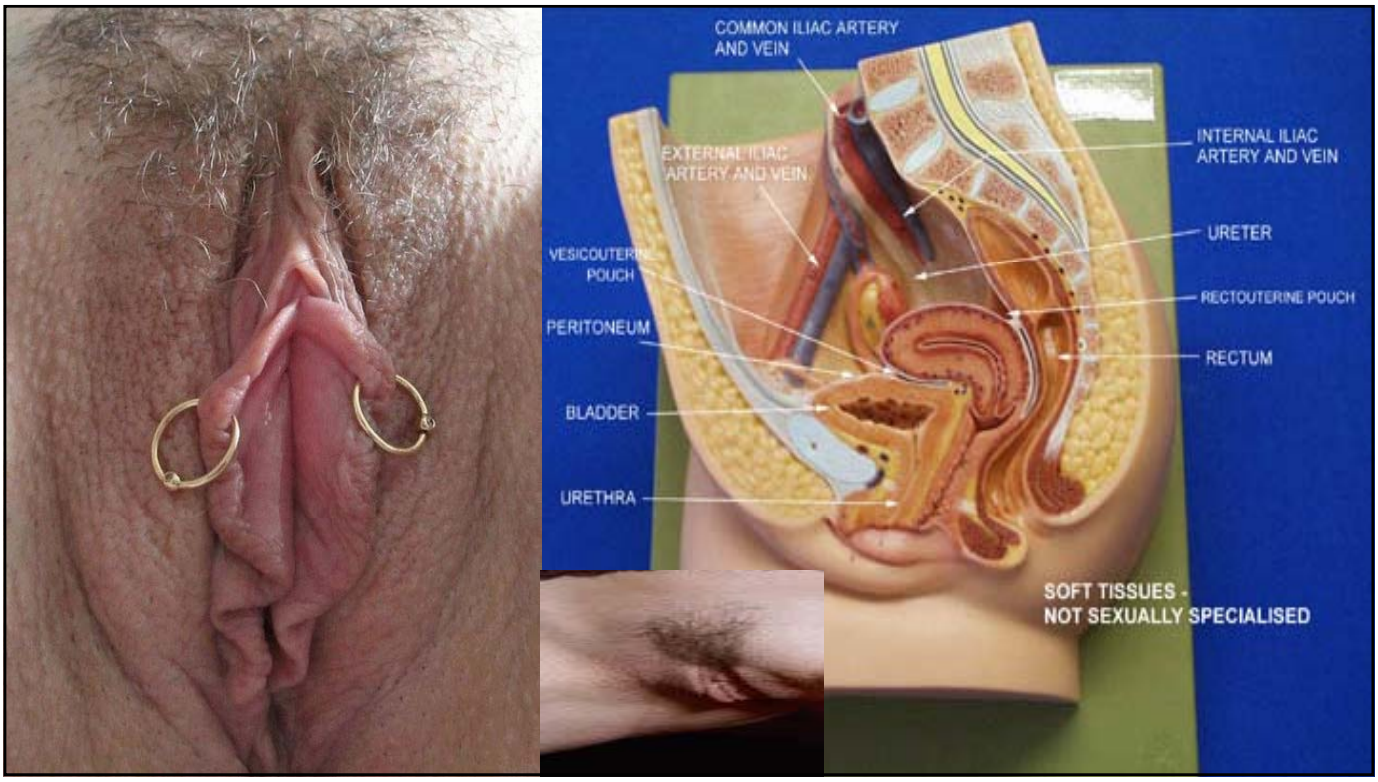


The clitoral glans is highly sensitive, containing 8,000 nerve endings, double the nerve endings as the analogous organ in males, the glans penis, making it particularly well-suited for sexual stimulation.




Development of Male and Female External Genitalia
tubercle
folds
swellings
Common Genital Anlagen
+ dihydrotestosterone
tubercle
folds
swellings
8 wpc
gt
uf
gs
indifferent
10 wpc
gt
sf
sf
male
tubercle
folds
swellings
Goto, JCI 116: 954-60, 2006

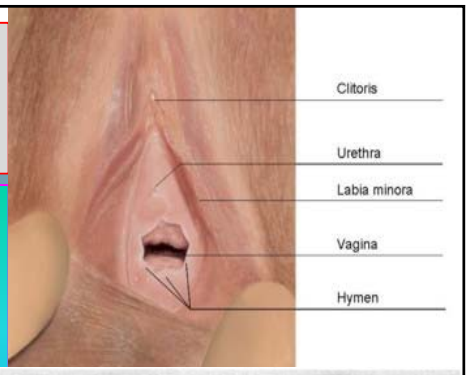

Stratified squamous epithelium
Lymphocytes
Lamina propria
100 μm

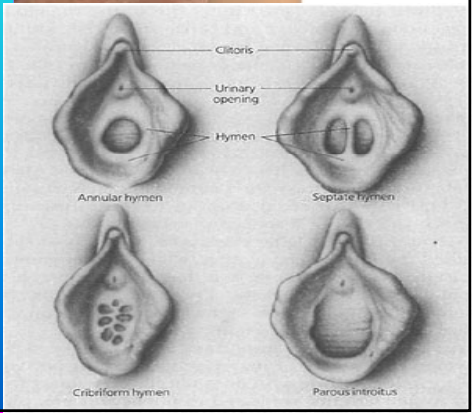


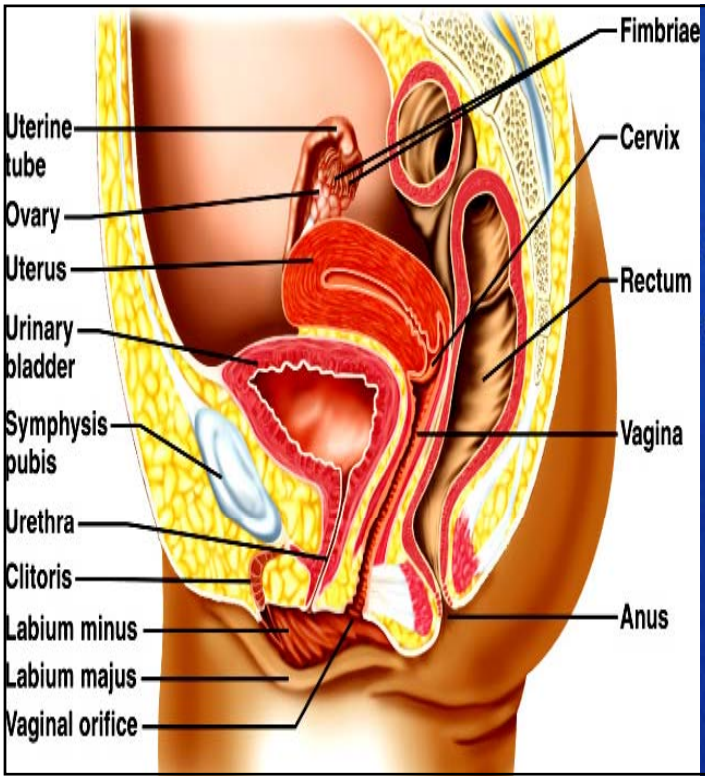
Vagina and cervix

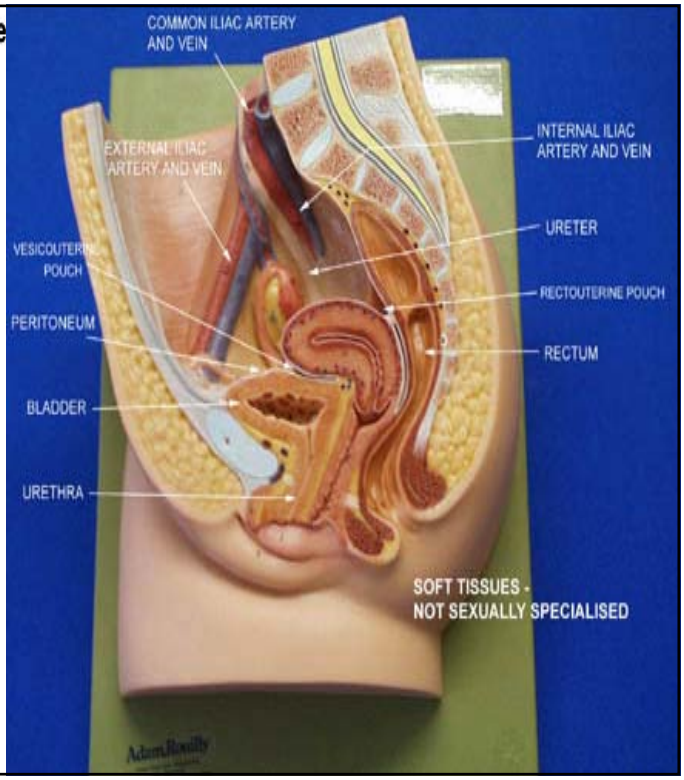
VAGINAL OPENING INTROITUS

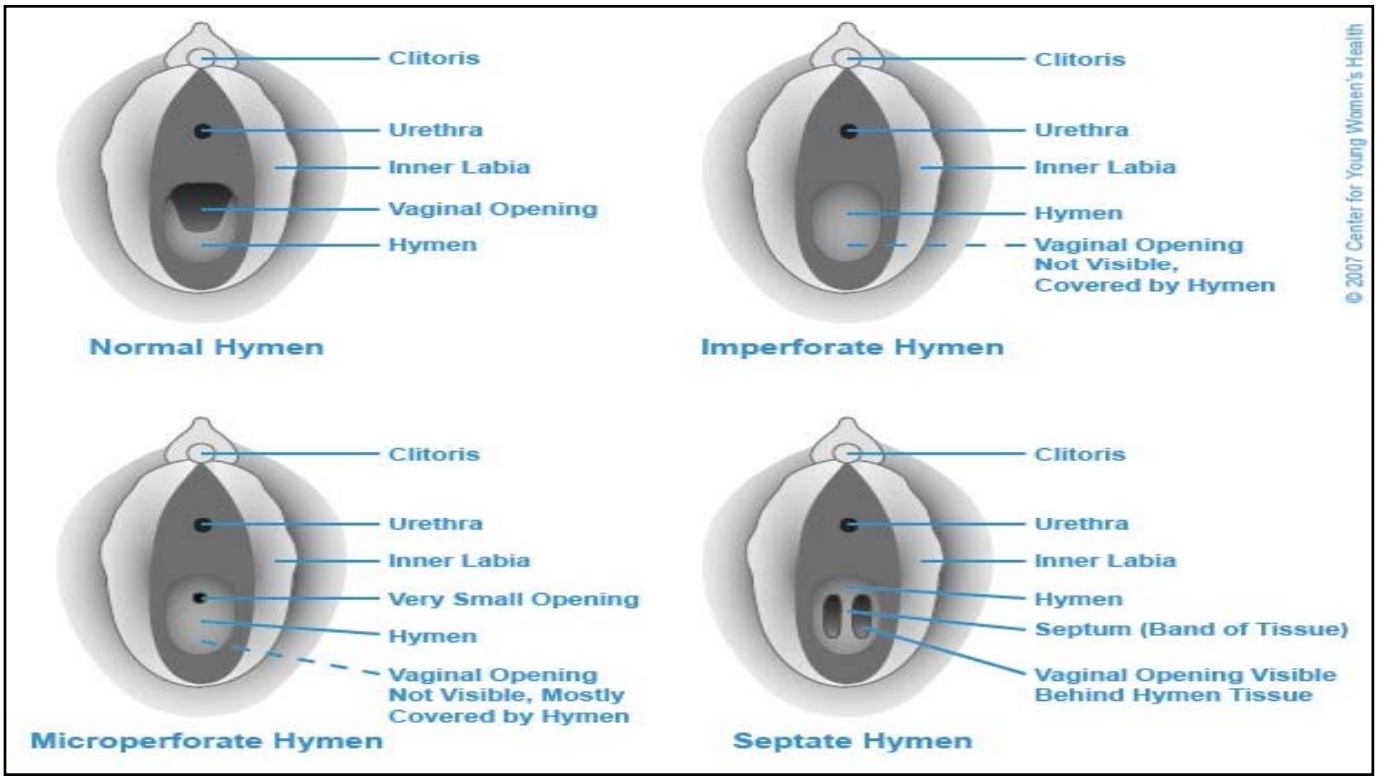
- Opening may be covered by a thin sheath called the ***hymen***
- Using the presence of an intact hymen for determining virginity is erroneous
- Some women are born without hymens
- The hymen can be perforated by many different events





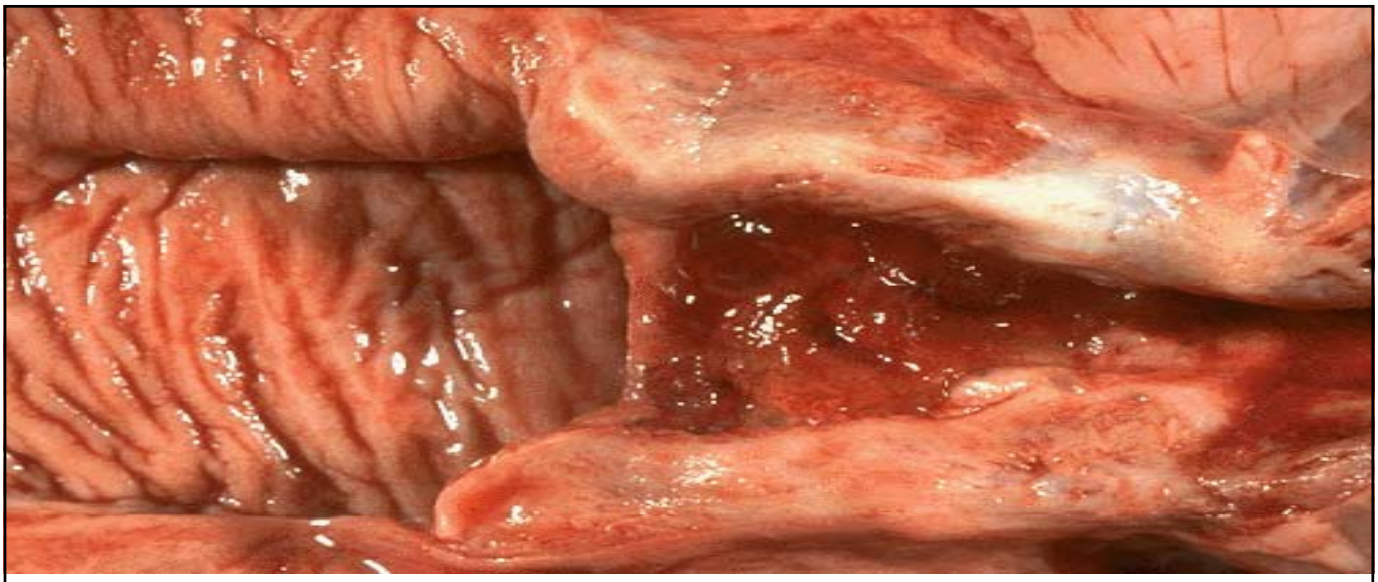






VAGINA

- The vagina connects the cervix to the external genitals
- It is located between the bladder and rectum
- It functions :
- As a passageway for the menstrual flow
- For uterine secretions to pass down through the introitus
- As the birth canal during labor
- With the help of two **Bartholin's glands** becomes lubricated during SI[INTERCOURSE]



The normal adult vaginal mucosa with a wrinkled appearance that is seen in women of reproductive years appears at the left. The cervix has been opened to reveal an endocervical canal leading to the lower uterine segment at the right that has an erythematous appearance extending to the cervical os consistent with chronic inflammation.

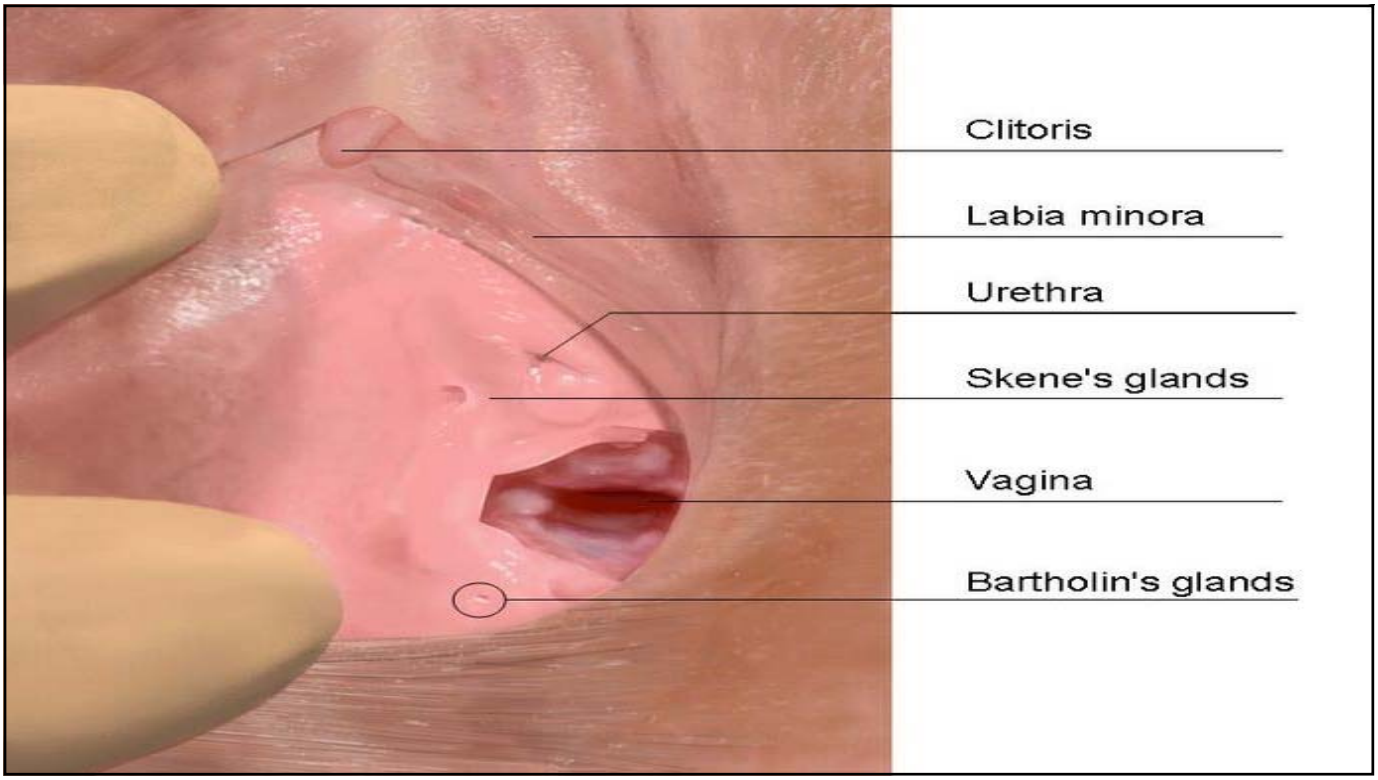
- **Bartholin glands** or **greater vestibular glands** are two glands located slightly below and to the left and right of the opening of the vagina in women.

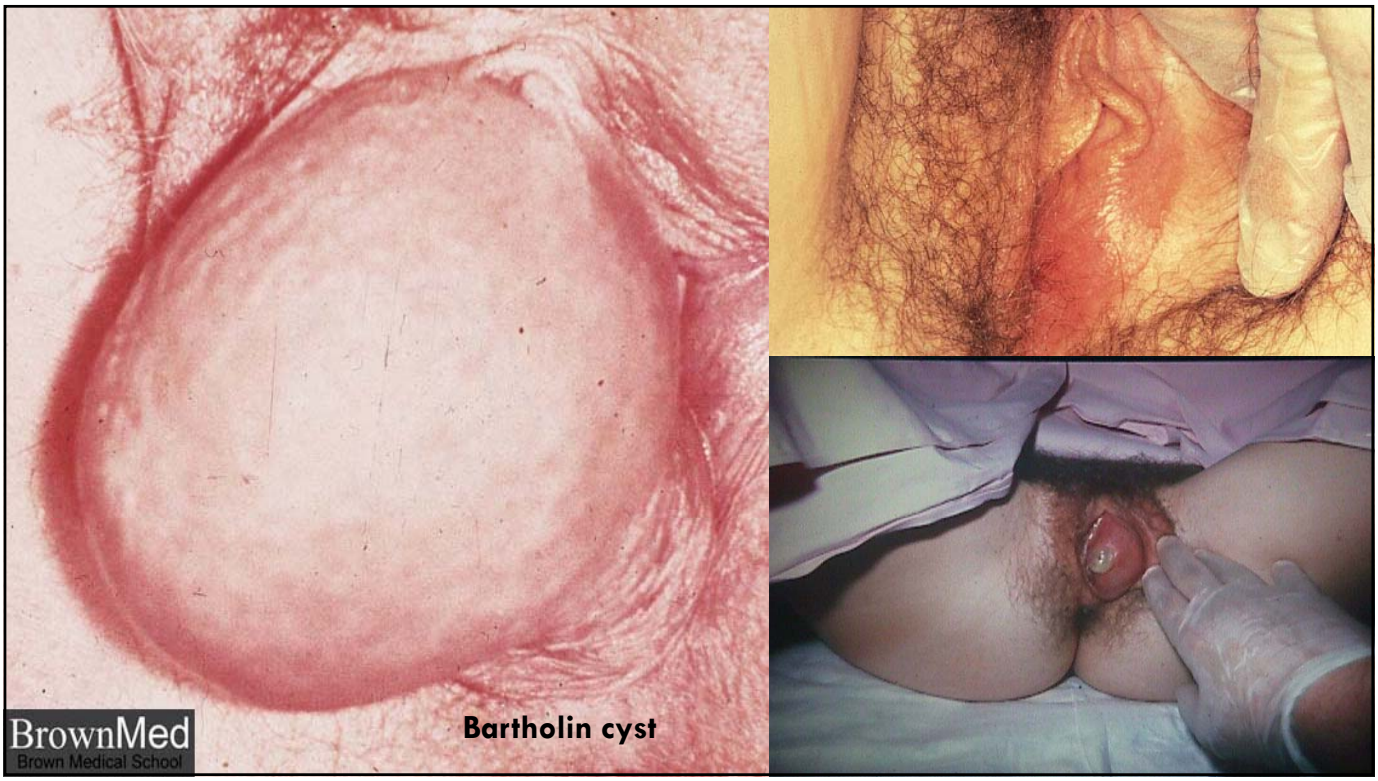
Bartholin's glands are homologous to **bulbourethral glands in males**.

However, while Bartholin's glands are located in the superficial perineal pouch, bulbourethral glands are located in the deep perineal pouch.

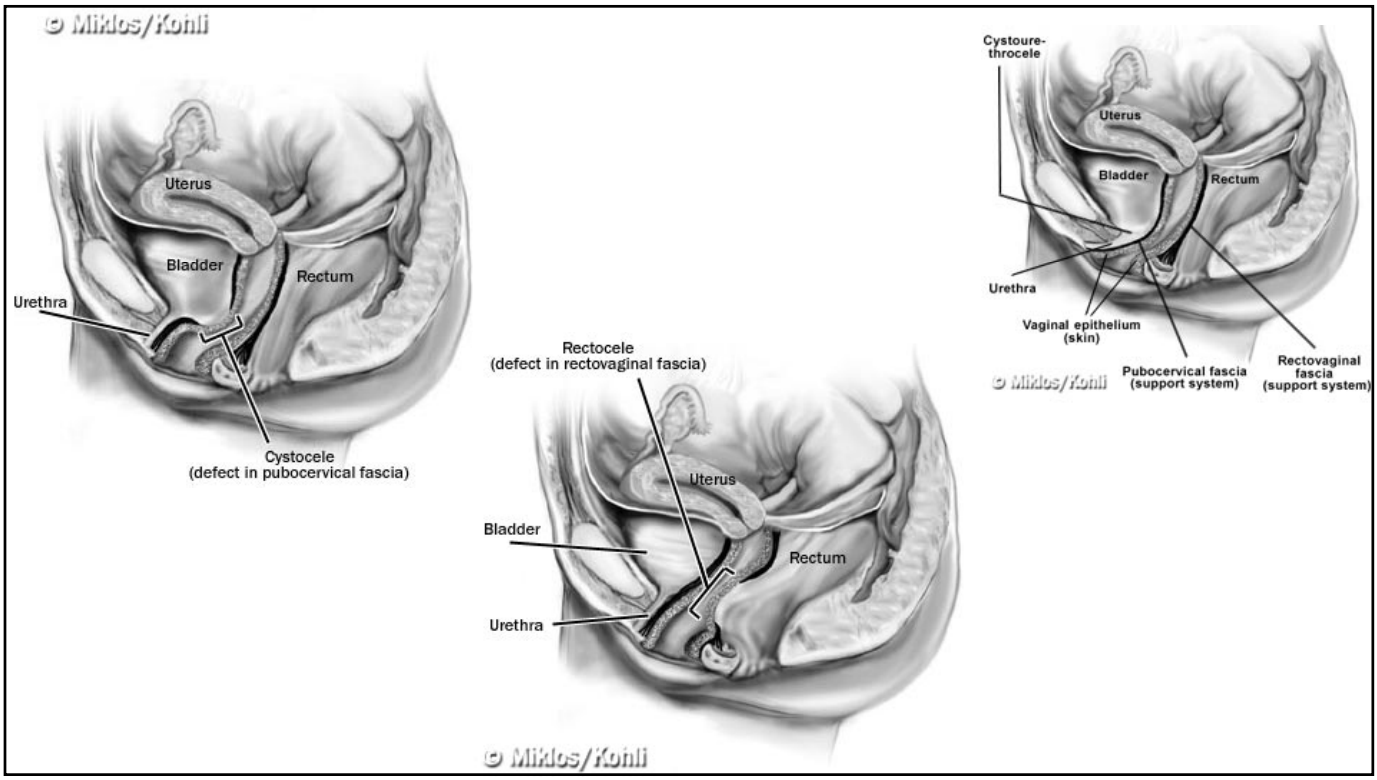
Function and purpose

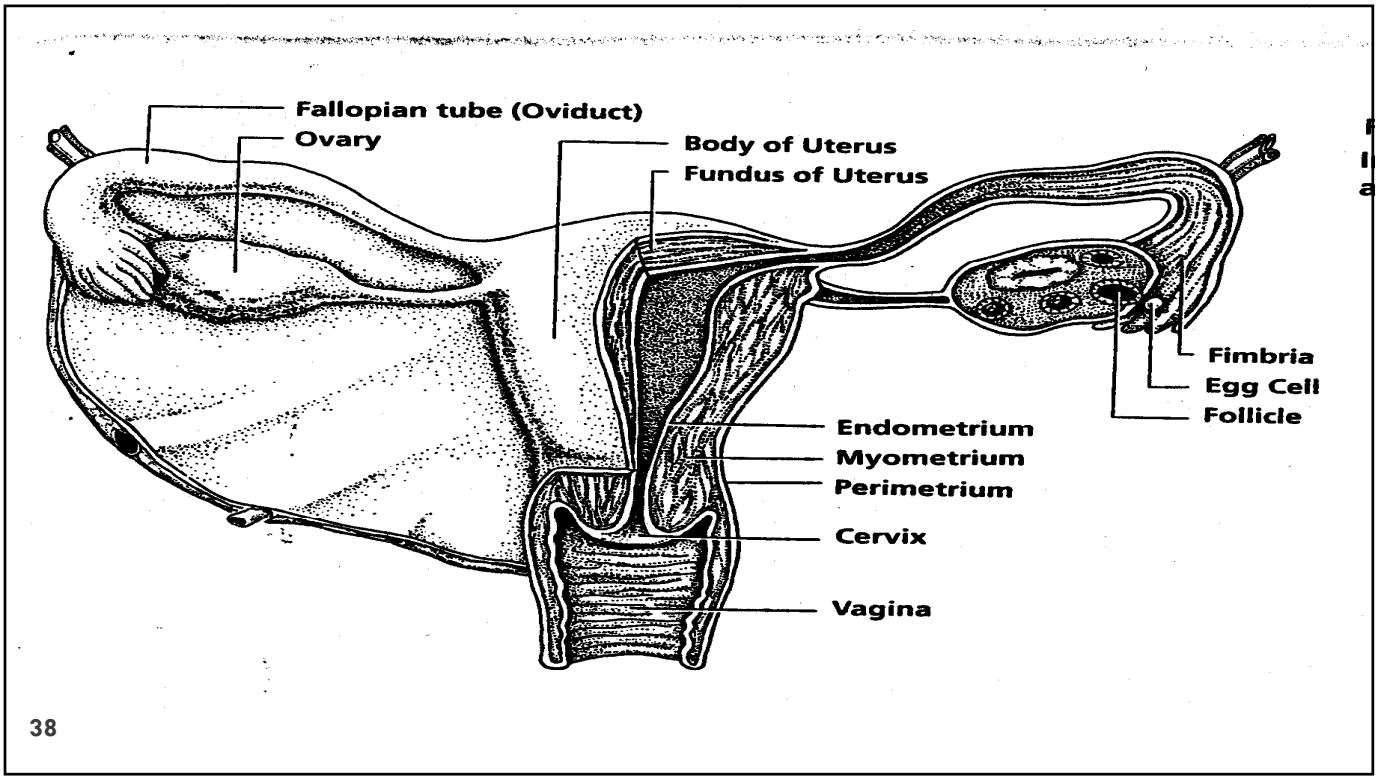
- They secrete mucus to provide vaginal lubrication.
- Bartholin's glands secrete relatively minute amounts (one or two drops) of fluid just before a woman orgasms.
-
- The fluid may slightly moisten the labial opening of the vagina, serving to make contact with this sensitive area more comfortable for the woman




BrownMed
Brown Medical School
Bartholin cyst


Left Bartholin Cyst


© Mikos/Kohli
Uterus
Bladder
Rectum
Urethra
Cystocele
(defect in pubocervical fascia)
Rectocele
(defect in rectovaginal fascia)
Uterus
Bladder
Rectum
Urethra
© Mikos/Kohli
Cystoure-
throcele
Uterus
Bladder
Rectum
Urethra
Vaginal epithelium
(skin)
Pubocervical fascia
(support system)
Rectovaginal
fascia
(support system)
© Mikos/Kohli


Fallopian tube (Oviduct)
Ovary
Body of Uterus
Fundus of Uterus
Fimbria
Egg Cell
Follicle
Endometrium
Myometrium
Perimetrium
Cervix
Vagina
38

PERINEUM

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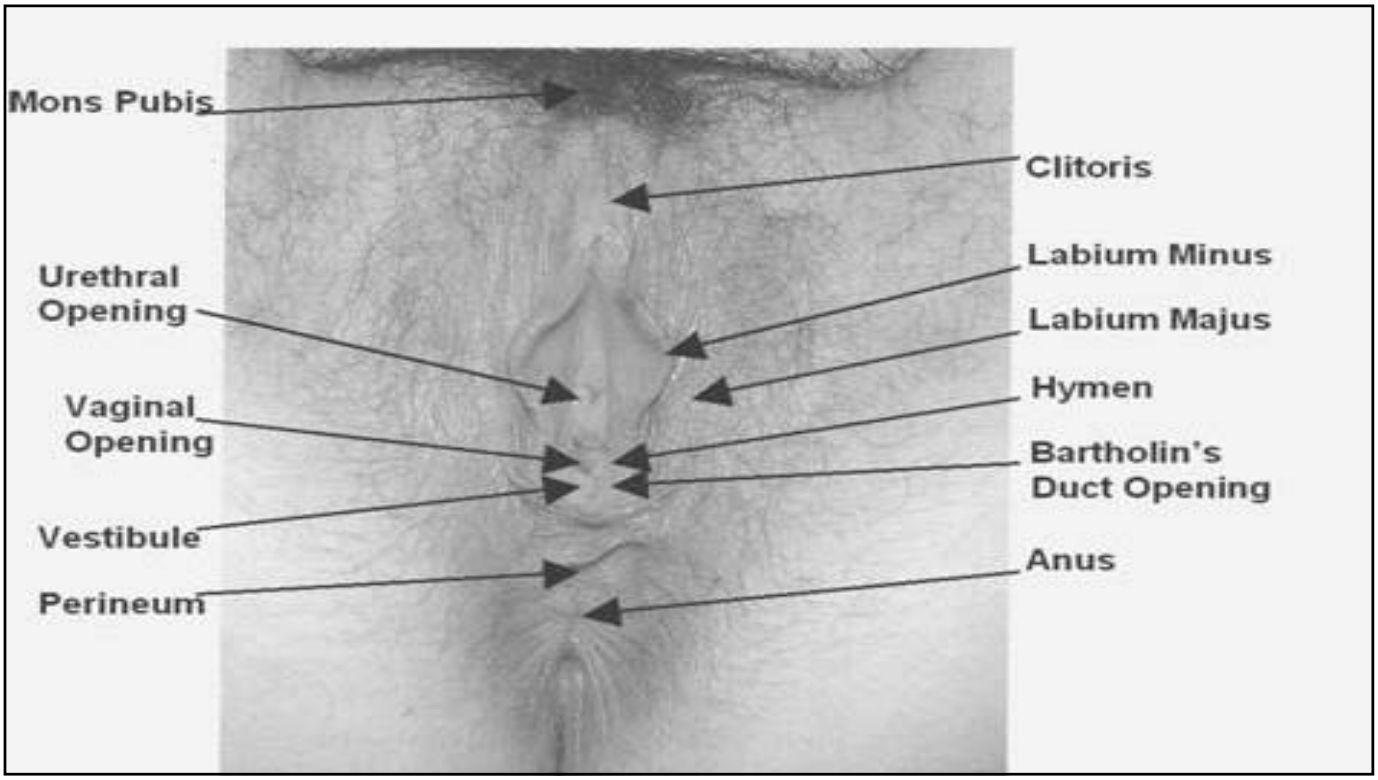
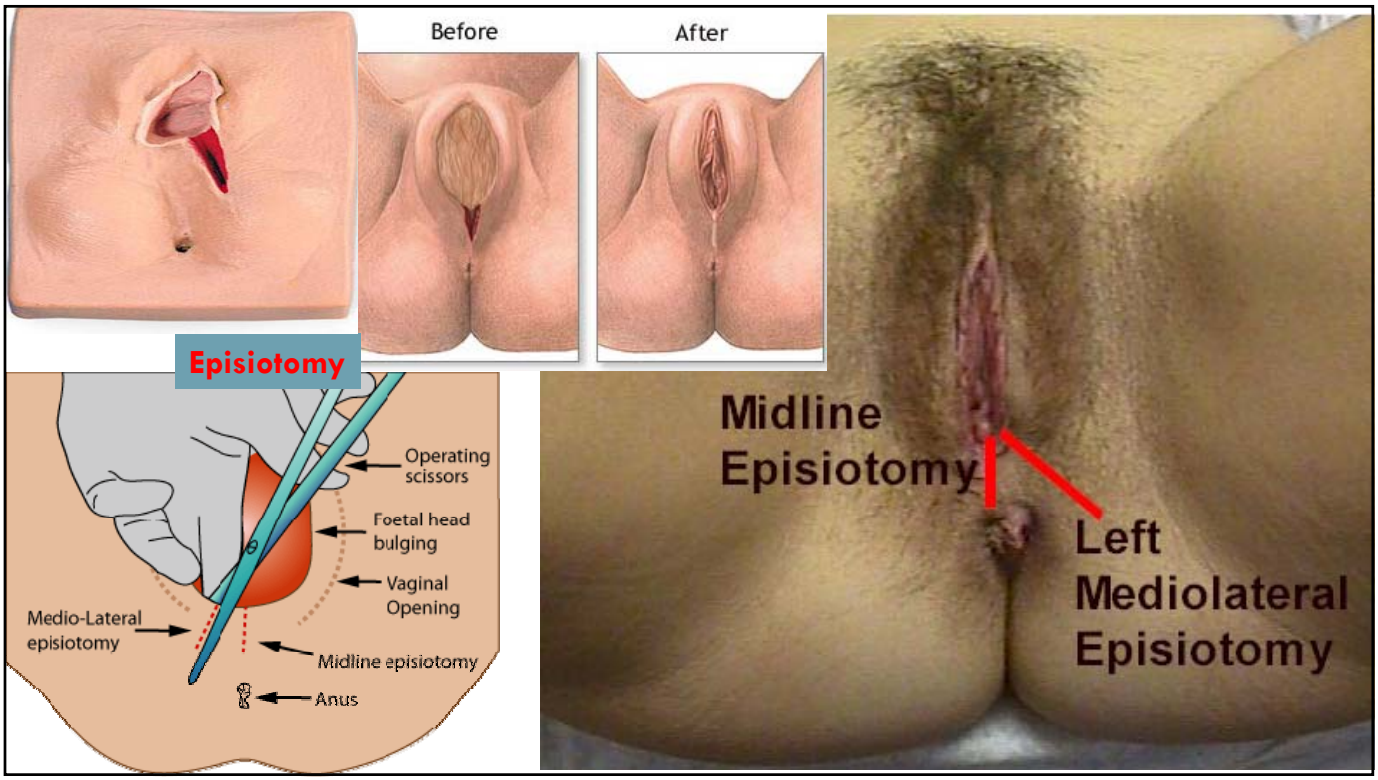
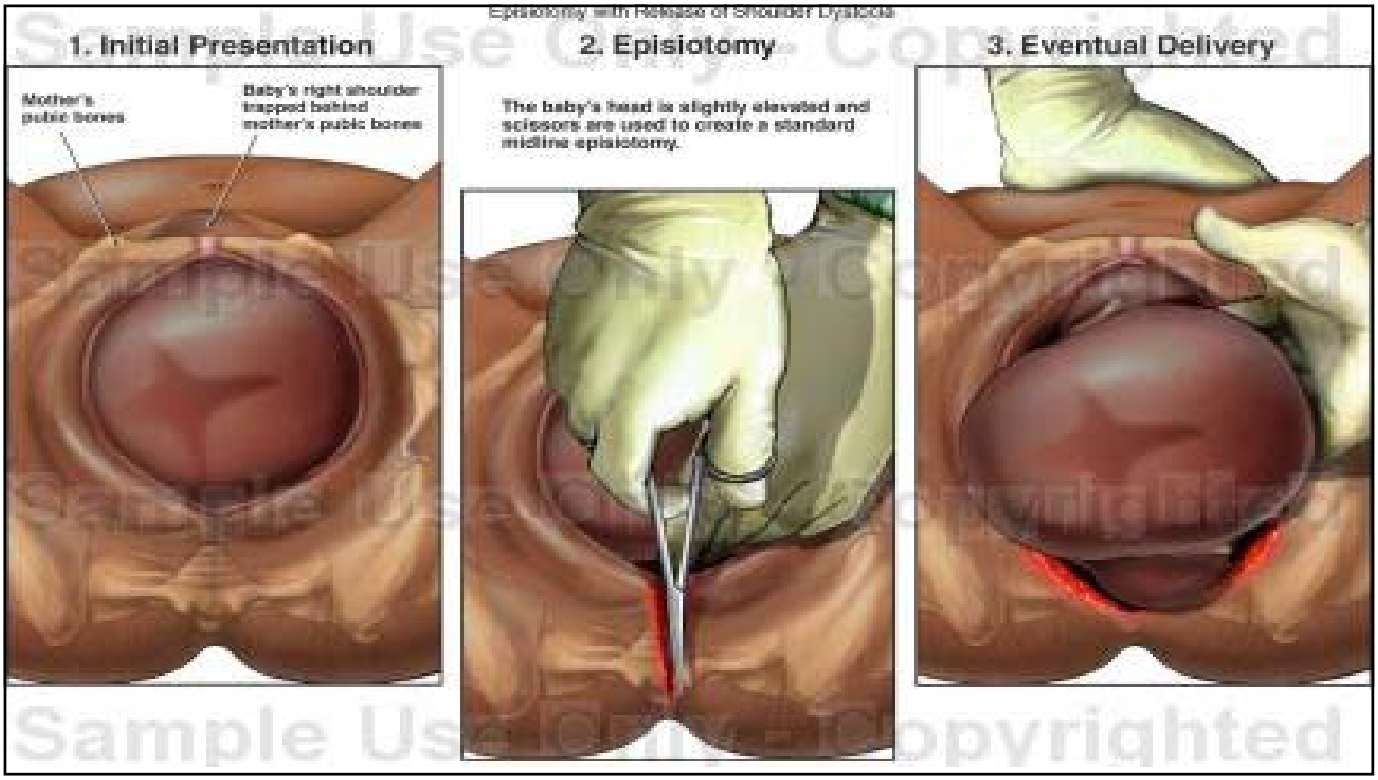
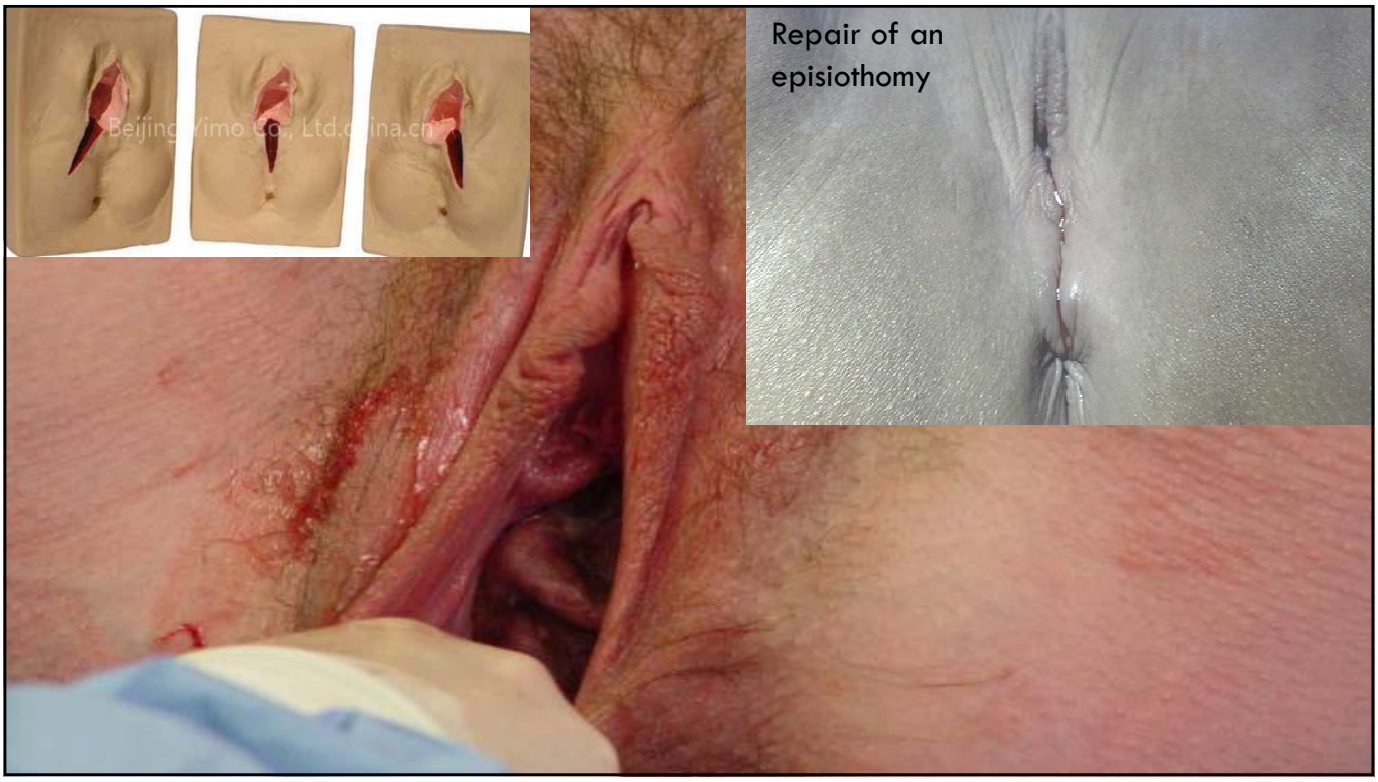
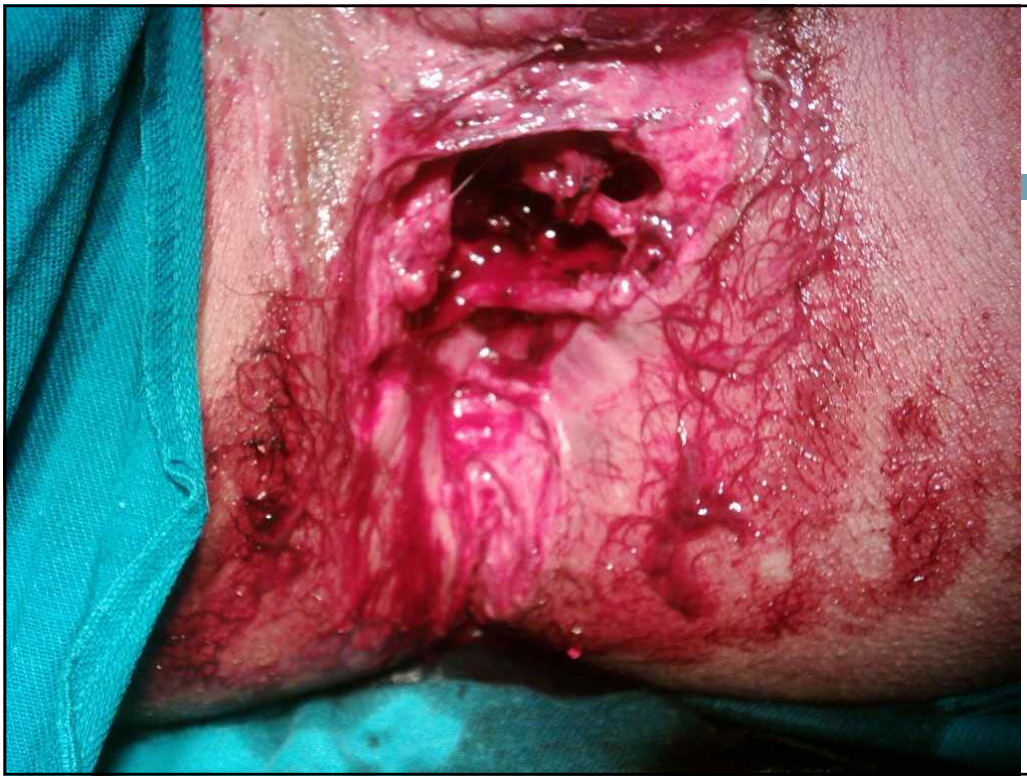
- The muscle and tissue located between the vaginal opening and anal canal
- It supports and surrounds the lower parts of the urinary and digestive tracts
- The perinium contains an abundance of nerve endings that make it sensitive to touch
- An episiotomy is an incision of the perinium used during childbirth for widening the vaginal opening









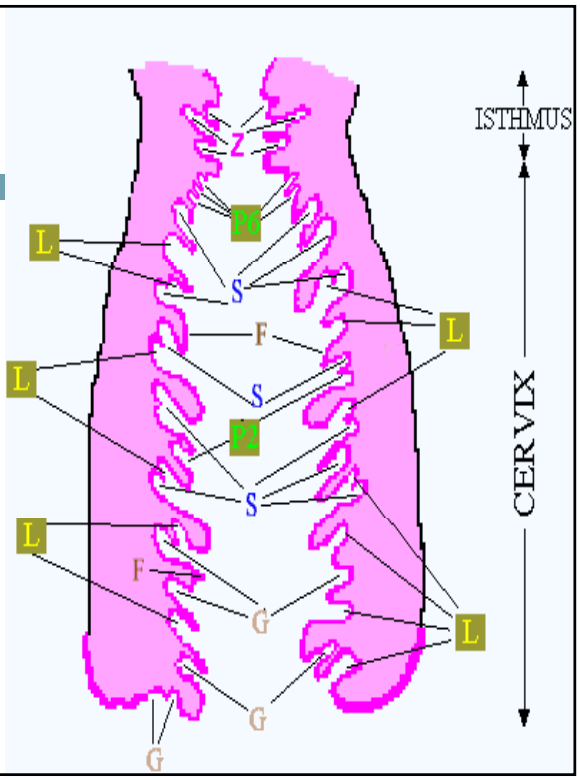


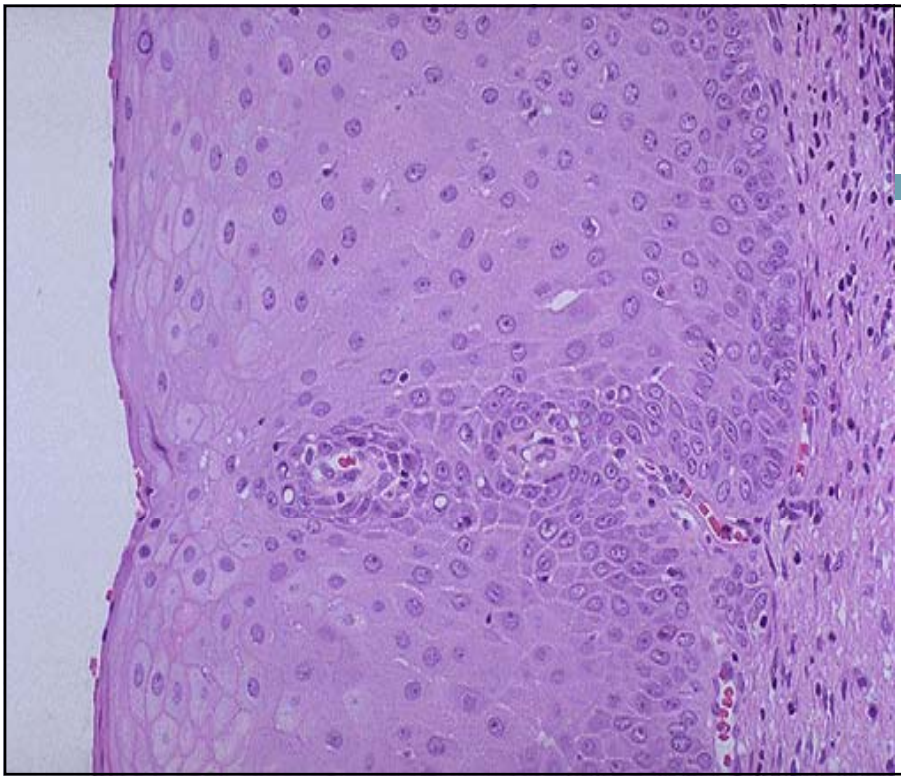
PERINEAL LACERATION

Dr. Nedal Matar, Aleppo University Hospital, Syria.
Perineal laceration following blunt trauma. No associated pelvic fracture and did not involve the anal sphincter mechanism.

CERVIX

F	F mucus
G	G mucus
L	L mucus
P	P mucus
S	S mucus
Z	Z granules





- This is normal cervical non-keratinizing squamous epithelium.
- The squamous cells show maturation from basal layer to surface.

CERVIX

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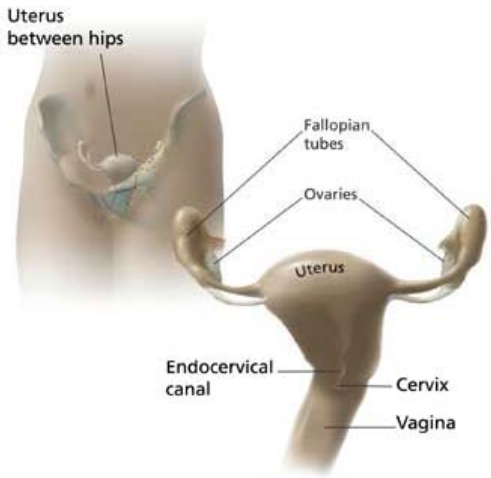
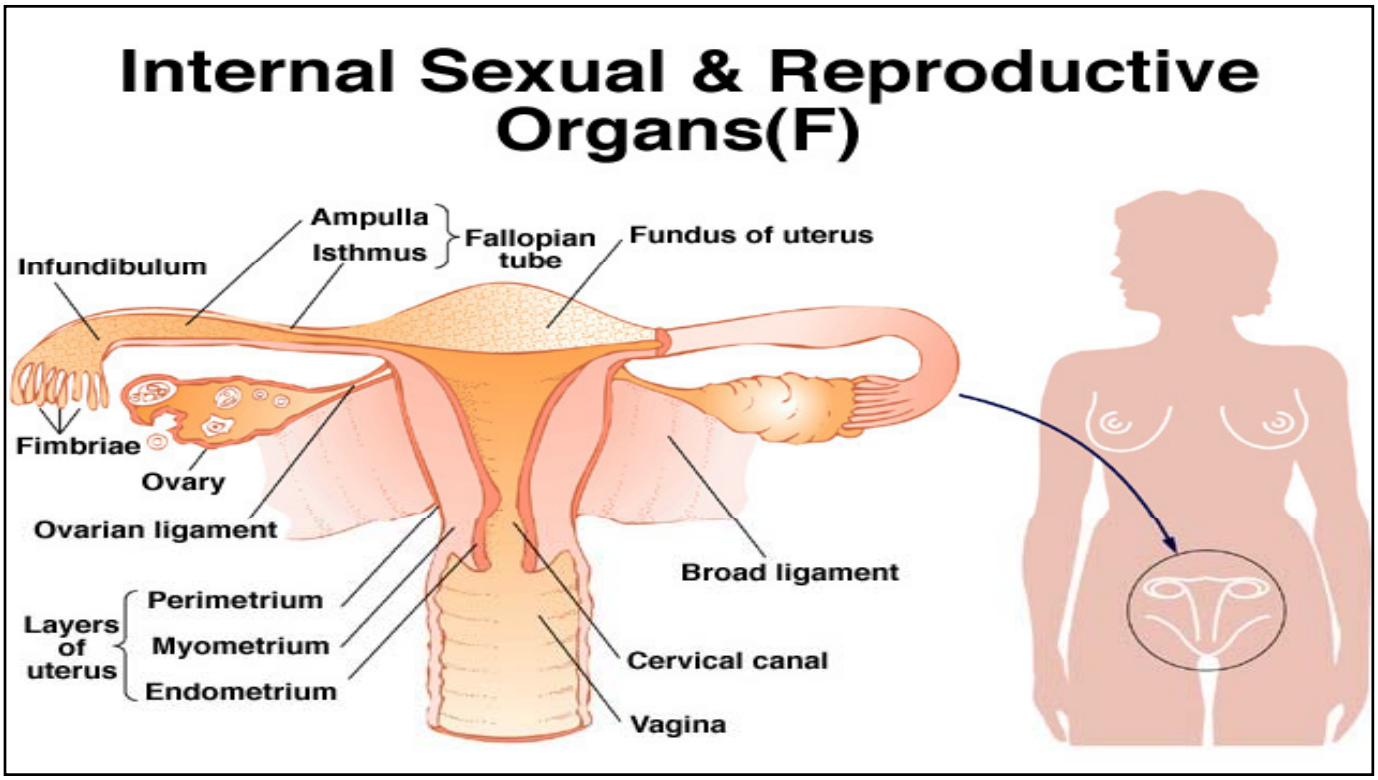
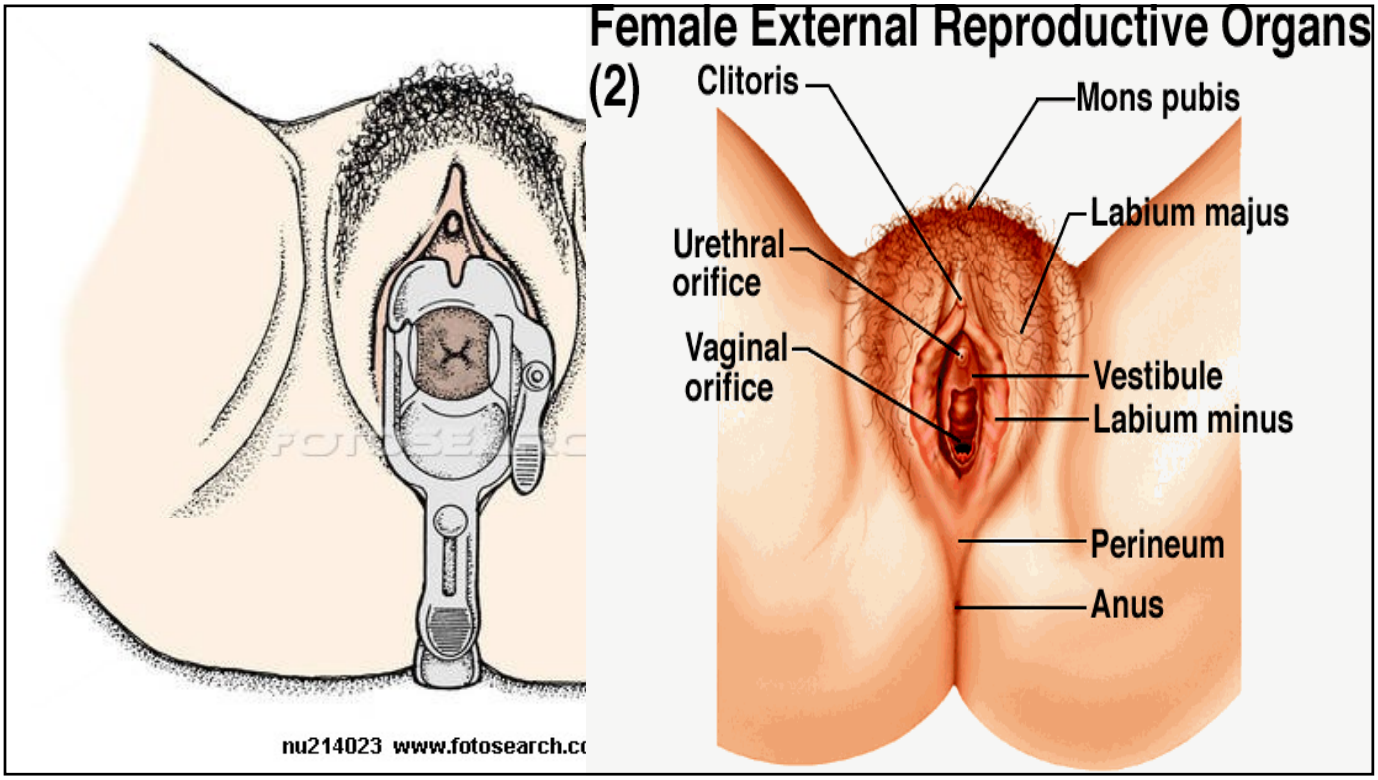
- The cervix connects the uterus to the vagina
- The cervical opening to the vagina is small
- This acts as a safety precaution against foreign bodies entering the uterus
- During childbirth, the cervix dilates to accommodate the passage of the fetus
- This dilation is a sign that labor has begun

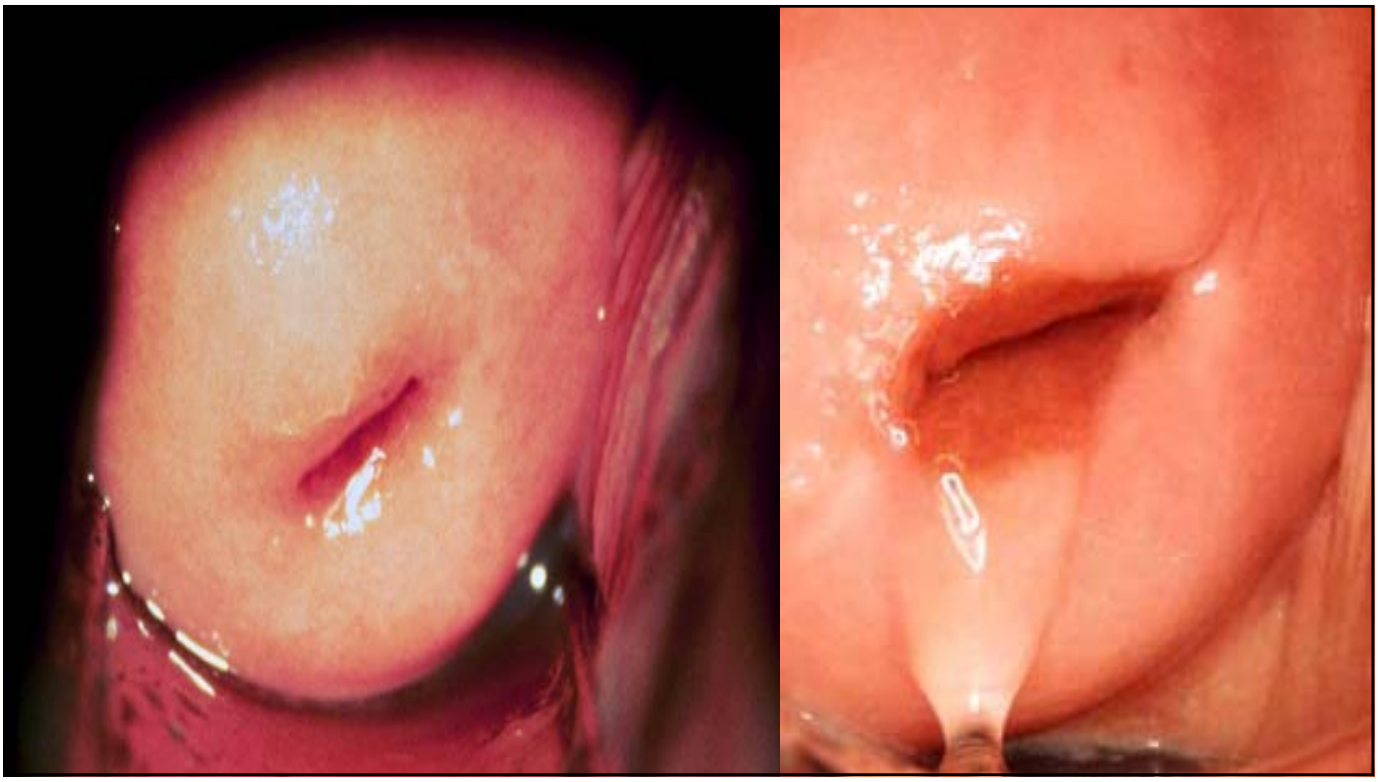
Cervix

• **Squamocolumnar junction (SCJ)**
– Junction between columnar and squamous epithelium
– Dynamic: puberty, pregnancy, menopausal, original vs active SCJ
– Neonate – exocervical, menopausal – endocervical
• **Transformation zone**
– Metaplasia advances from the original SCJ inward, toward the external os, over the columnar villi
– This process creates the transformation zone
• **Nabothian Cysts**
– Endocervical glands covered during the metaplastic process



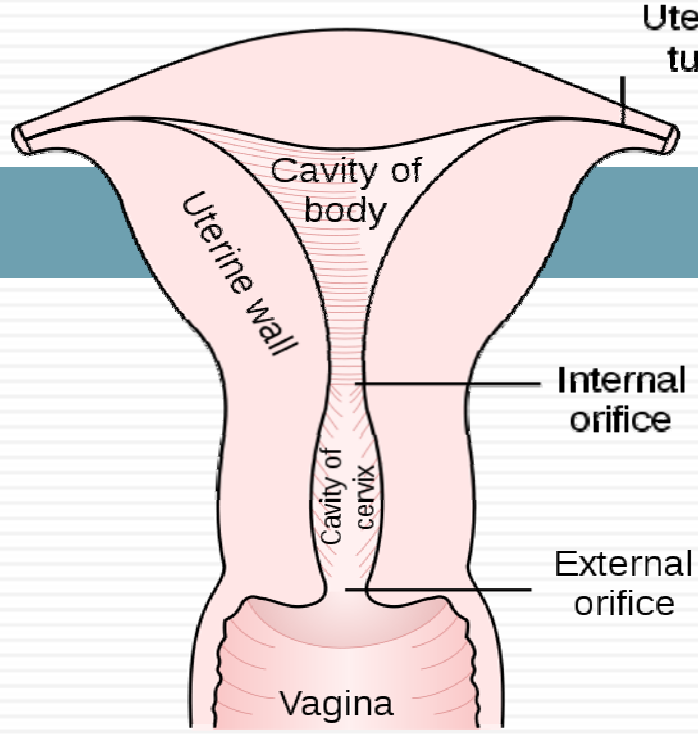

Internal Sexual & Reproductive Organs(F)
Ampulla
Isthmus
Fallopian tube
Fundus of uterus
Infundibulum
Fimbriae
Ovary
Ovarian ligament
Broad ligament
Layers of uterus
Perimetrium
Myometrium
Endometrium
Cervical canal
Vagina


Female External Reproductive Organs (2)
Clitoris
Mons pubis
Labium majus
Urethral orifice
Vaginal orifice
Vestibule
Labium minus
Perineum
Anus
nu214023 www.fotosearch.c

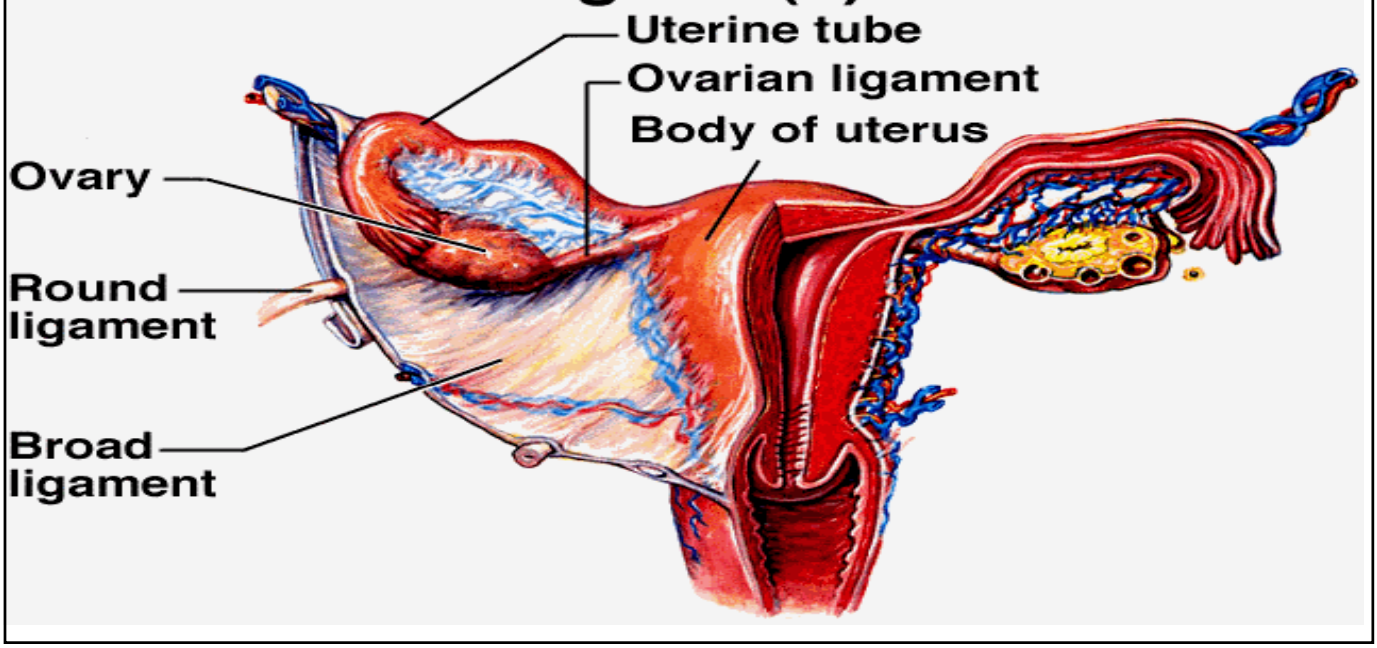


Uterus

Ovaries



Female Internal Reproductive Organs (1)



UTERUS

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- Commonly referred to as the womb
- A pear shaped organ about the size of a clenched fist
- It is made up of the endometrium, myometrium and perimetrium
- Consists of blood-enriched tissue that sloughs off each month during menstrual cycle
- The powerful muscles of the uterus expand to accommodate a growing fetus and push it through the birth canal

The uterus

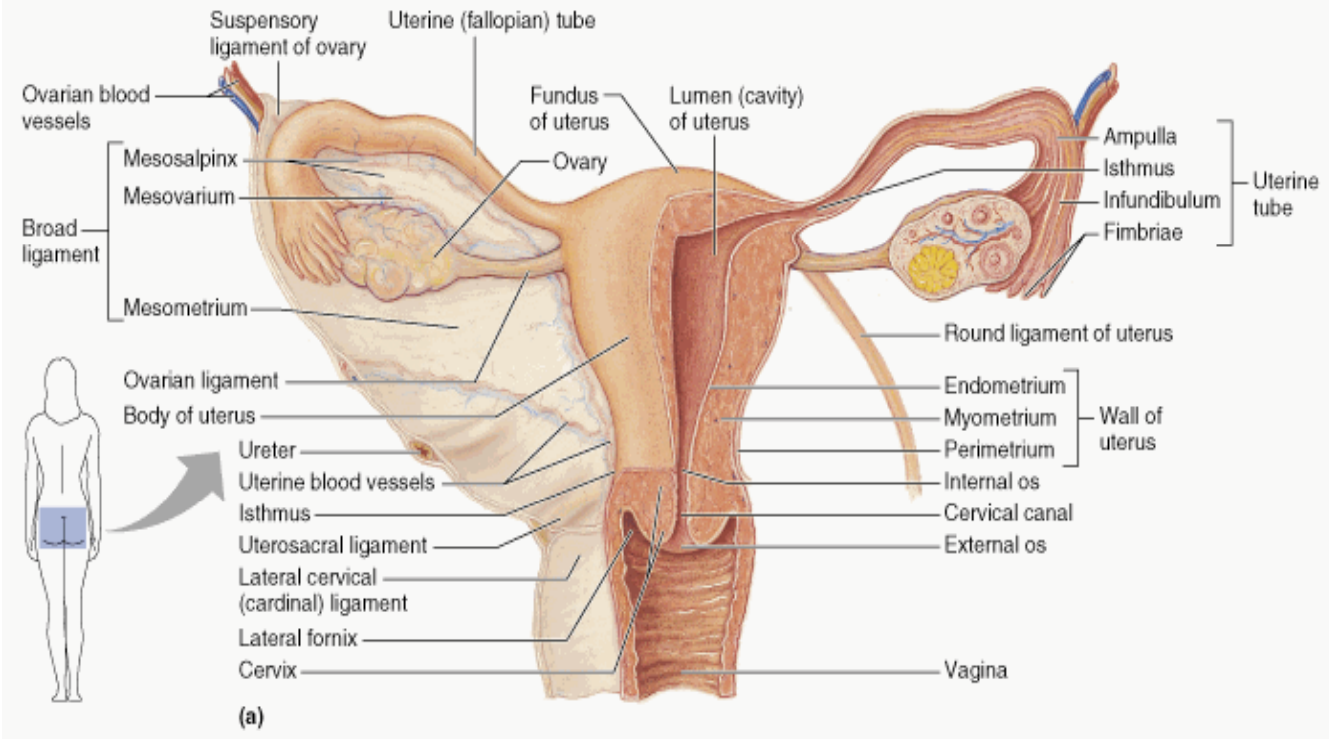
- Muscular organ
  - Mechanical protection
  - Nutritional support
  - Waste removal for the developing embryo and fetus
- Supported by the broad ligament and 3 pairs of suspensory ligaments

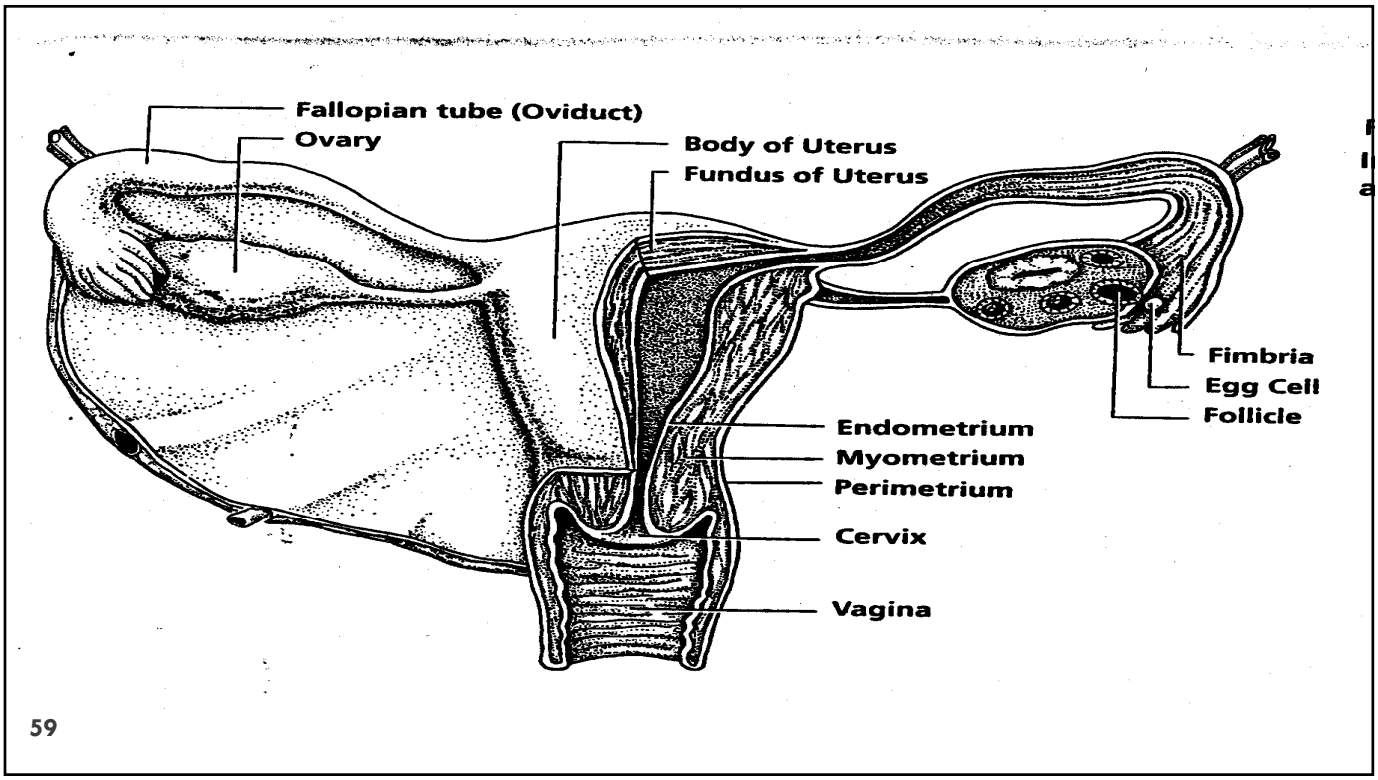
Uterine wall consists of three layers:

- Myometrium – outer muscular layer
- Endometrium – a thin, inner, glandular mucosa
- Perimetrium – an incomplete serosa continuous with the peritoneum

The uterus

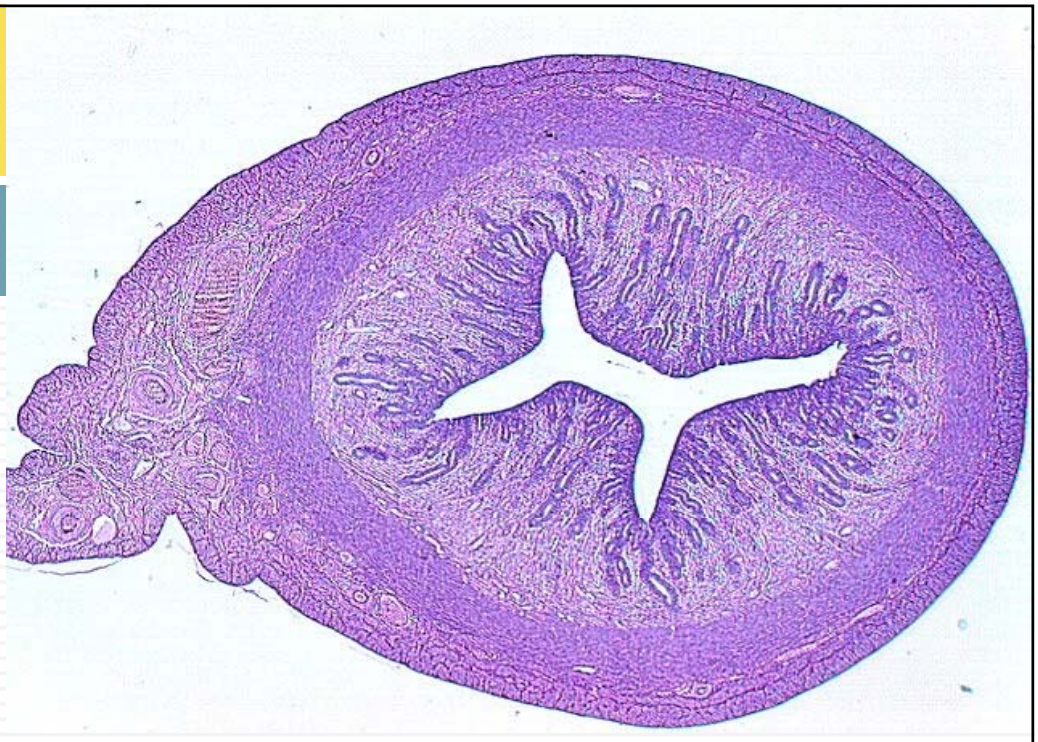
- Muscular organ
  - Mechanical protection
  - Nutritional support
  - Waste removal for the developing embryo and fetus
- Supported by the broad ligament and 3 pairs of suspensory ligaments

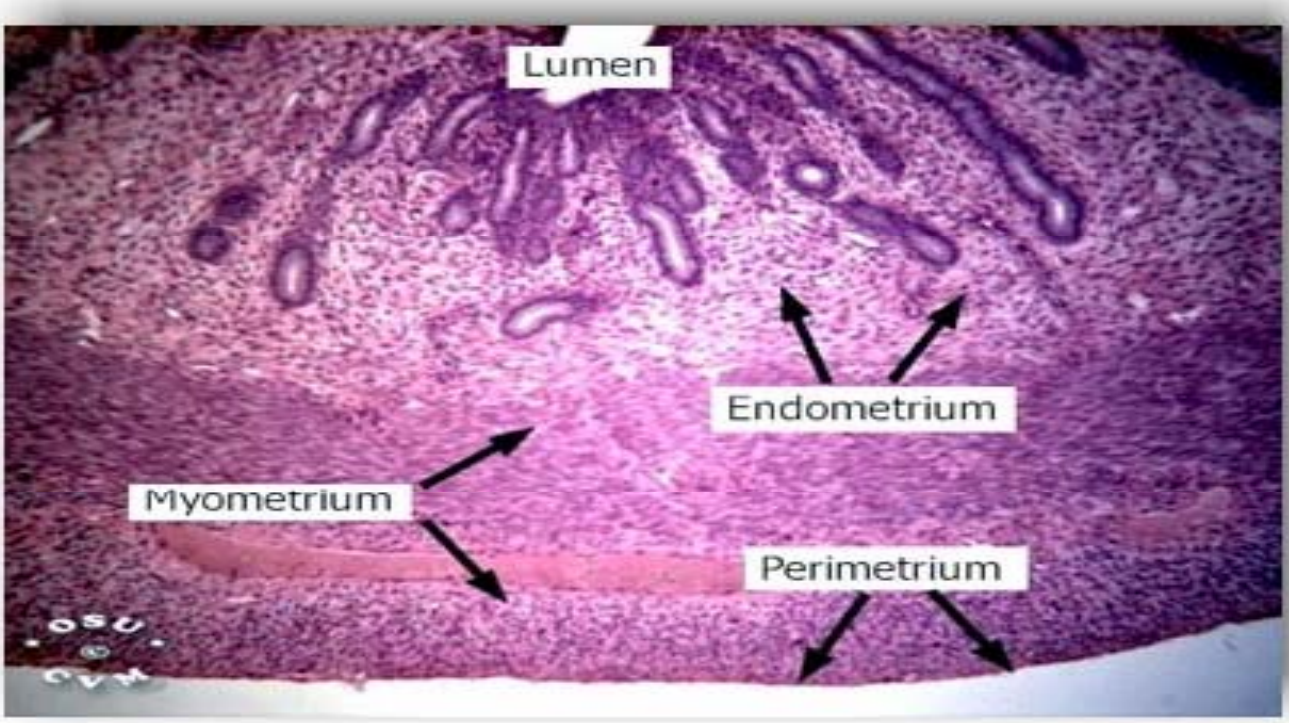




Uterus ,ovaries

The uterus is a muscular sac, lined with epithelium that undergoes cyclic changes.
The wall is made up of thick smooth muscle, organized in interlacing bundles that run randomly.
It is called the myometrium





Arterial/Venous Supply

– Uterine, ovarian, and vaginal artery

• **Lymphatic Drainage**

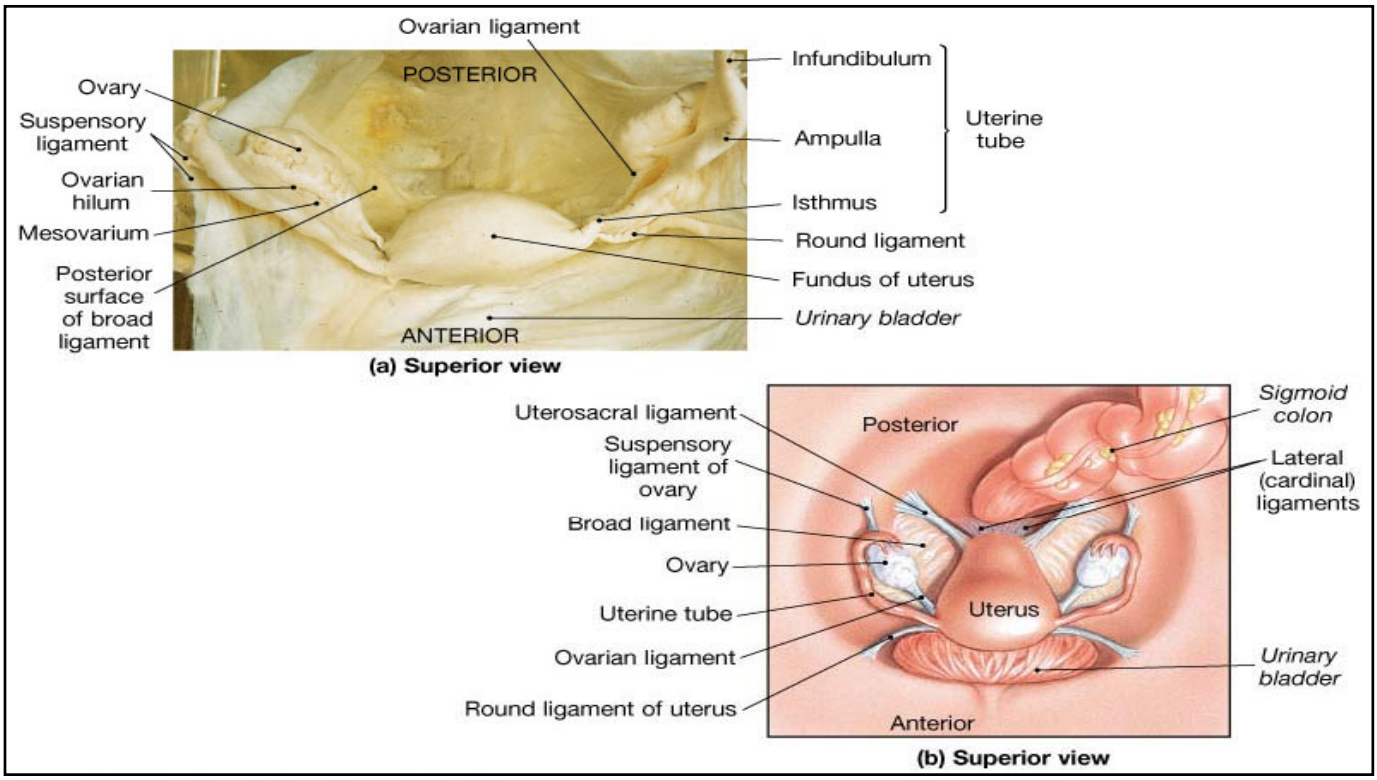
– Fundus = aortic/lumbar/pelvic lymph nodes

– Body = within broad ligament to external iliac nodes

– Cervix = internal iliac and sacral lymph nodes

• **Innervation**

– Sympathetic and parasympathetics run through the uterovaginal plexus (which travels with the uterine artery) from the inferior hypogastric plexus and lumbar splanchnic nerves



The Wall

– Perimetrium, myometrium, endometrium

• **The Endometrium**

– Stratum basale – premordial glands and densely cellular stroma

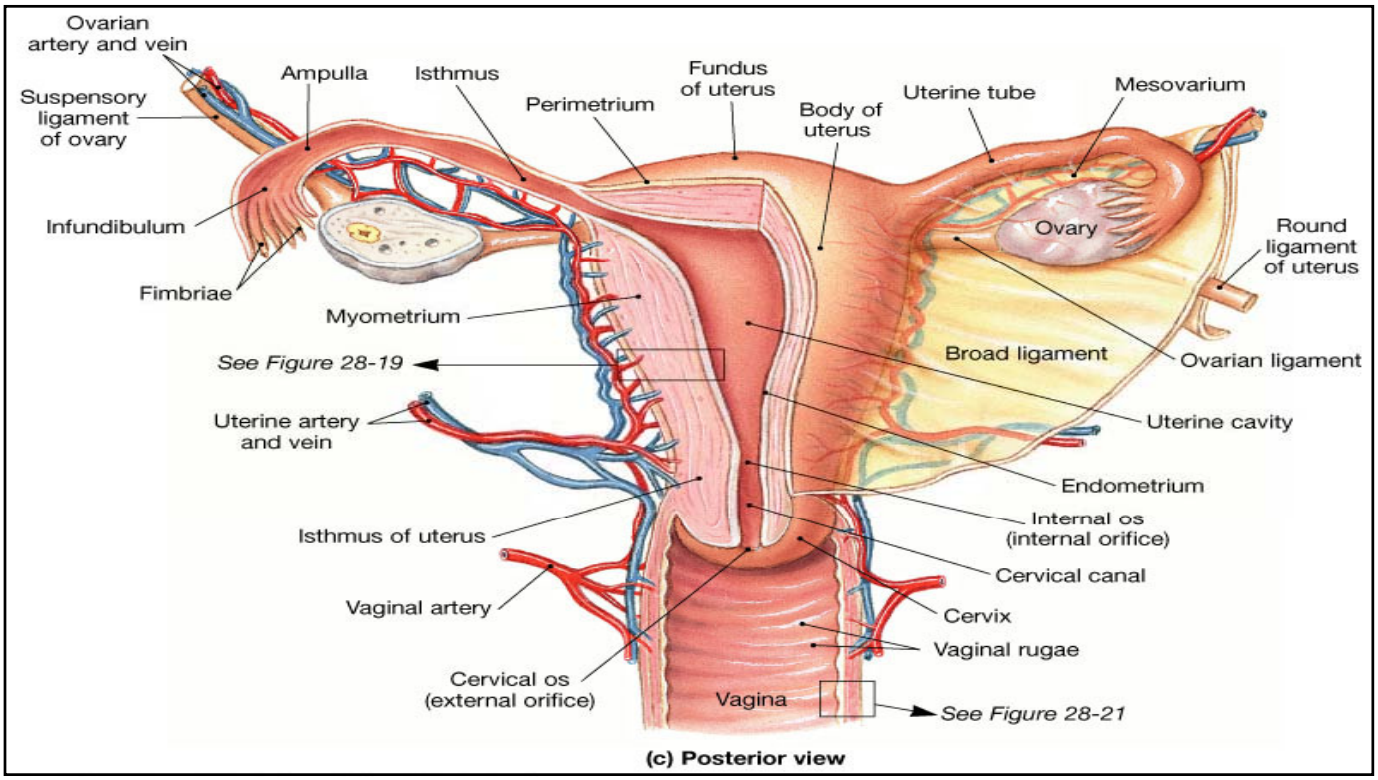
– Stratum functionale – responds to fluctuating hormone levels, includes Stratum compactum and spongiosum,

• **Stratum Compactum**

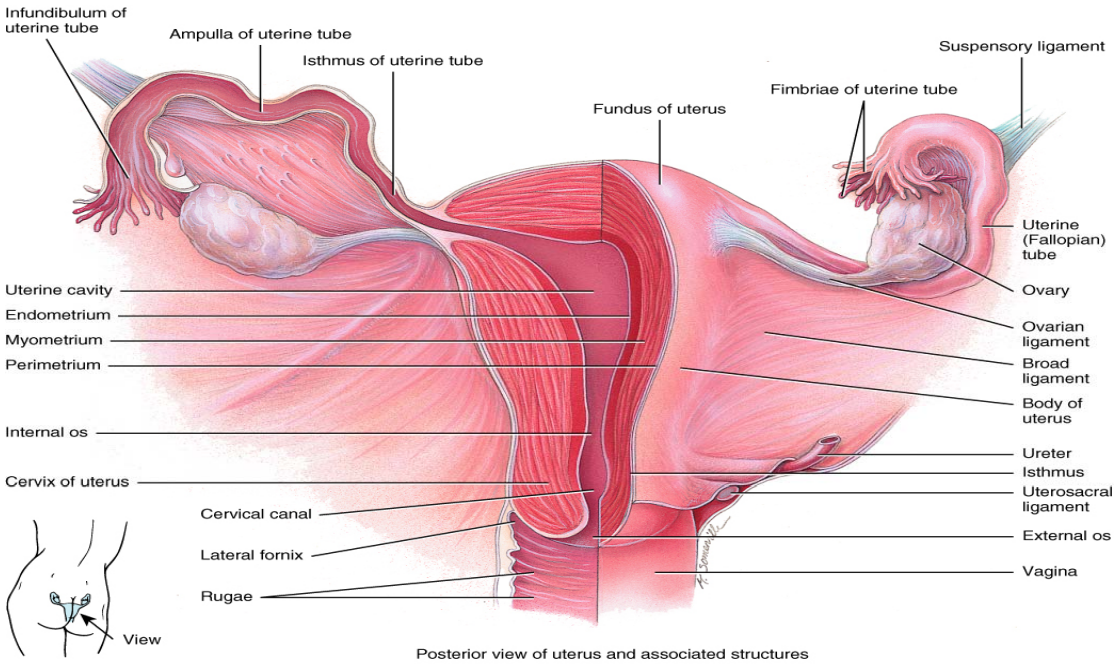
– Consists of the necks of the glands and densely populated stromal cells

• **Stratum Spongiosum**

– Consists primarly of glands with less densely populated stroma and large amounts of interstitial tissue



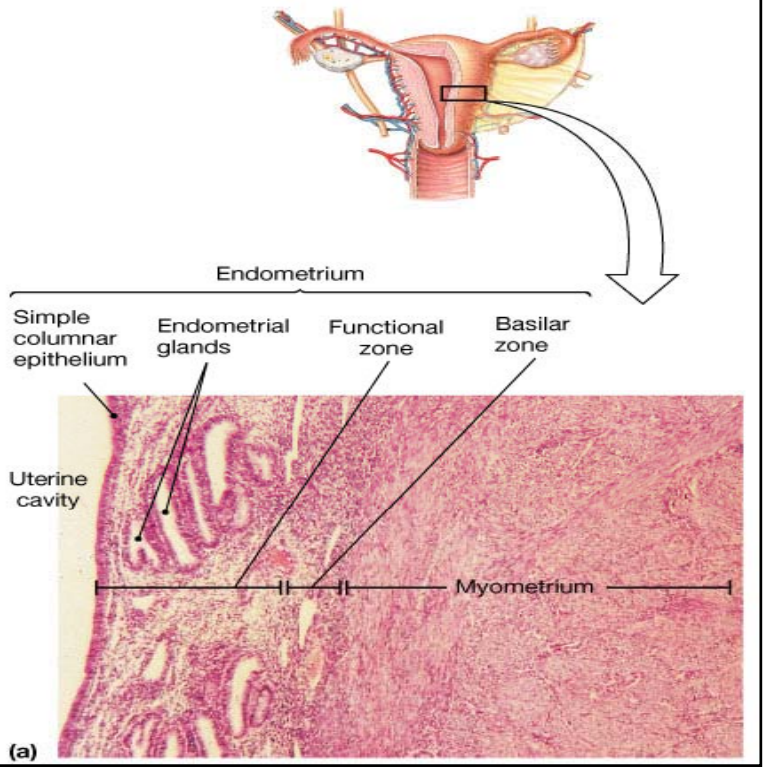
(c) Posterior view



Posterior view of uterus and associated structures

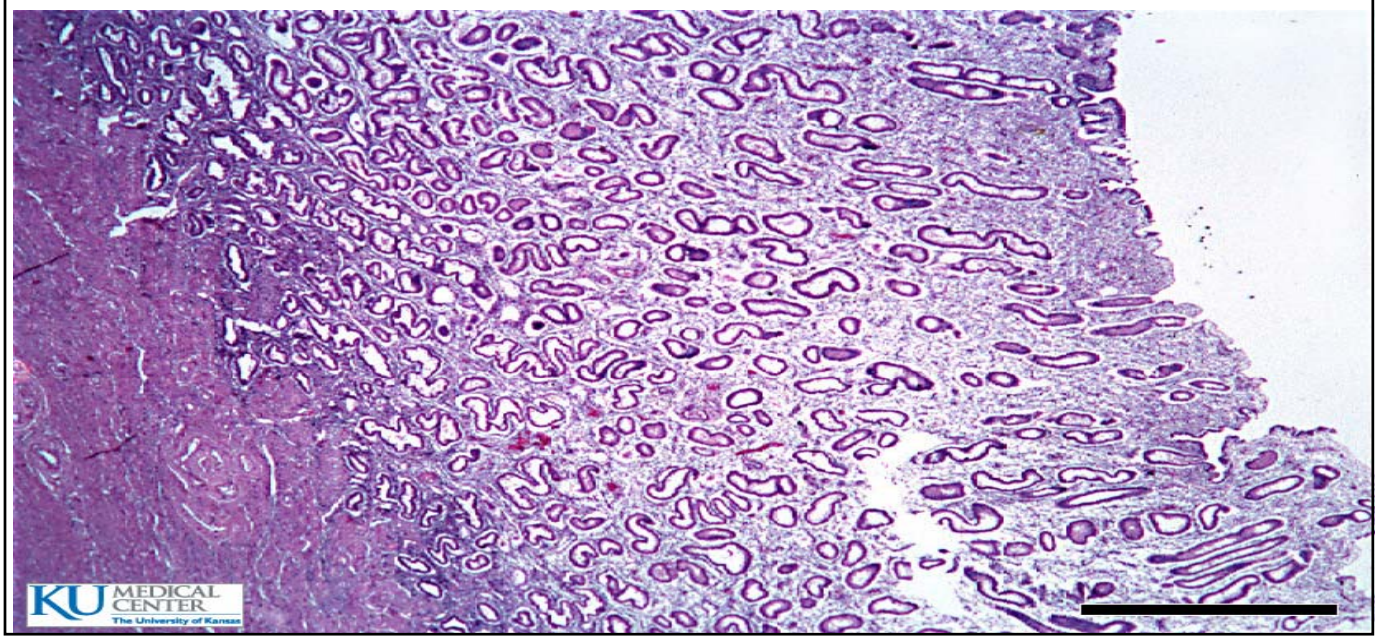
28.18.jpeg

The Uterine Wall

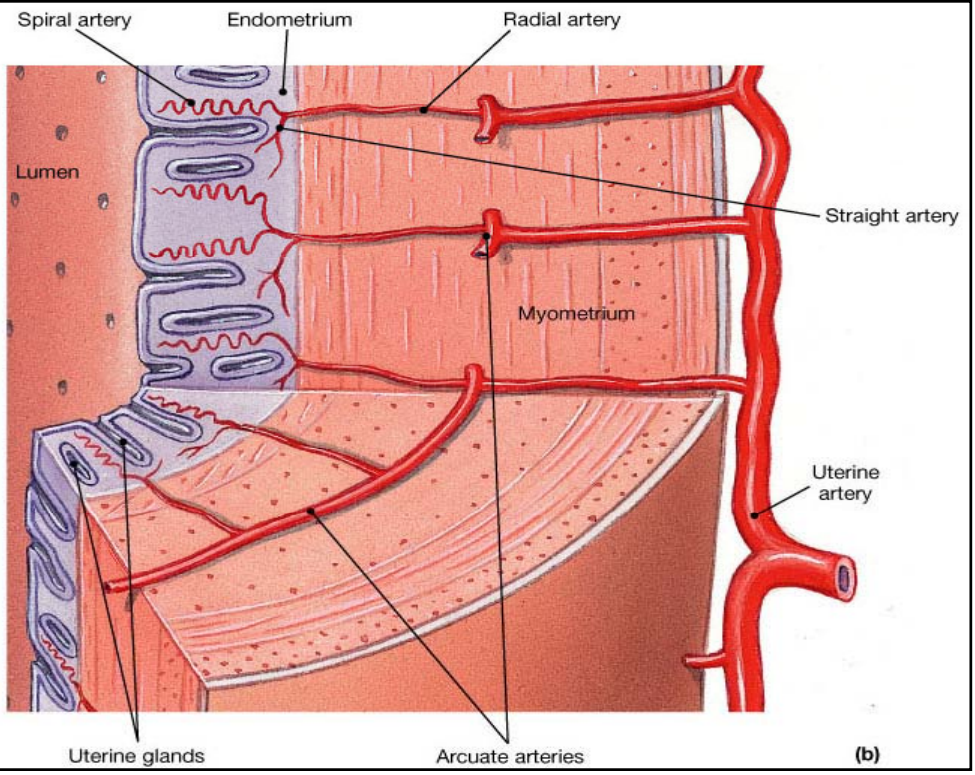


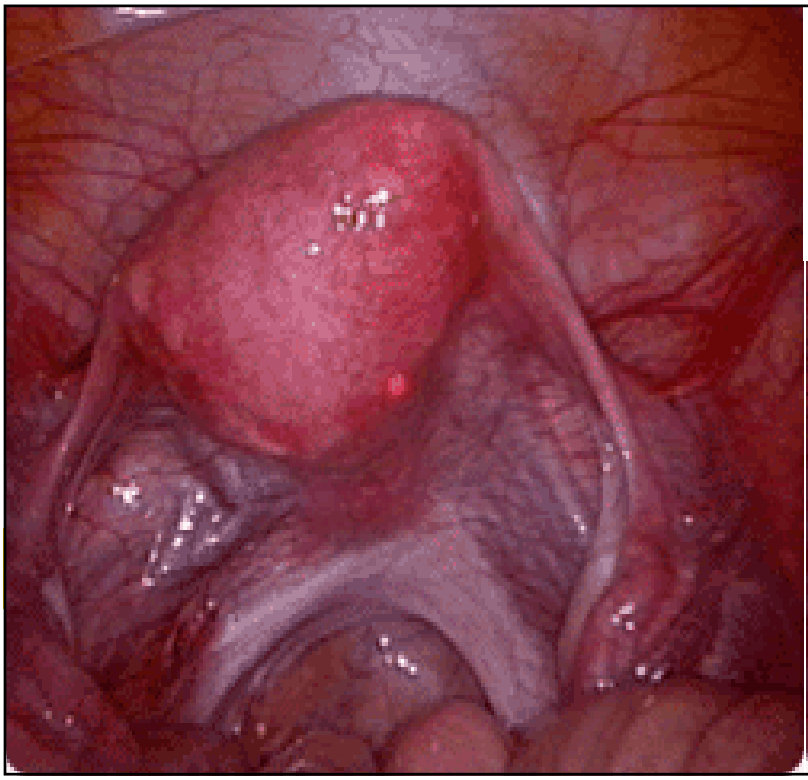
Uterus (Secretory)

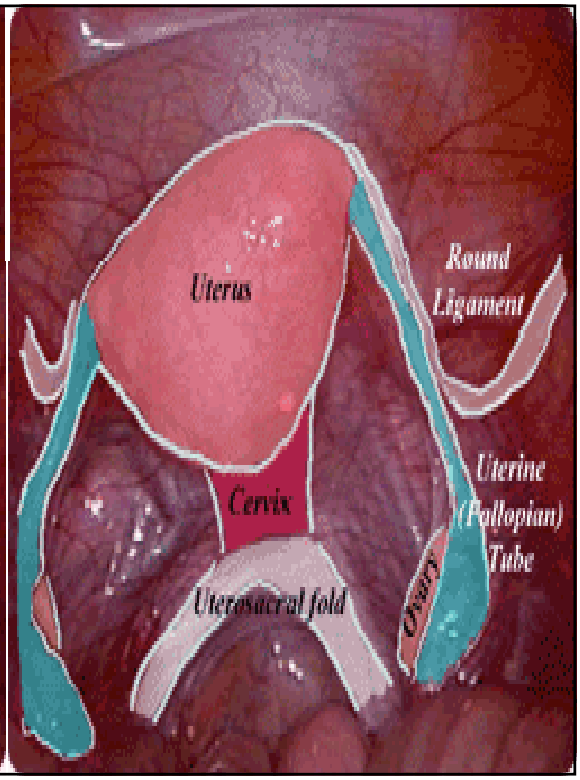
During the secretory phase, the endometrium thickens and the tubular glands become extremely convoluted (arrow), as shown in this low power micrograph



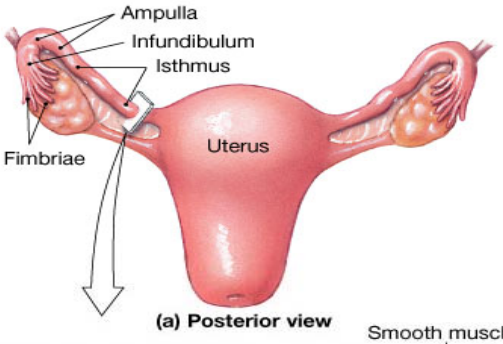
The Uterine Wall



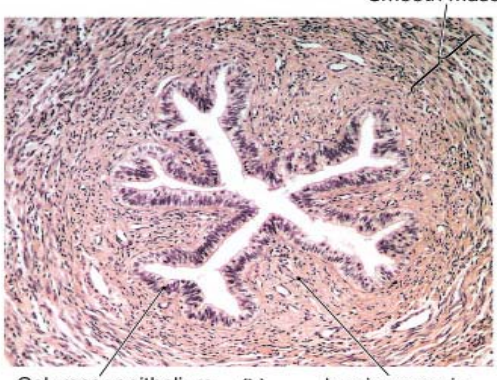




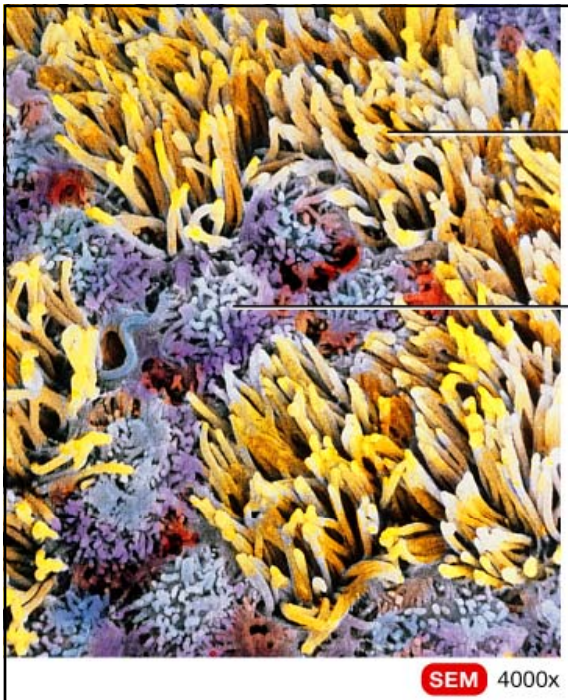
The Uterine Tubes



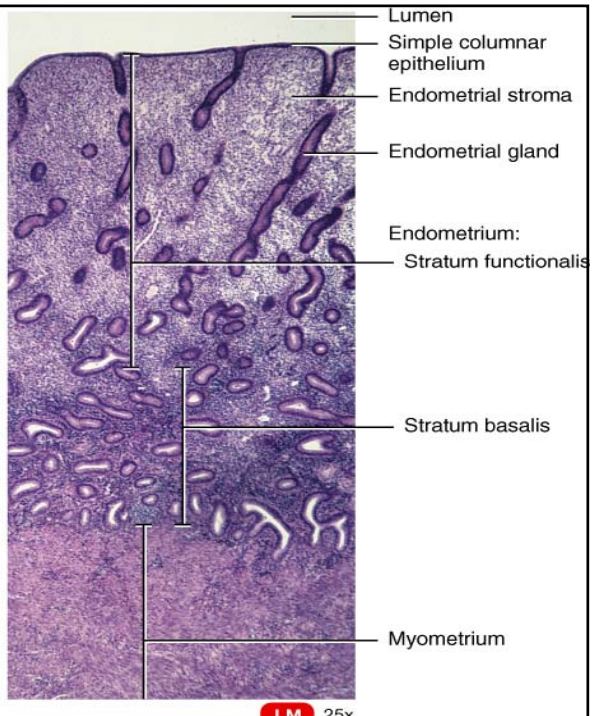
(a) Posterior view



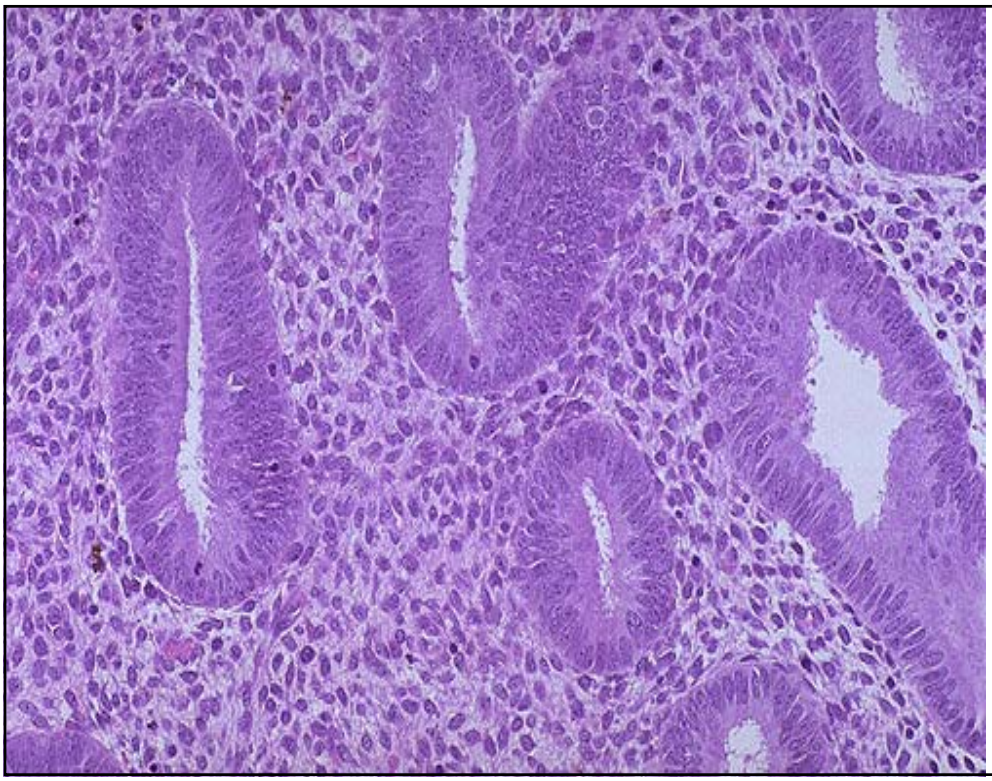
(c)



Cilia and secretory cells lining the uterine (Fallopian) tube

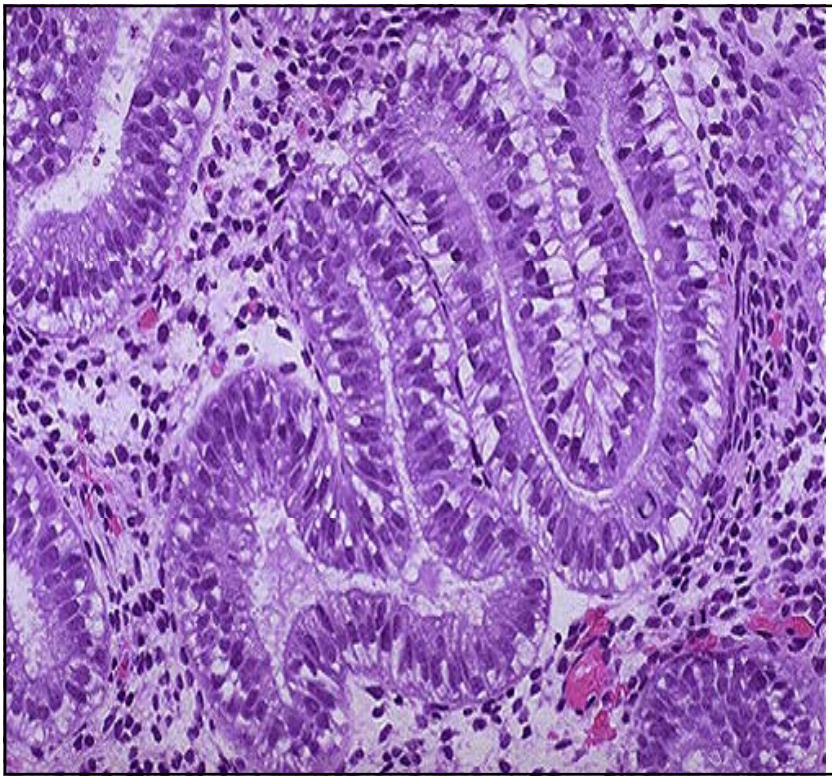


Portion of endometrium and myometrium



This is the microscopic appearance of normal proliferative endometrium in the menstrual cycle.

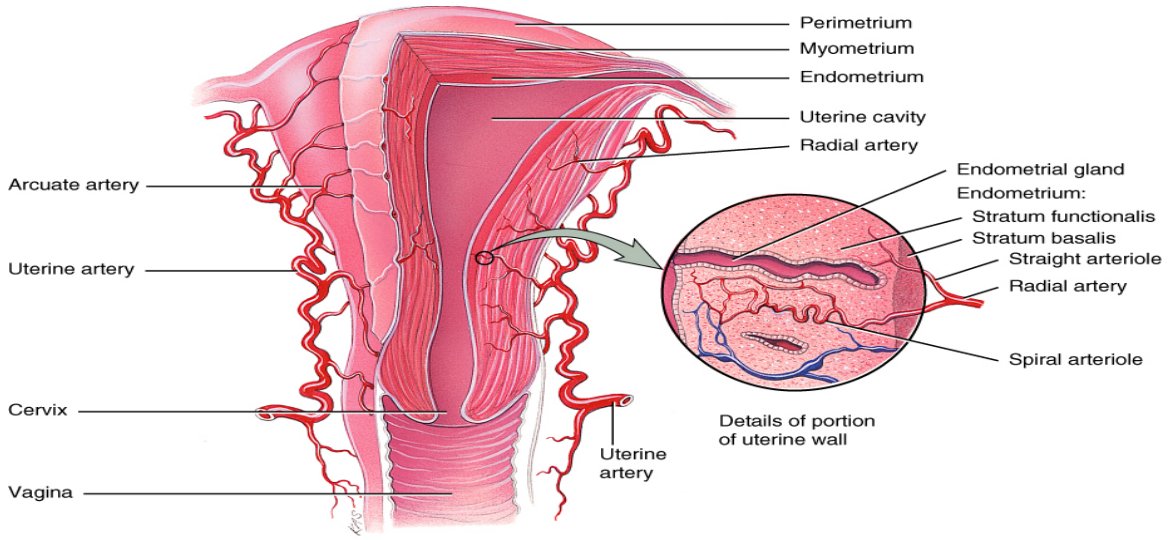
The proliferative phase is the variable part of the cycle. In this phase, tubular glands with columnar cells and surrounding dense stroma are proliferating to build up the endometrium following shedding with previous menstruation.



Here is early secretory endometrium.

The appearance with prominent subnuclear vacuoles in cells forming the glands is consistent with post-ovulatory day 2.

The histologic changes following ovulation are quite constant over the 14 days to menstruation and can be utilized to date the endometrium.



Anterior view with left side of uterus partially sectioned

28.21.jpeg

Uterine cycle

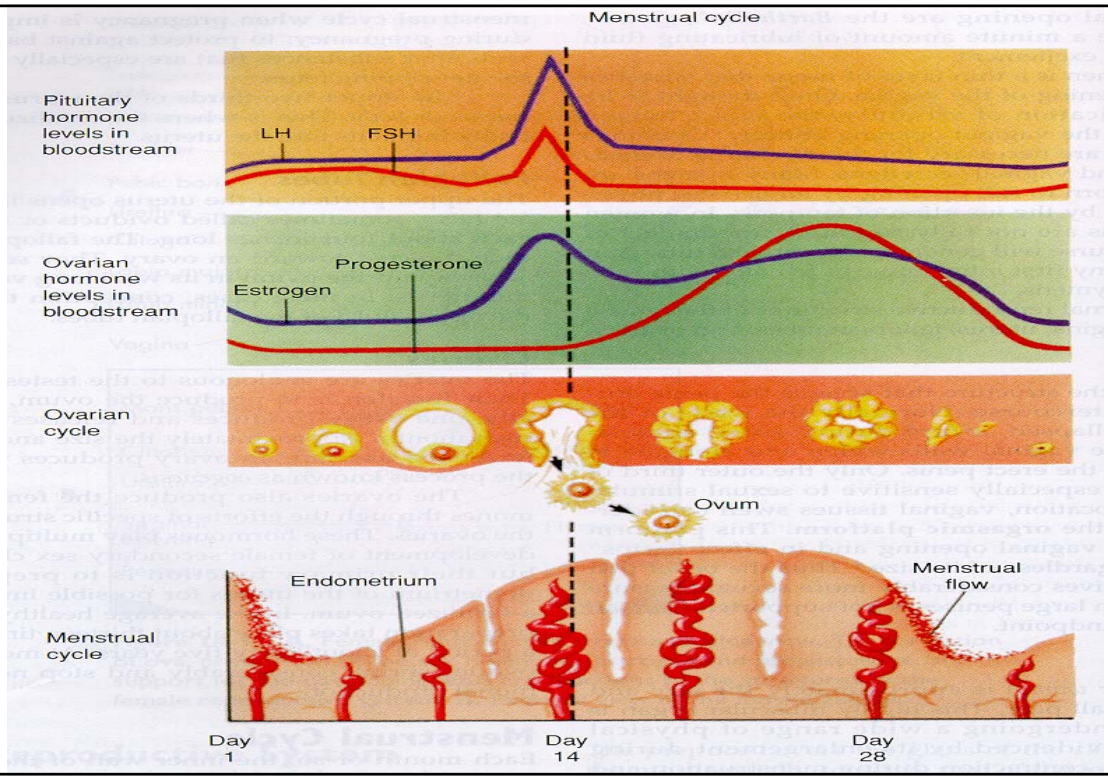
- Repeating series of changes in the endometrium
- Continues from menarche to menopause
  - Menses
    - Degeneration of the endometrium
    - Menstruation
  - Proliferative phase
    - Restoration of the endometrium
  - Secretory phase
    - Endometrial glands enlarge and accelerate their rates of secretion

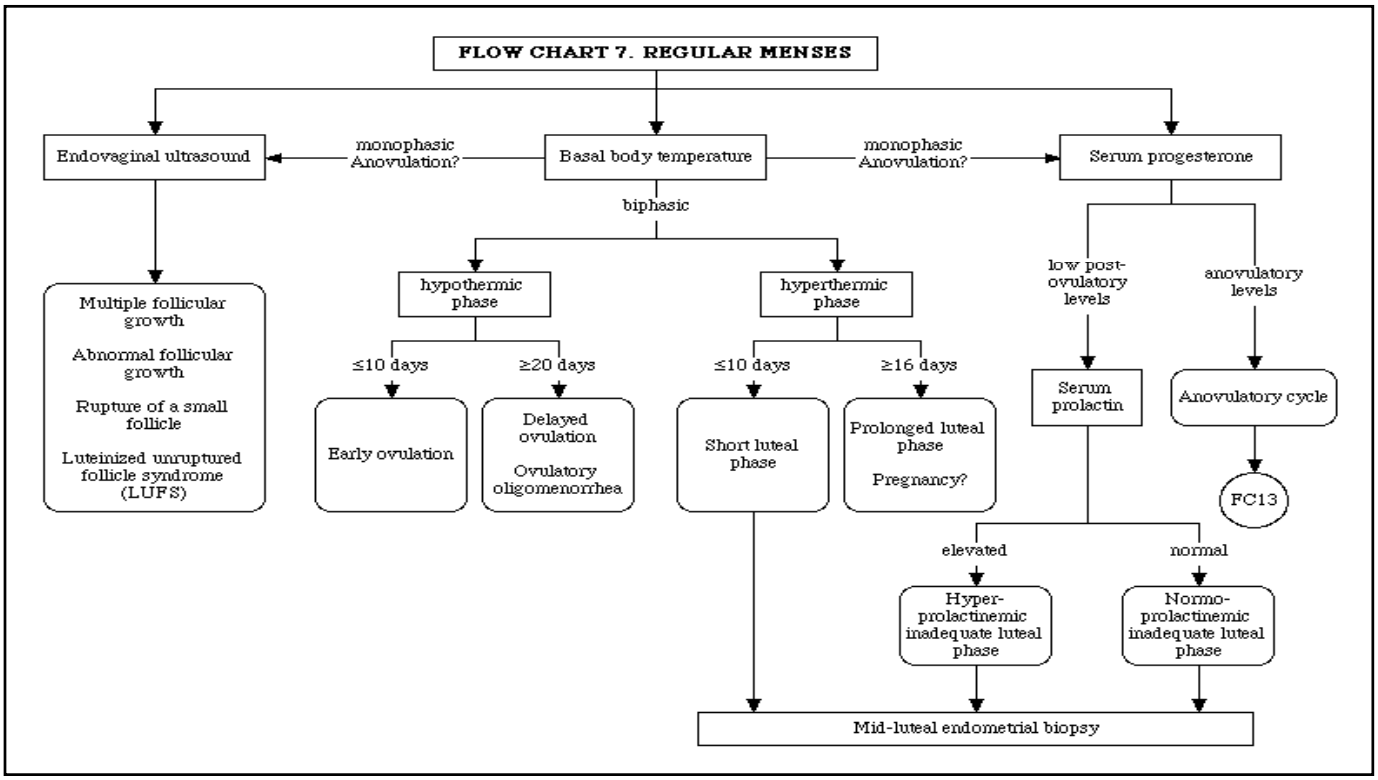
MENSTRUATION

- Menarch, the onset of menstruation signals the bodily changes that transform a female body
- Average age is 12.8
- Amount of bleeding varies from woman to woman
- Expulsion of blood clots

- Blood color can vary from bright red to dark maroon
- Usually occurs every 25 to 32 days
- Women can experience fluid retention, cramping, mood swings, weight gain, breast tenderness, diarrhea, and constipation

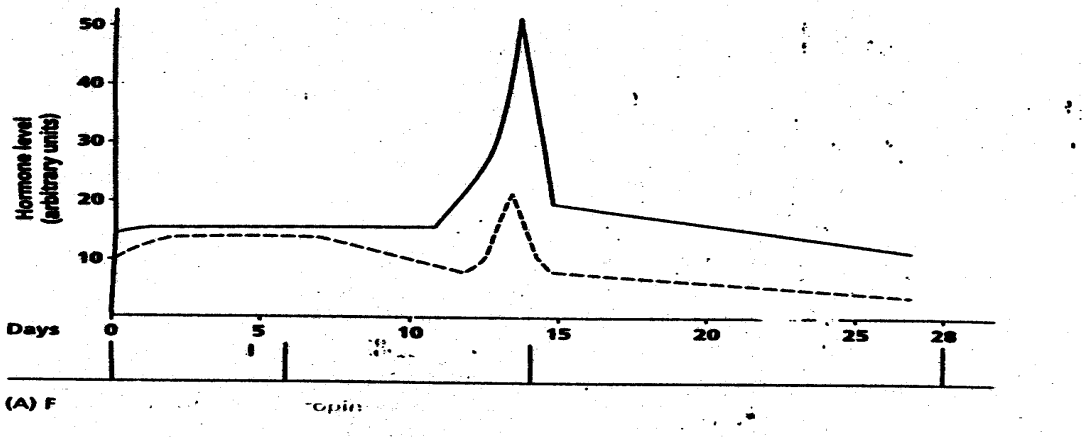
78





PITUITARY HORMONES

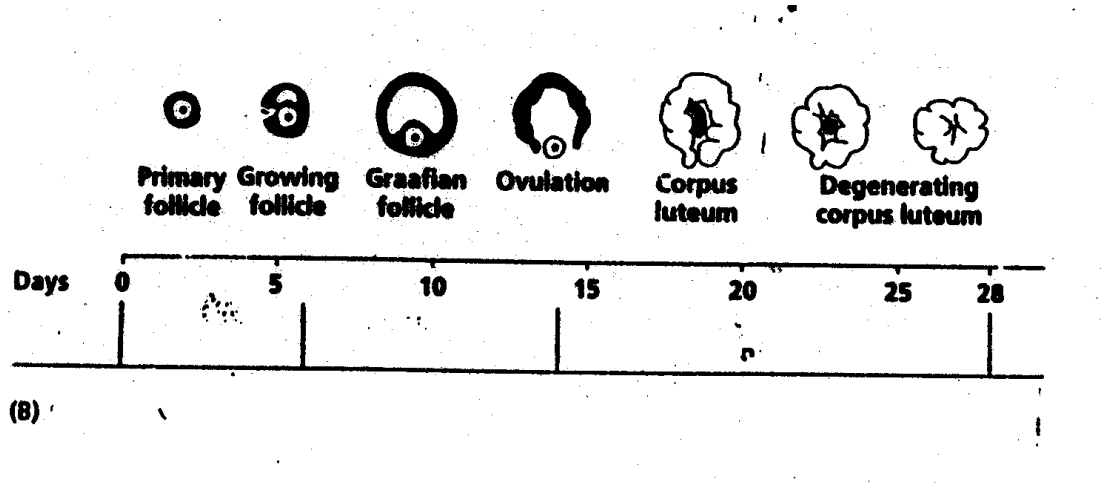
80



UNIT 3: FEMALE REPRODUCTIVE SYSTEM

FOLLICLE DEVELOPMENT

81



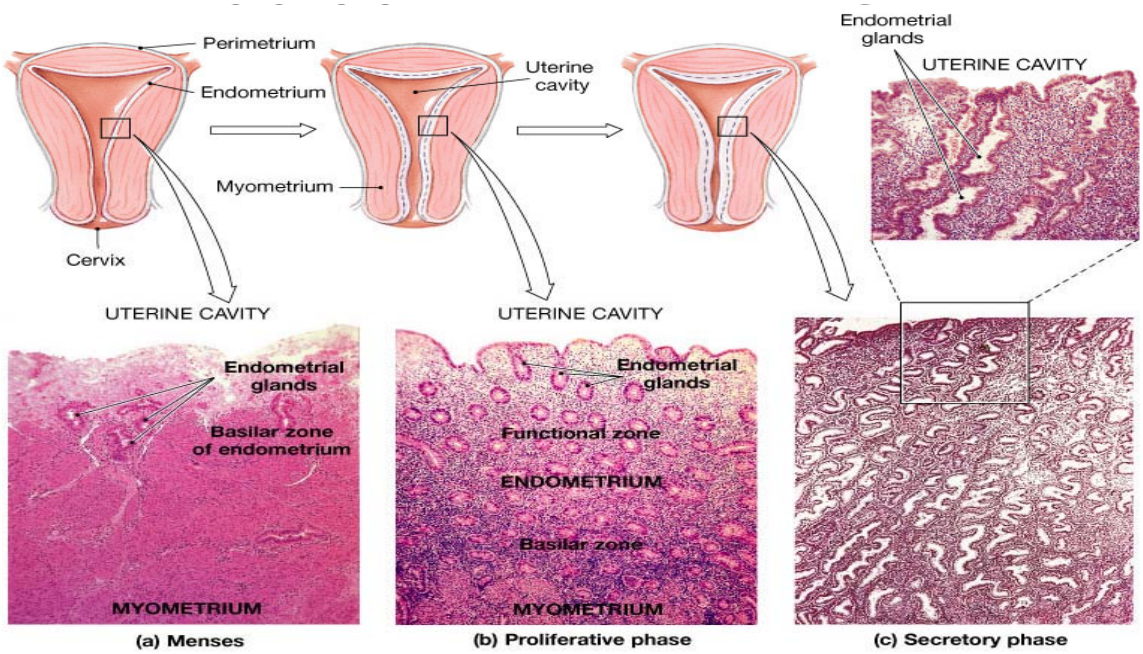
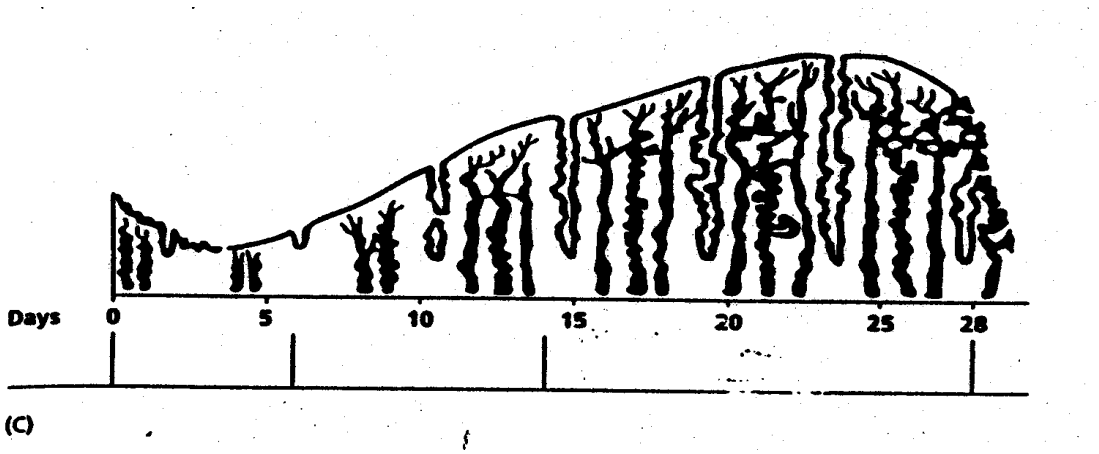


Figure 28.20

OVULATION

83



DEFINITION OF MENSTRUAL CYCLE

A menstrual cycle is defined as that period of time from the beginning of one menstrual flow to the beginning of the next menstrual flow. The menstrual cycles includes:

Follicular Phase - approximately 14 days but highly variable and ending with ovulation.

•After menstruation, low levels of estradiol and progesterone stimulate the hypothalamic release of GnRH with in turn increases the pituitary's release of FSH and LH.

•

•FSH stimulates the maturation of ovarian follicles and LH stimulates theca cells of the ovary to produce androgens, which are then converted to estrogens in the granulosa cells of the ovary.

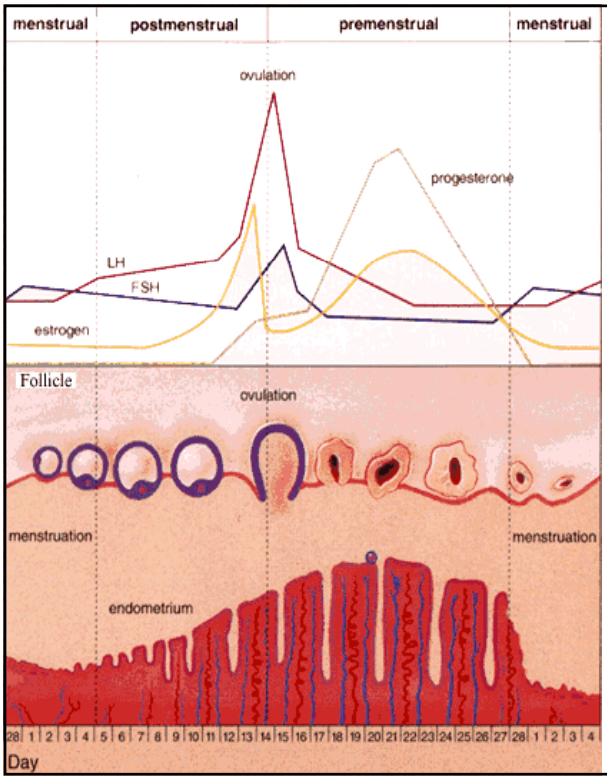
•Estrogen stimulates proliferation of the endometrial lining (proliferative phase).

Ovulation

•A preovulatory estradiol surge leads to a midcyde LH surge, which initiates ovulation.
•A mature follicle releases an oocyte and becomes a functioning corpus luteum.

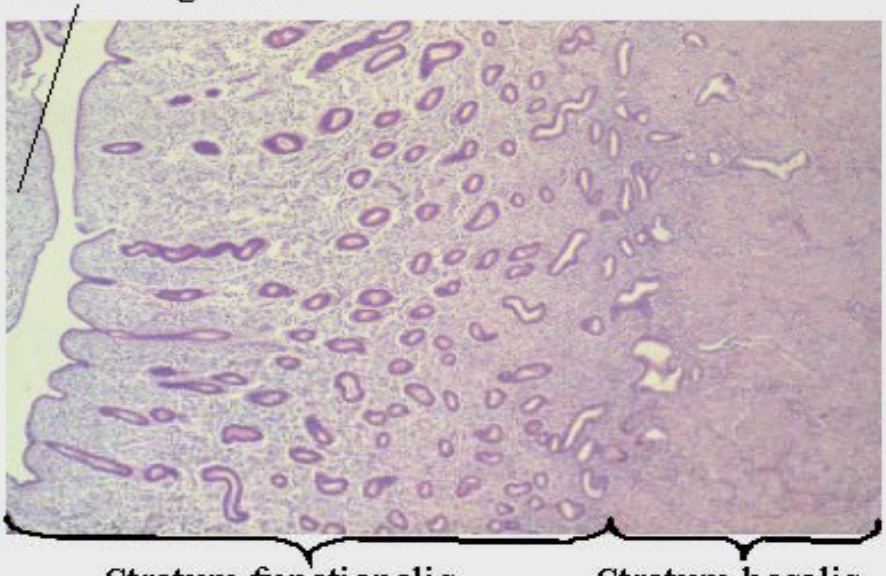
Luteal Phase

•The luteal phase begins with ovulation and ends with the menstrual flow and usually lasts 14 ± 2 days.
•Large amounts of progesterone are produced by the corpus luteum as well as estrogen.
•Rising levels of estrogen and progesterone lead to falling levels of FSH and LIT
•Progesterone stops the growth of the endometrium and stimulates differentiation of the endometrium into a secretory endometrium.
•Without fertilization and human chorionic gonadotropin production, the corpus luteum involutes after about 10 - 12 days and sloughing of the endometrium.
•Local prostaglandin release leads to vasoconstriction and uterine contractions



Uterus, Menstrual Phase

Exfoliating tissue

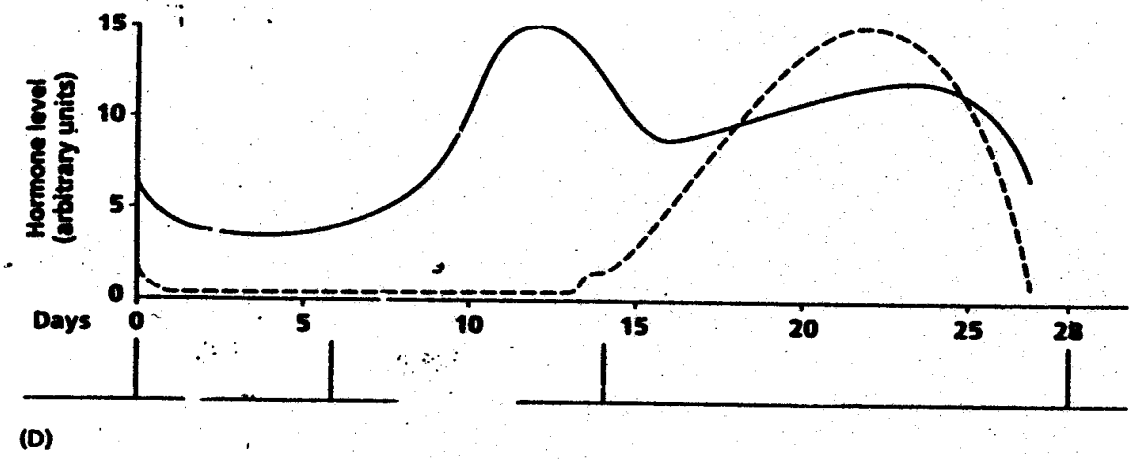


Breakdown of the corpus luterum in the absence of LH causes loss of estrogen and progesterone to maintain the endometrium.

Stratum functionalis Stratum basalis

OVARIAN HORMONES

88



SEX HORMONES

- Follicle stimulating hormone **FHS-**
- Luteinizing hormone **LH**-signals ovulation
- **Estrogen**- produced throughout the menstrual cycle
- **Progesterone-**produced during second half of cycle
- Contributes to thickening of the endometrium which is shed during menstrual phase if fertilization does not take place

- Both FHS and LH are produced in the pituitary gland
- Both estrogen and progesterone are produced by the follicles in the ovaries

DYSMENORRHEA

- Painful menstrual cramps
- Painful menses without evidence of a physical abnormality
- Believed to be normal body response to uterine contractions
- Other symptoms :
- Nausea, vomiting, gastrointestinal disturbances, and fainting
- Prostaglandins cause forceful, frequent uterine contractions called cramps
- Fibroids, polyps, IUD, PID, or endometriosis

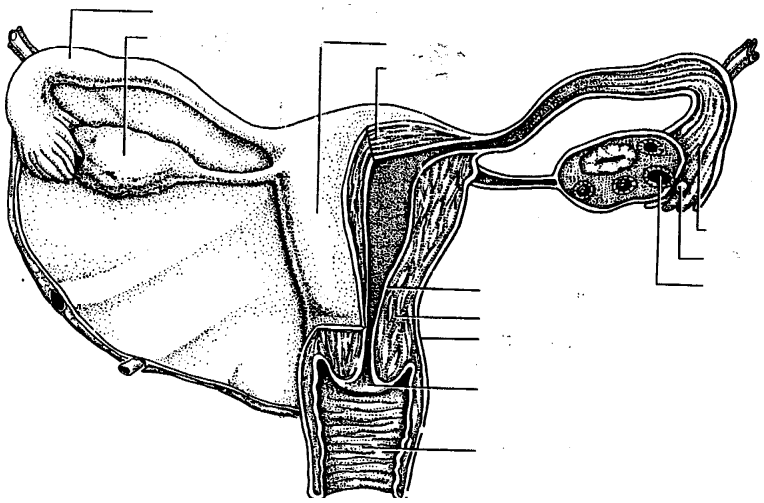
ENDOMETRIOSIS

91

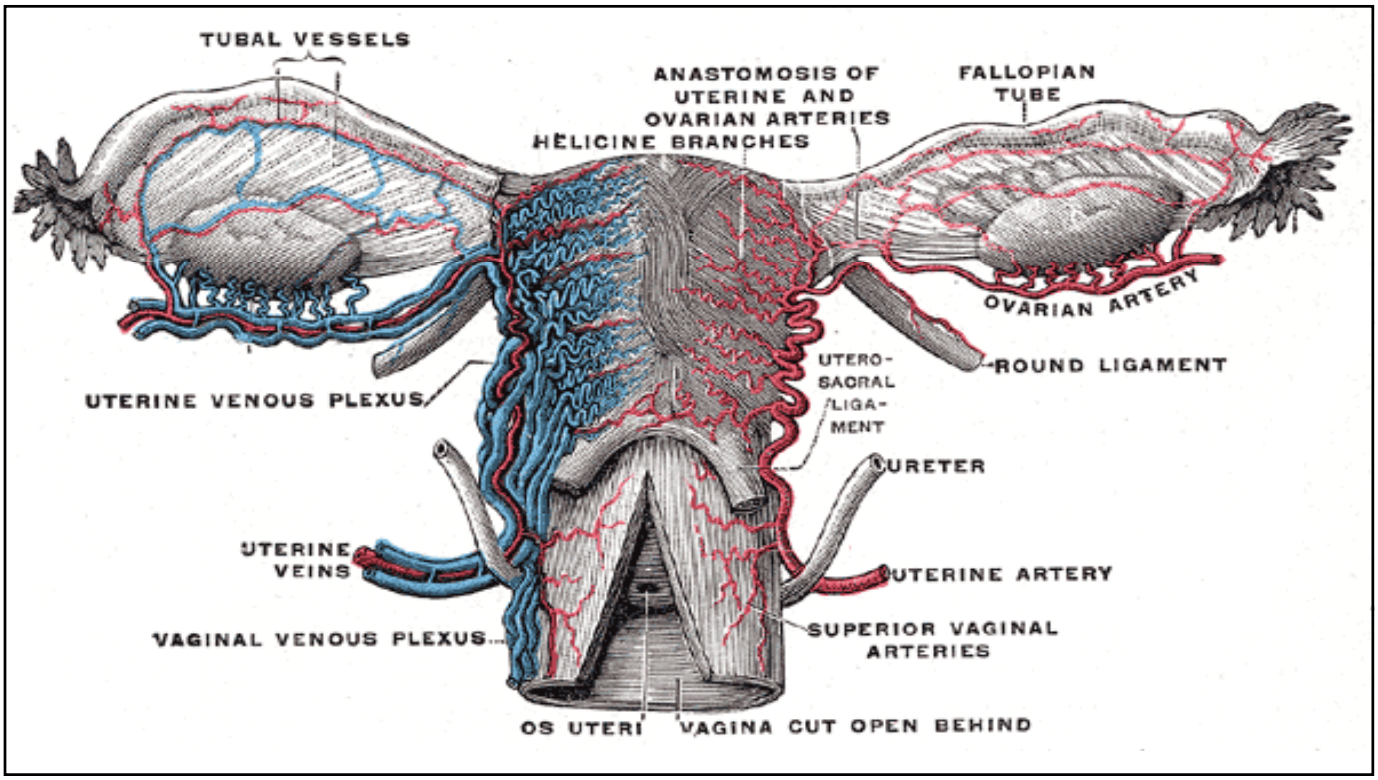
- Common cause of dysmennorrhea, dyspareunia, and infertility
- Endometrium fragments and lodges in other parts of the pelvic cavity
- Causes inflammation, bleeding, scarring,and adhesions
- Causes are still being studied
- Treated through hormonal therapy, laparoscopic surgery, or major surgical management

OVIDUCTS

92



- **oviducts,**
- **uterine tubes,**
- **salpinges** (*singular* **salpinx**)
- are two very fine tubes lined with **ciliated epithelia, leading from the ovaries of female mammals into the uterus**



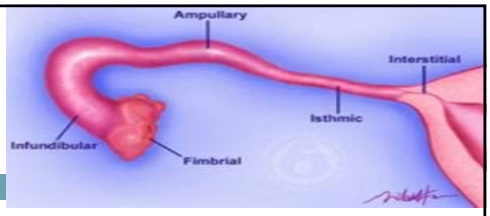
FALLOPIAN TUBES

94

- Serve as a pathway for the ovum to the uterus
- **Are the site of fertilization by the male sperm**
- Fertilized egg takes approximately 6 to 10 days to travel through the fallopian tube to implant in the uterine lining

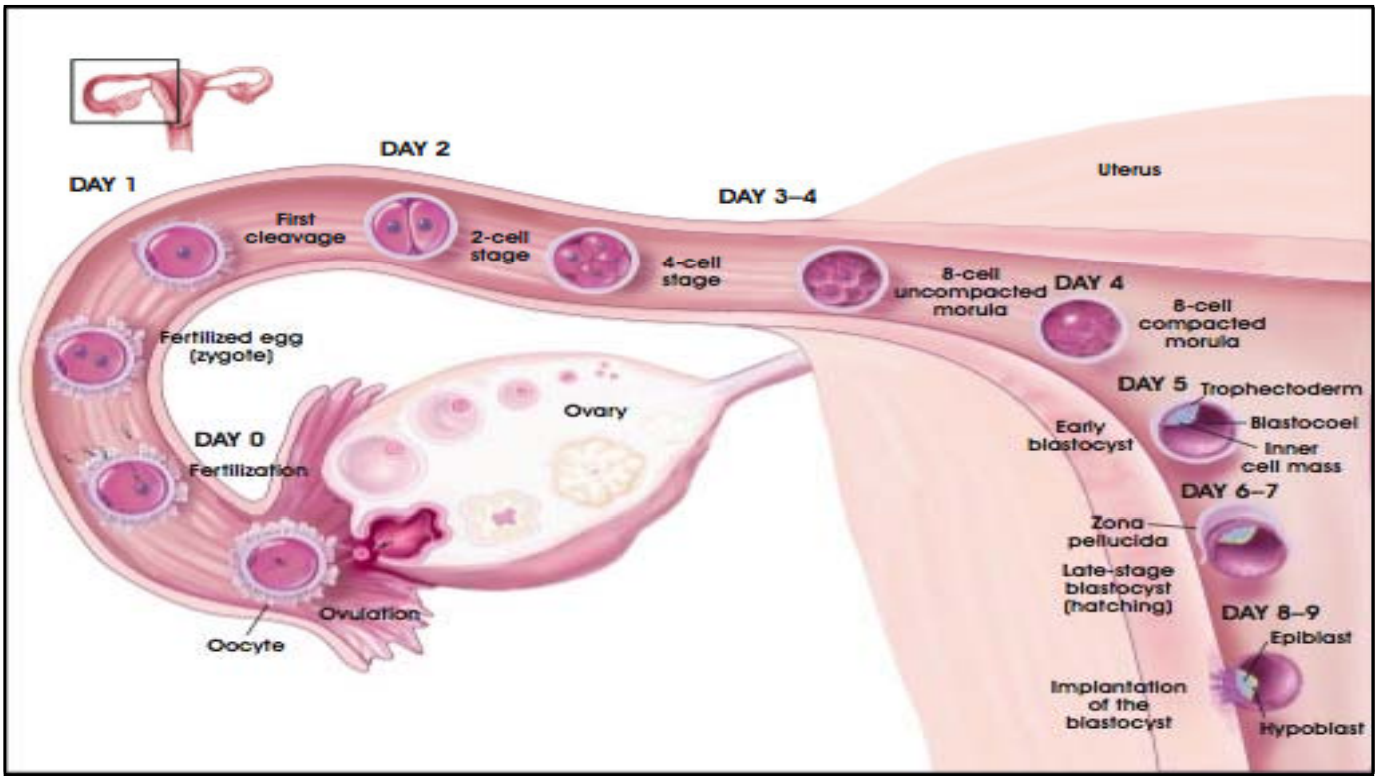
- There are two Fallopian tubes attached to either side of the cornual end of **the uterus at the axilla of Welch**.
- Each terminates at or near one ovary forming a structure called the **fimbria**.
- **The Fallopian tubes are not directly attached to the ovaries**, but open into the peritoneal cavity (essentially the inside of the abdomen); they thus form a direct communication between the peritoneal cavity and the outside via the vagina.
- In humans, the Fallopian tubes are about 7–14 cm long.
- If a Fallopian Tube is missing from the pair, then the other fallopian tube that is functional could still be a way of carrying an egg down to the uterus

Regions



There are four regions of the fallopian tube from the ovary to the uterus:

- **Infundibulum** - contains fimbria
- **Ampulla** - usual site of fertilization
- **Isthmus**
- **Intramural oviduct** - inside wall of uterus



Histology

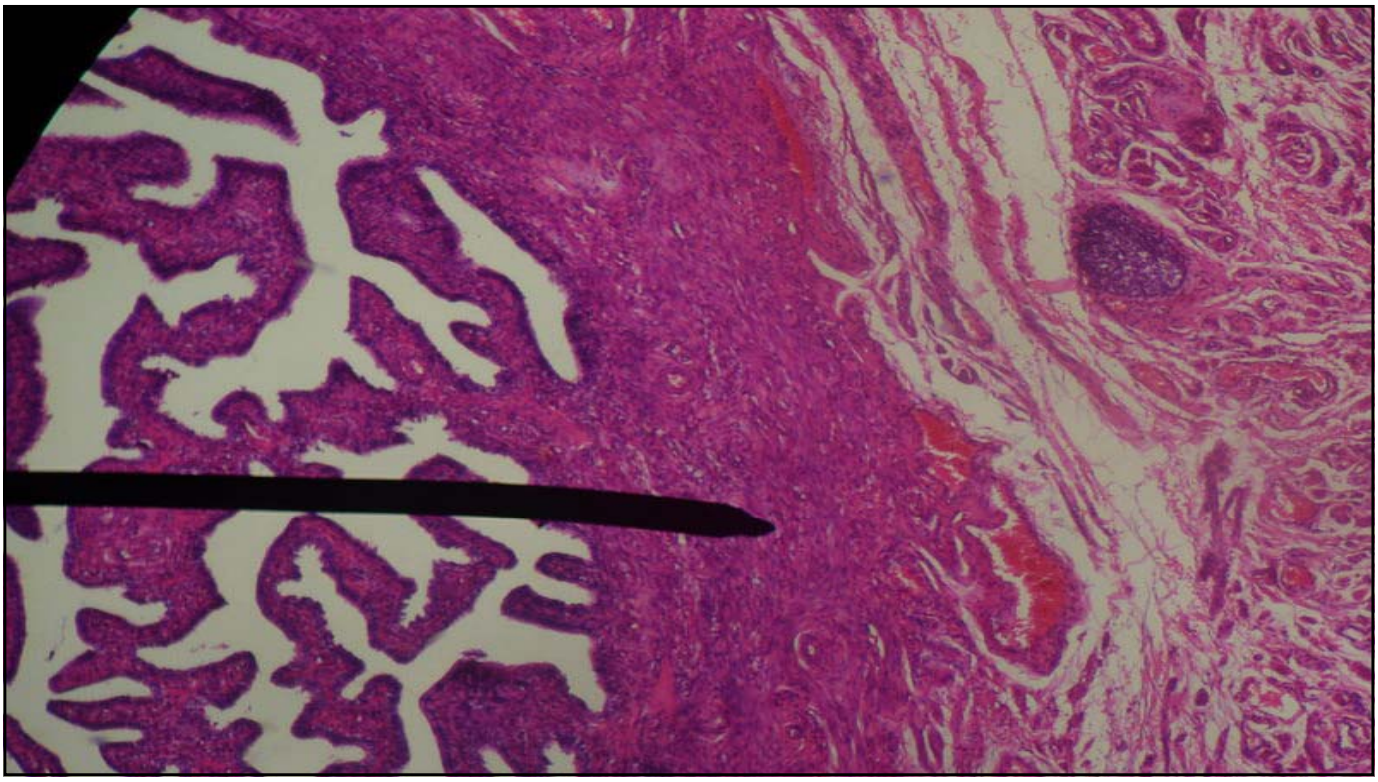
Layers of the wall of the fallopian tube.

- There are three layers of the fallopian tube:

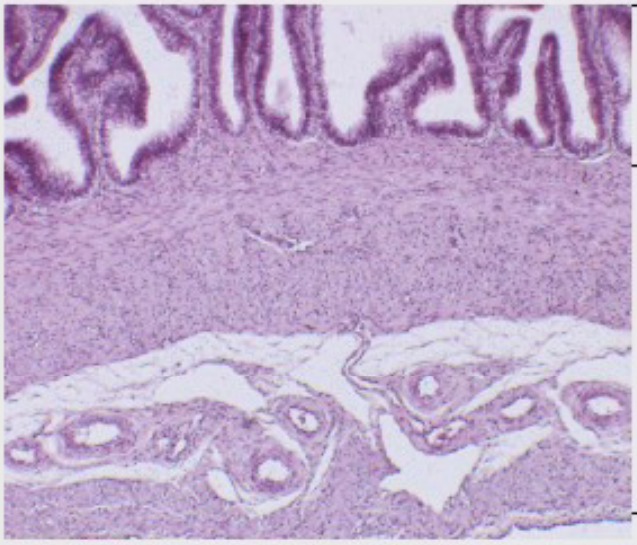
1. **Mucosa** - the distinctive folds of the mucosa are the most unusual feature. The folds contain ciliated cells and "peg cells". The region of the fallopian tube can be approximated by looking at the mucosa, because the folds are most elaborate at the ampulla and almost nonexistent at the intramural portion.
2. **Muscularis externa**
3. **Serosa**

Motility

- The Fallopian tubes are mobile, and have been observed on time-lapse videography moving about the pelvis.
- Although anatomical illustrations have them proceeding from the uterine horns to the ovary, this is not the case for most of the menstrual cycle, and a tube may cross to the other side or lie on top of the uterus.

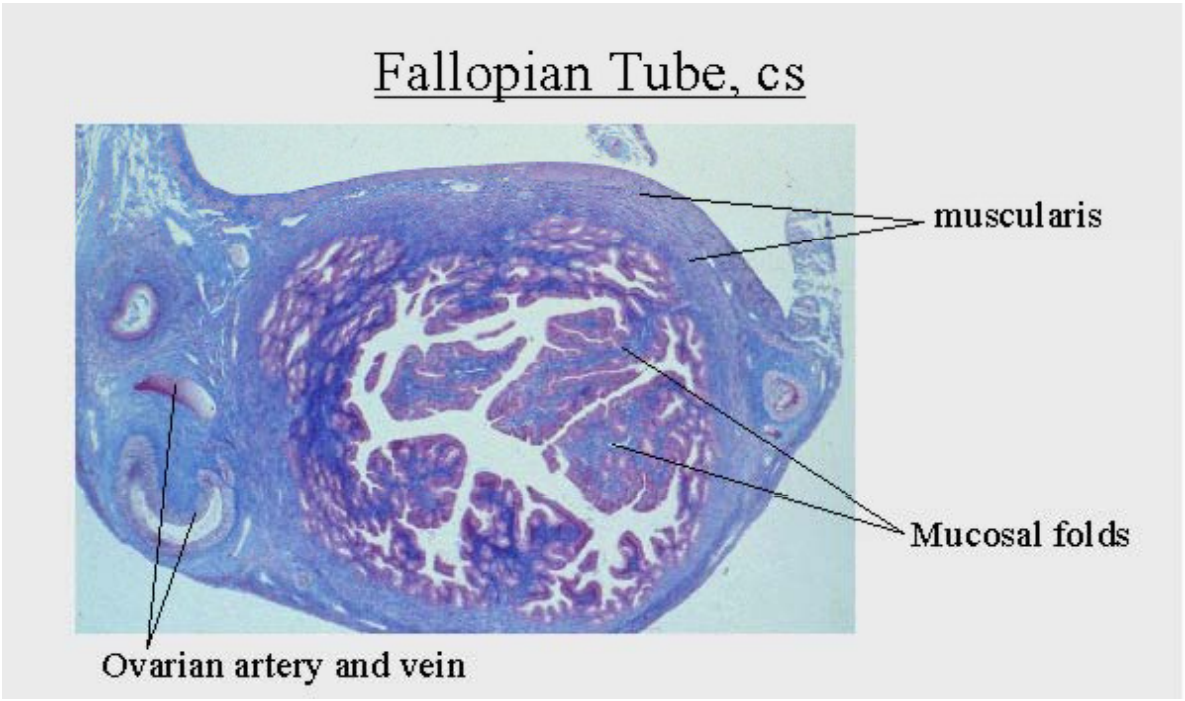


Fallopian Tube, ls

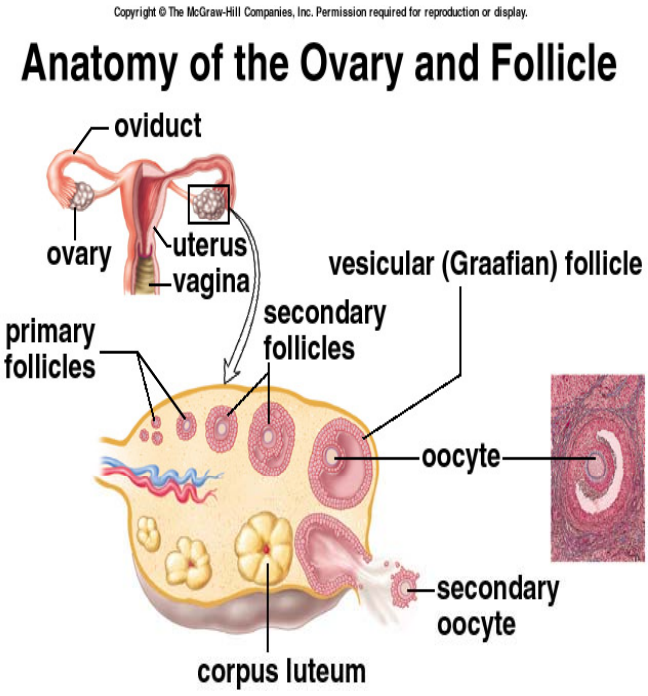


Mucosa: consists of longitudinal folds lined with ciliated and non-ciliated columnar epithelium.

Muscularis: consists of a circular and a longitudinal layer.


Fallopian Tube, cs
muscularis
Mucosal folds
Ovarian artery and vein


Suspensory ligament
Follicle
BV
Medulla
Cortex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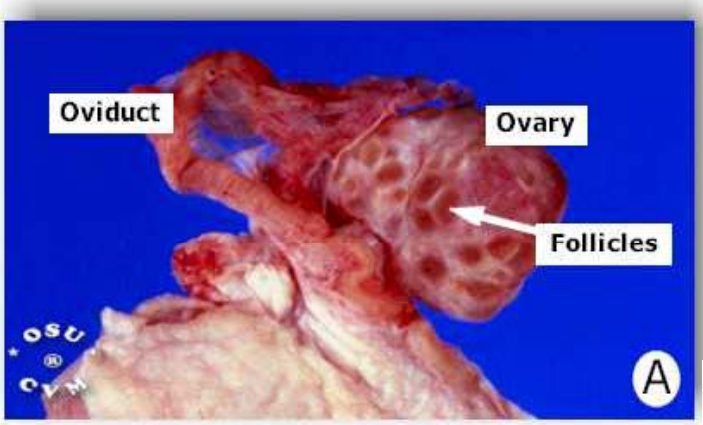
Anatomy of the Ovary and Follicle
oviduct
ovary
uterus
vagina
vesicular (Graafian) follicle
secondary follicles
primary follicles
oocyte
secondary oocyte
corpus luteum

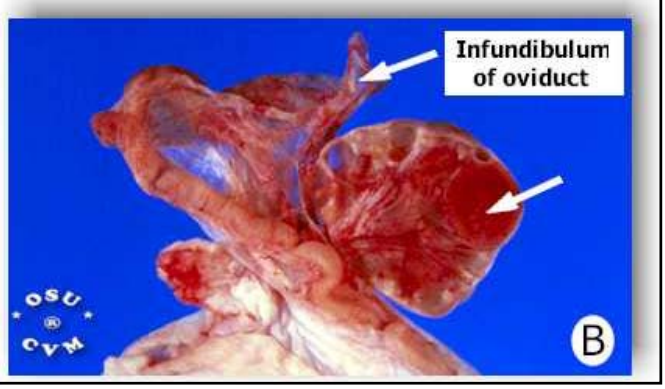
The Fallopian Tubes

- **Arterial/Venous Supply**
  - Terminal branches of the uterine and ovarian arteries found in the mesosalpinx
- **Lymphatic Drainage**
  - Separate and distinct from the uterus
  - Drains to the internal iliac nodes and the aortic nodes at the level of the renal vessels
- **Innervation**
  - Sympathetic and parasympathetic from the uterine and ovarian plexus.
  - Sensory nerves come from T11, T12, and L1

Four segments

- **Intramural, isthmic (narrowest internal diameter), ampullary, infundibulum**
- **Fimbriae**
  - the largest attached to the ovary is called **fimbria ovarica**
- **Layers**
  - Serosa, Adventia (vessels), muscle, mucosa (plica, cilia)





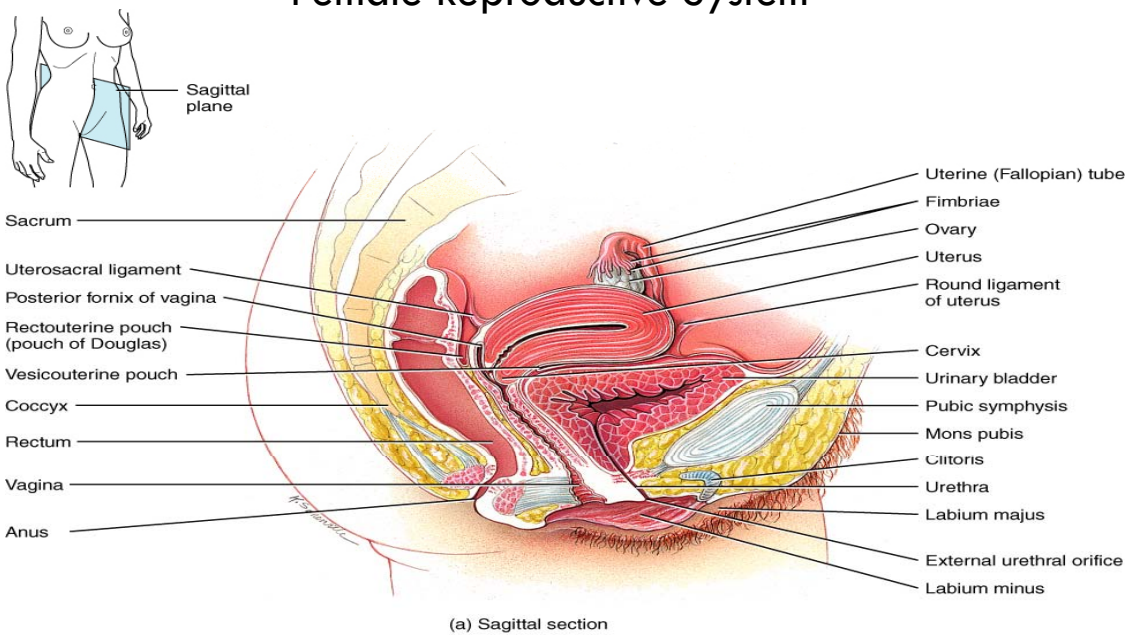
OVARIES

The ureter runs close to the ovarian fossa

- Germinal epithelium is cuboidal
- Ligaments – ovarian and infundibular pelvic (vessels)
- Ovarian fossa

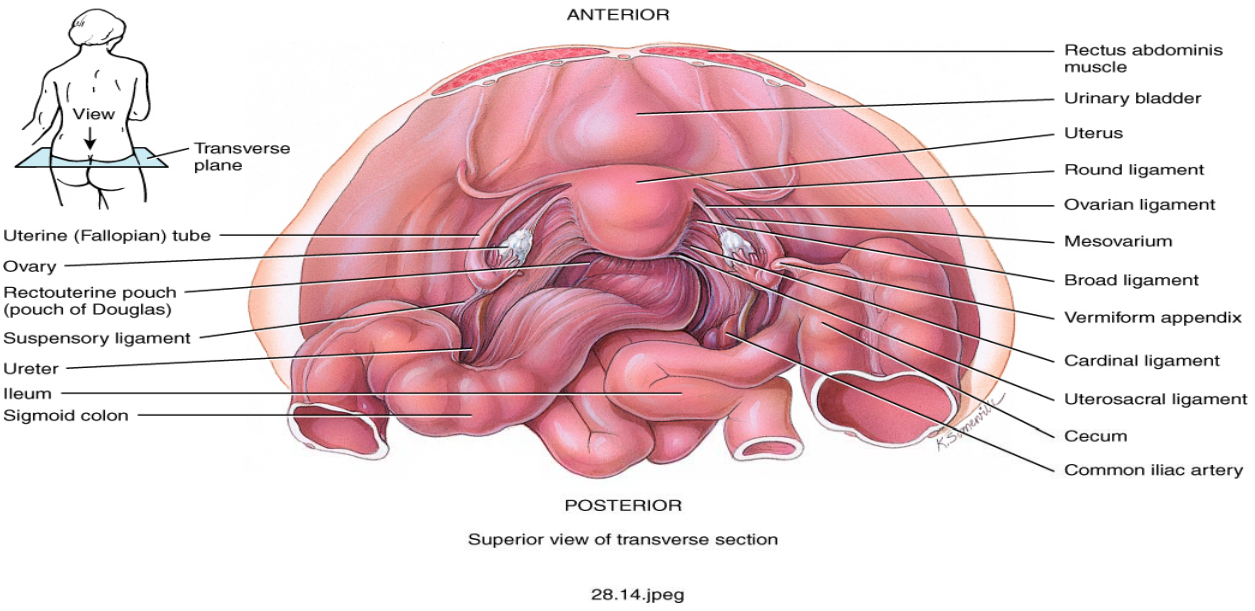
– A depression in the peritoneum where the ovary rests in nulliparous women

Female Reproductive System



(a) Sagittal section

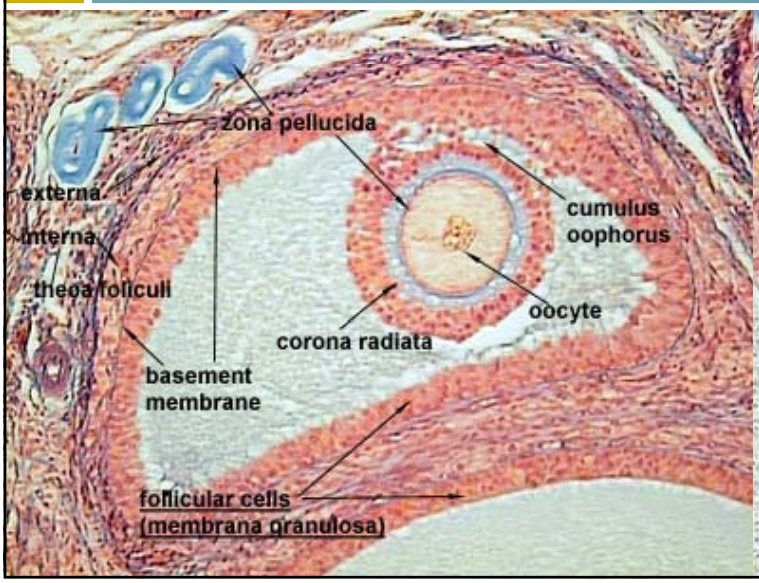
28.13a.jpeg

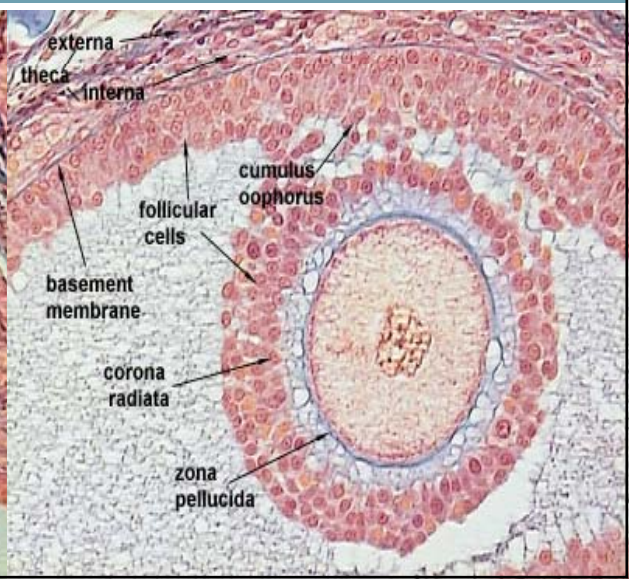


Superior view of transverse section

28.14.jpeg

Ovaries





The Ovaries

Two functions –

- production and ovulation of oocytes
- the production and secretion of hormones.

The ovary is attached to the broad ligament by a short fold of peritoneum, called the mesovarium (or ligament of the ovary), through which vessels and nerves pass to the ovary and enter it at the hilus of the ovary.

The surface of the ovary is covered by a single layer of cuboidal epithelium, also called **germinal epithelium**.

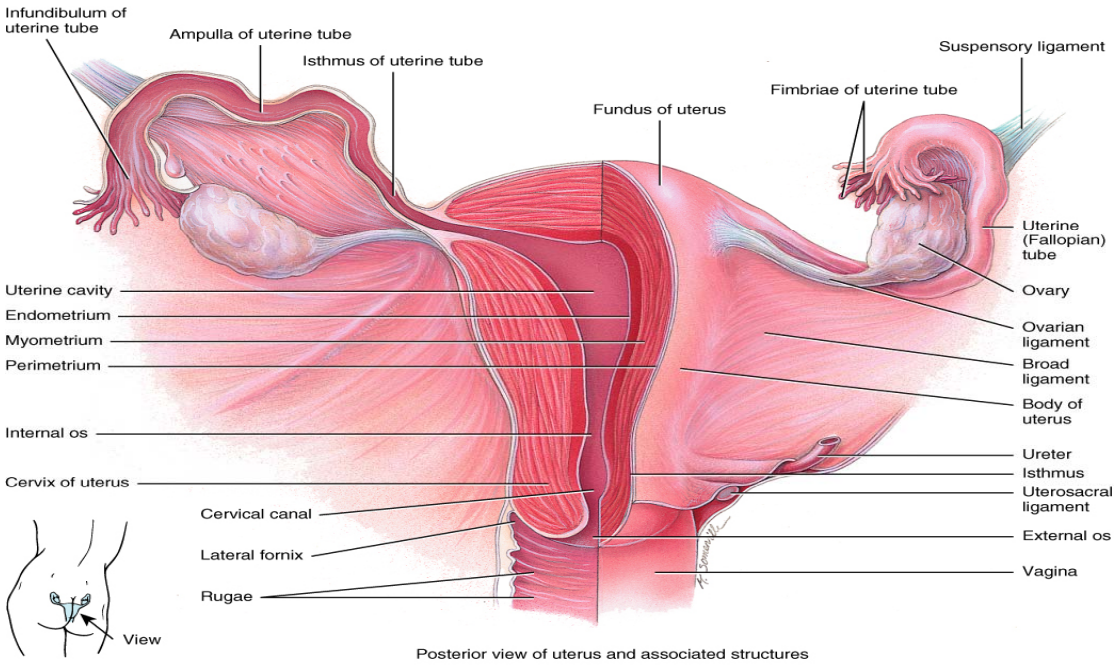
It is continuous with the peritoneal mesothelium.

Fibrous connective tissue forms a thin capsule, the **tunica albuginea,** immediately beneath the epithelium.

Like so many other organs the ovary is divided into an outer cortex and an inner medulla.

The cortex consists of a very cellular connective tissue stroma in which the ovarian follicles are embedded.

The medulla is composed of loose connective tissue, which contains blood vessels and nerves.

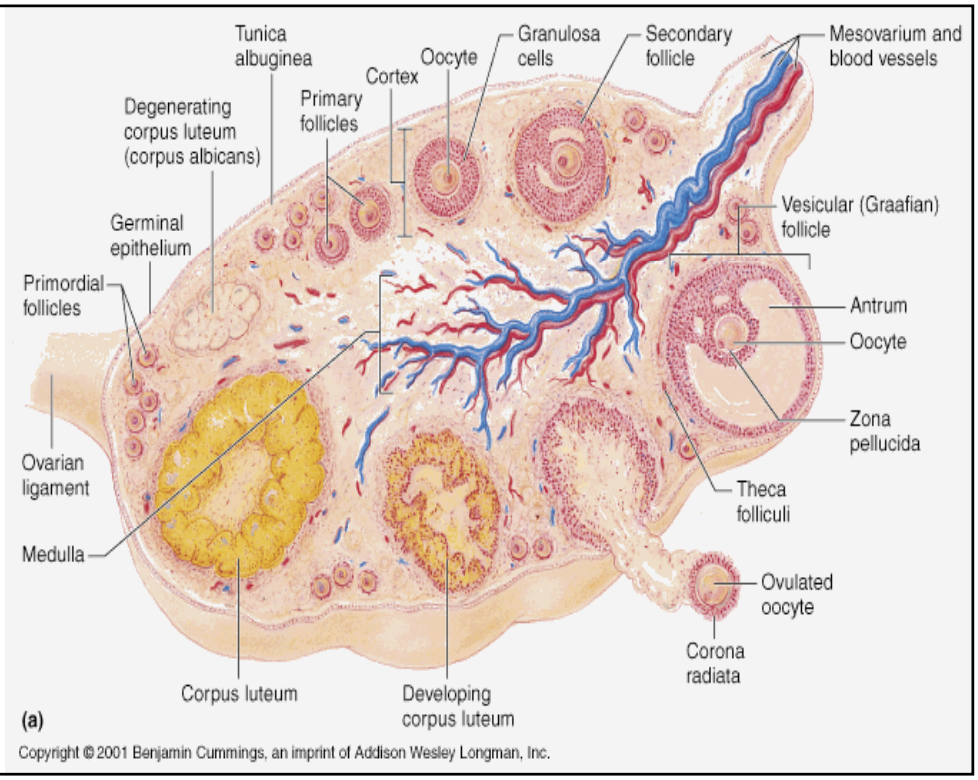


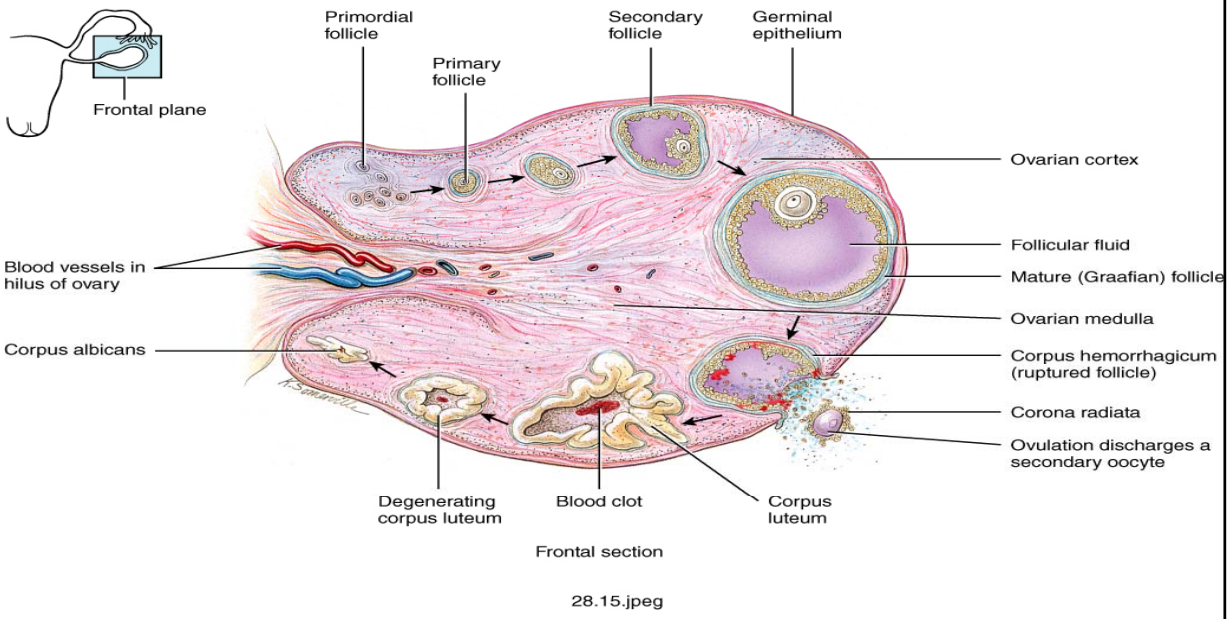
Ovarian Follicles

consist of one **oocyte** and surrounding follicular cells.

Follicular development can be divided into a number of stages.

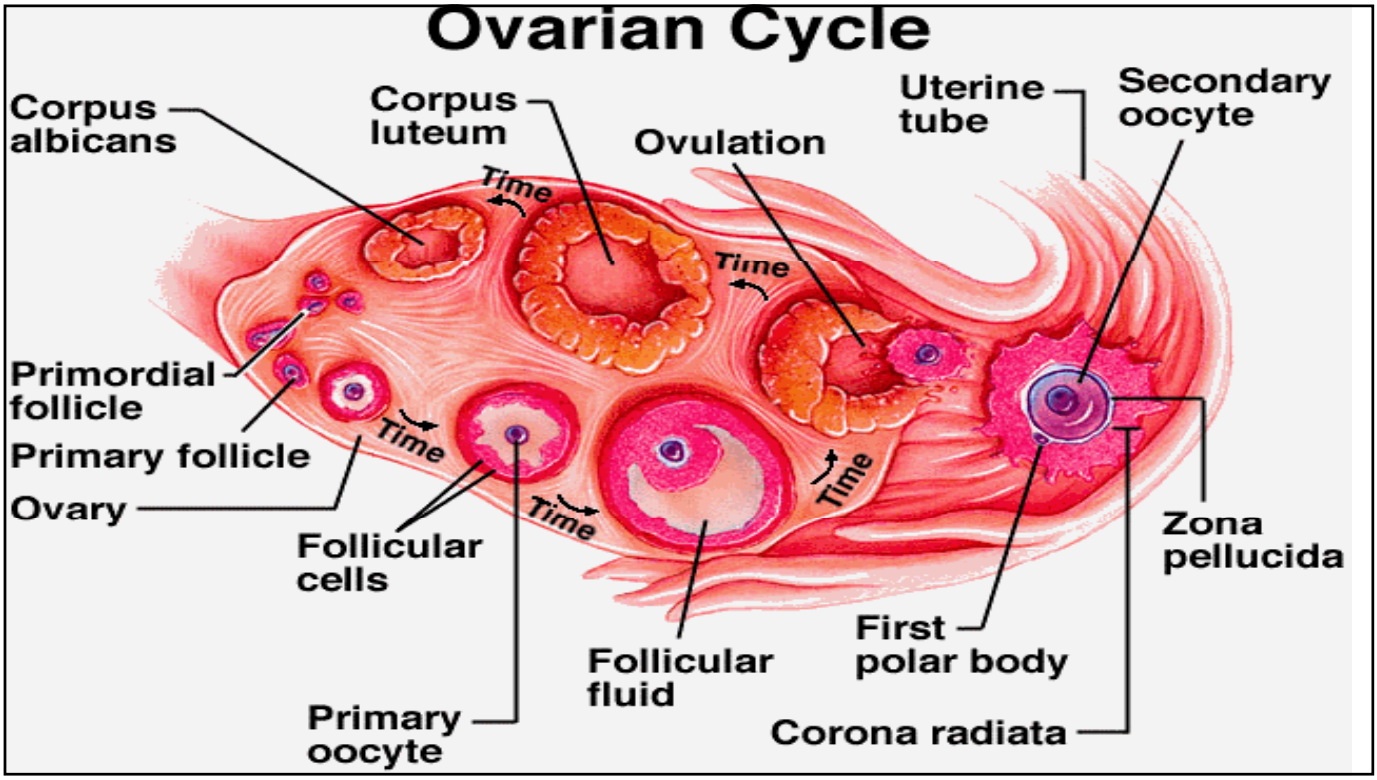
Development represents a morphological continuum, and it may not be possible to assign all follicles to a specific stage.





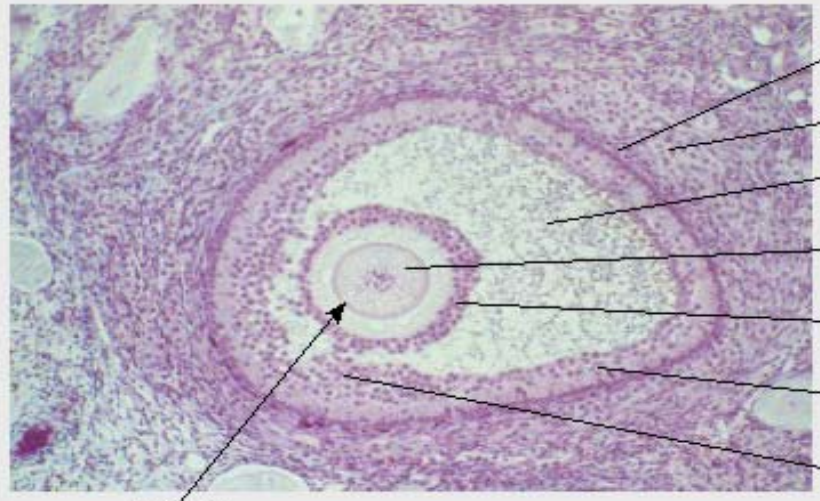
Graafian follicle expels ovum.

Corpus luteum produces progesterone, estrogen, relaxin and inhibin.



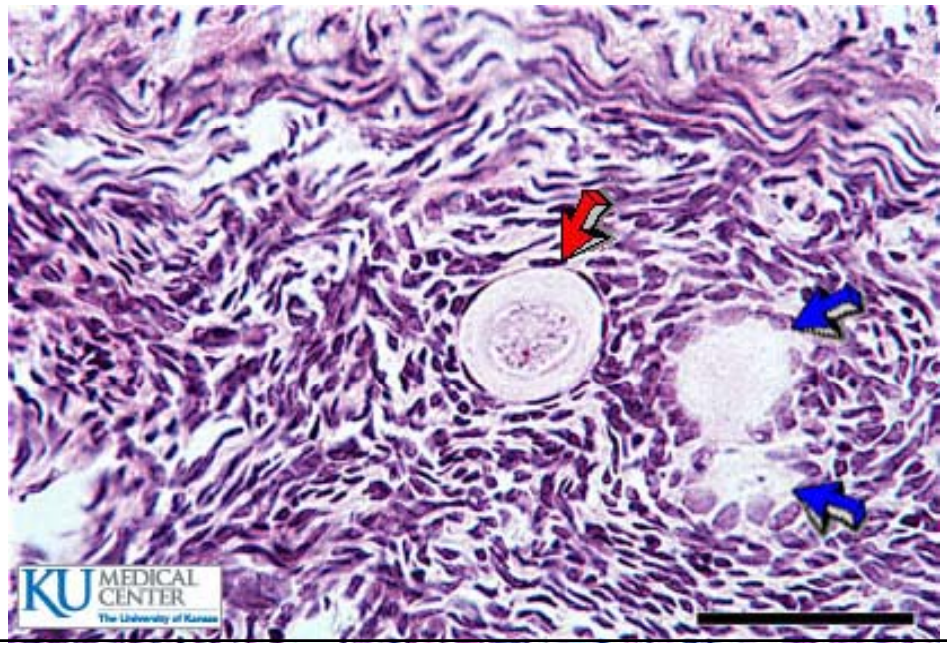
Graafian Follicle
The Graafian follicle is identified by the large antrum (A) and the corona radiata (arrow) that surrounds the actual oocyte and projects into the antrum

Mature (Vesicular) Follicle



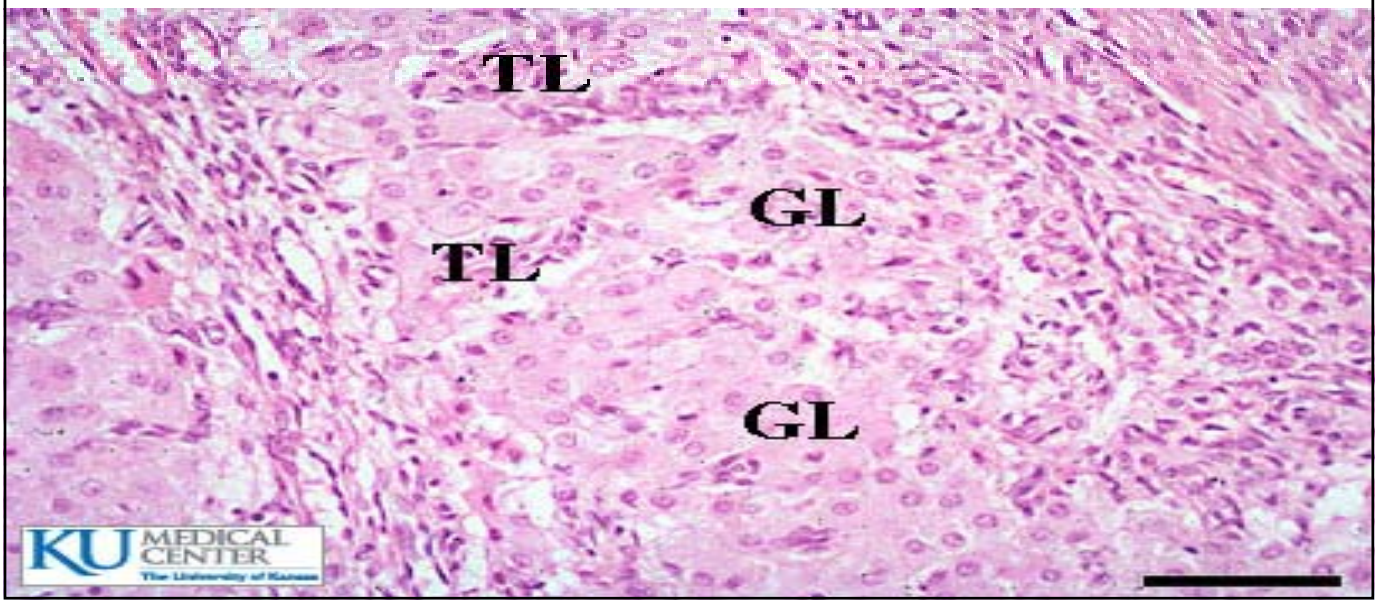
Primordial Follicle

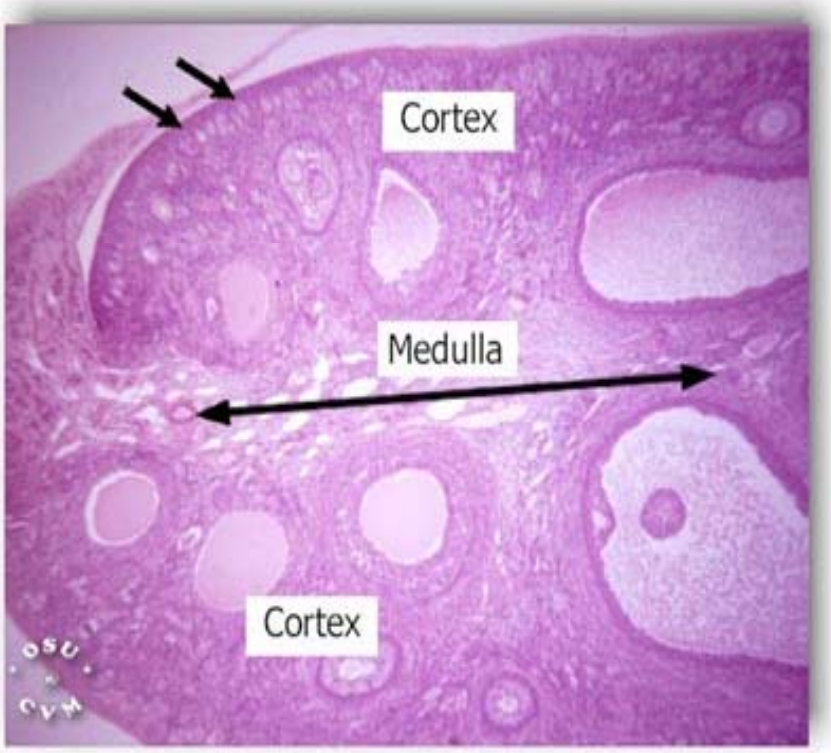
The primordial follicle can be identified by its single layer of follicular cells (red arrow). To the right are two atretic follicles (blue arrows). Notice the wavy stroma.



Corpus Luteum

Progesterone from the corpus luteum maintains the uterus for implantation. Notice the fullness of the granulosa luteal cells (GL) and positioning of the theca luteal cells (TL).





Stages of follicle maturation

a). Primordial follicle Only 1 layer of cells

b). **Primary follicle** 2 or more layers of cells.

c). **Secondary follicle:** fluid filled space

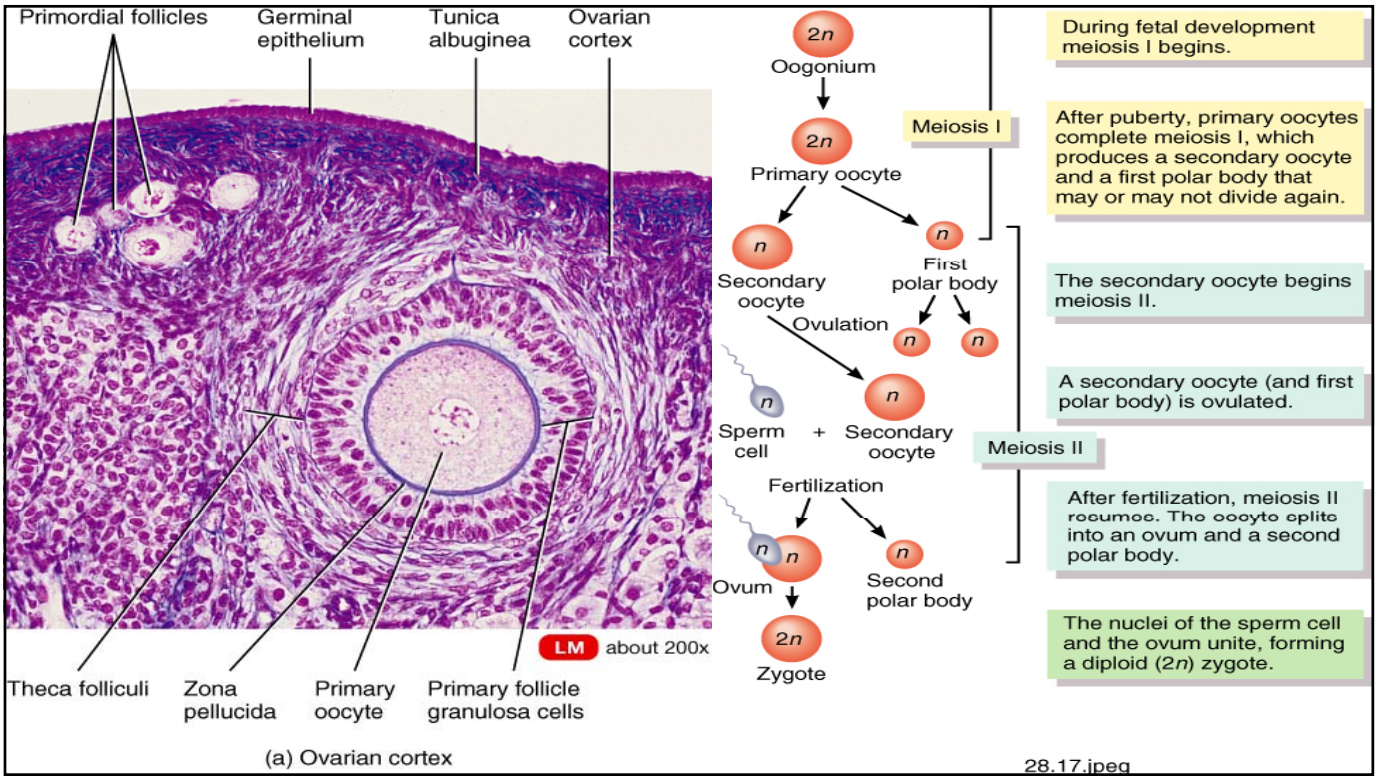
d). **Vesicular (Graafian) follicle:** Bulges

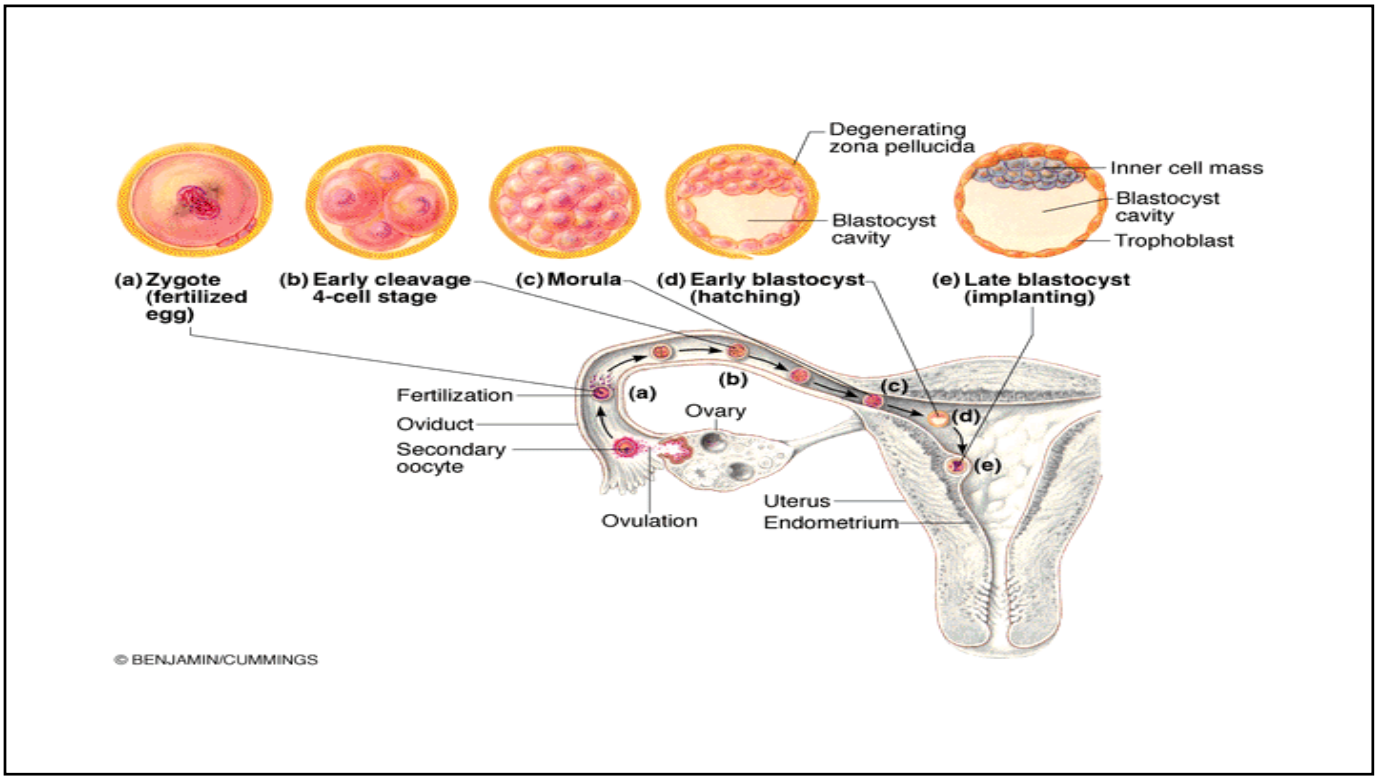
e). **Corpus luteum:** The ruptured follicle

Primordial follicles

•are located in the cortex just beneath tunica albuginea.
•One layer of flattened follicular cells surround the oocyte (about 30 µm in diameter).
•The nucleus of the oocyte is positioned eccentric in the cell.
•It appears very light and contains a prominent nucleolus.

•Most organelles of the oocyte aggregate in the centre of the cell, where they form the vitelline body (probably not visible in any of the available preparations).


Primordial follicles
Germinal epithelium
Tunica albuginea
Ovarian cortex
LM about 200x
Theca folliculi
Zona pellucida
Primary oocyte
Primary follicle granulosa cells
(a) Ovarian cortex
2n
Oogonium
Meiosis I
2n
Primary oocyte
n
Secondary oocyte
n
First polar body
Ovulation
n
n
n
Sperm cell
+
n
Secondary oocyte
Meiosis II
Fertilization
n
n
Ovum
n
Second polar body
2n
Zygote
During fetal development meiosis I begins.
After puberty, primary oocytes complete meiosis I, which produces a secondary oocyte and a first polar body that may or may not divide again.
The secondary oocyte begins meiosis II.
A secondary oocyte (and first polar body) is ovulated.
After fertilization, meiosis II resumes. The oocyte splits into an ovum and a second polar body.
The nuclei of the sperm cell and the ovum unite, forming a diploid (2n) zygote.
28.17.jpeg


Degenerating zona pellucida
Inner cell mass
Blastocyst cavity
Blastocyst cavity
Trophoblast
(a) Zygote (fertilized egg)
(b) Early cleavage 4-cell stage
(c) Morula
(d) Early blastocyst (hatching)
(e) Late blastocyst (implanting)
Fertilization
Oviduct
Secondary oocyte
Ovulation
Ovary
(a)
(b)
(c)
(d)
(e)
Uterus
Endometrium
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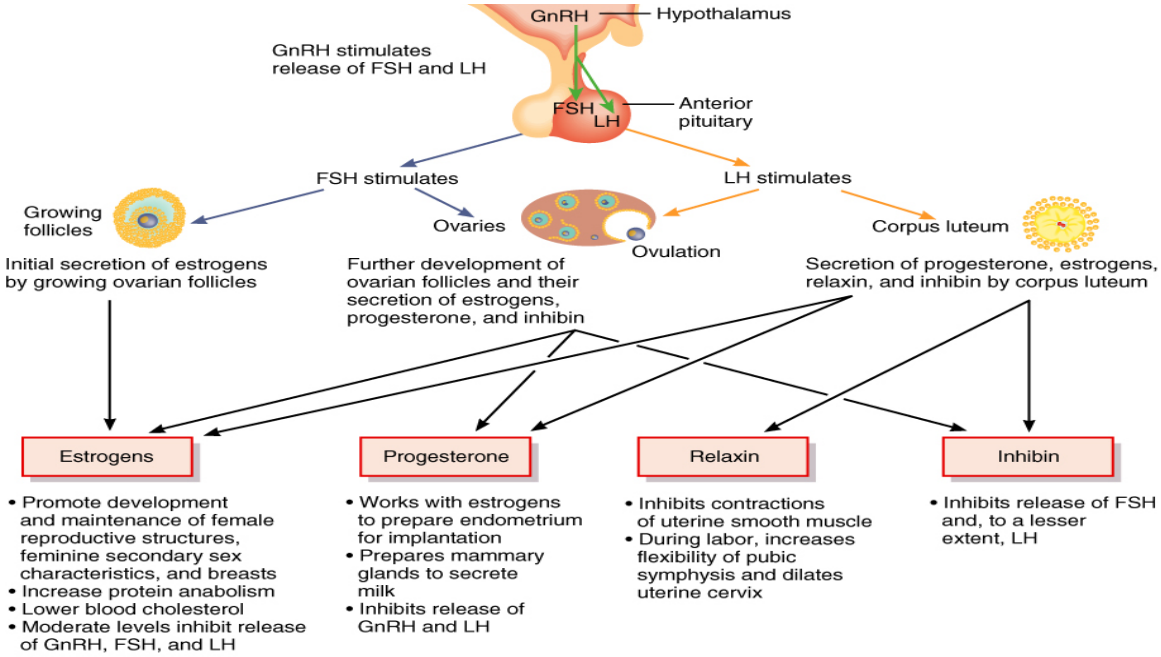

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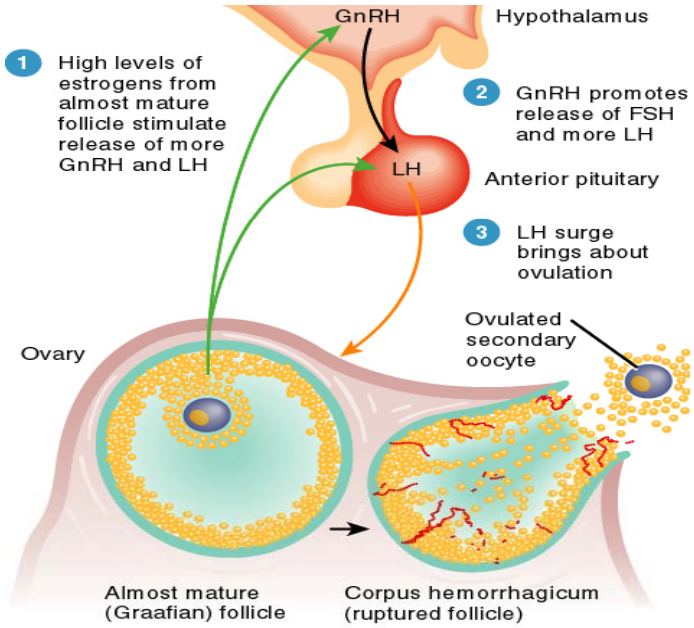

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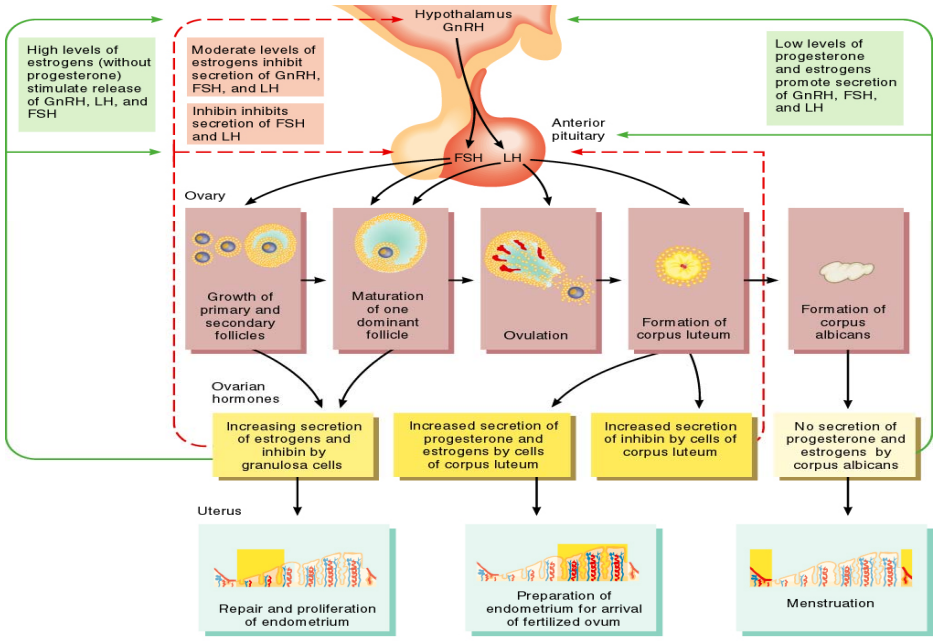
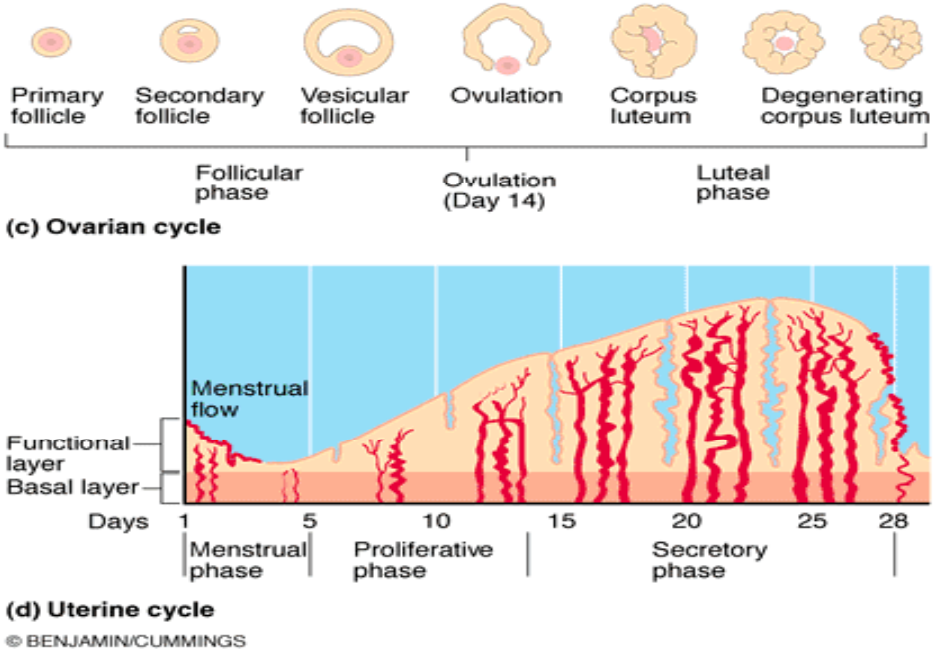

Hypothalamus
GnRH
High levels of estrogens (without progesterone) stimulate release of GnRH, LH, and FSH
Moderate levels of estrogens inhibit secretion of GnRH, FSH, and LH
Inhibin inhibits secretion of FSH and LH
Low levels of progesterone and estrogens promote secretion of GnRH, FSH, and LH
Anterior pituitary
FSH
LH
Ovary
Growth of primary and secondary follicles
Maturation of one dominant follicle
Ovulation
Formation of corpus luteum
Formation of corpus albicans
Ovarian hormones
Increasing secretion of estrogens and inhibin by granulosa cells
Increased secretion of progesterone and estrogens by cells of corpus luteum
Increased secretion of inhibin by cells of corpus luteum
No secretion of progesterone and estrogens by corpus albicans
Uterus
Repair and proliferation of endometrium
Preparation of endometrium for arrival of fertilized ovum
Menstruation

28.28.jpeg


Primary follicle
Secondary follicle
Vesicular follicle
Ovulation
Corpus luteum
Degenerating corpus luteum
Follicular phase
Ovulation (Day 14)
Luteal phase
(c) Ovarian cycle
Menstrual flow
Functional layer
Basal layer
Days 1 5 10 15 20 25 28
Menstrual phase
Proliferative phase
Secretory phase
(d) Uterine cycle
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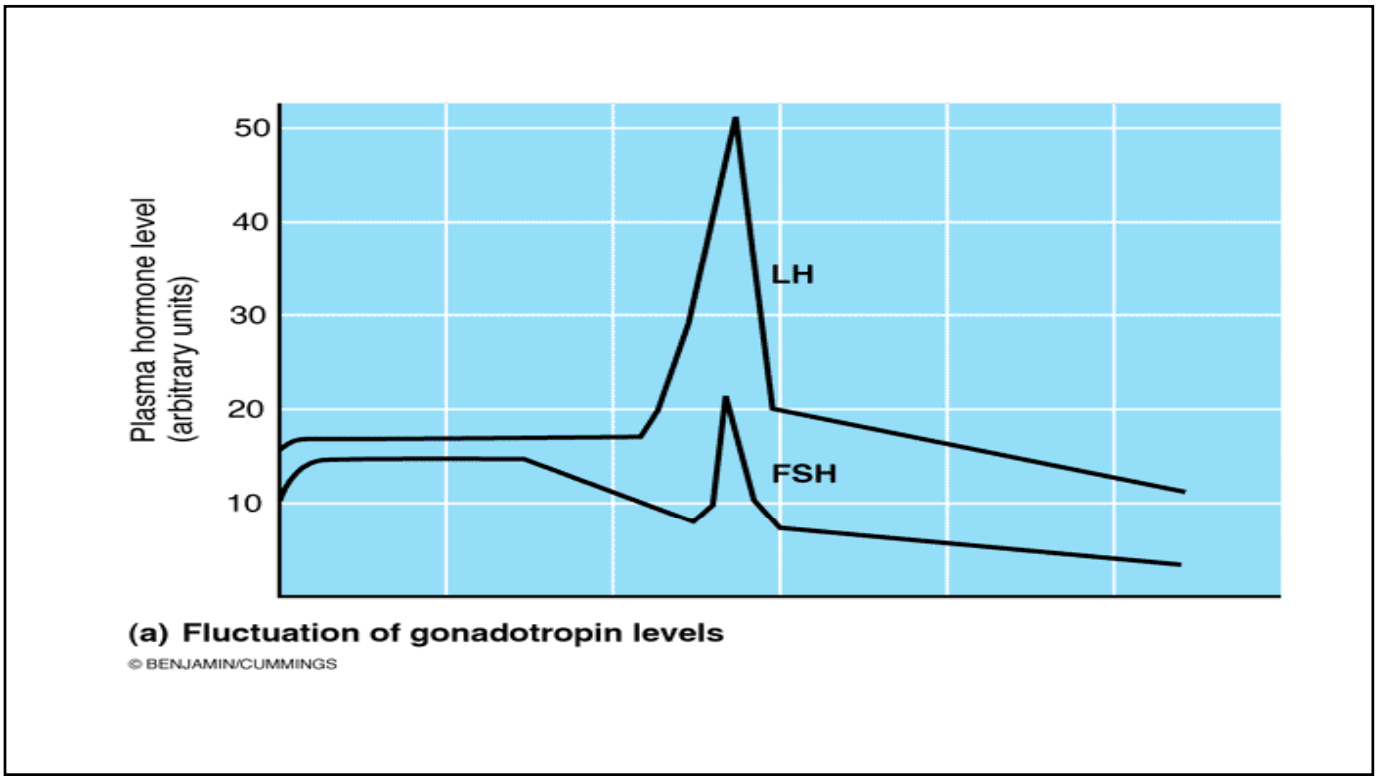
50
40
30
20
10
Plasma hormone level (arbitrary units)
LH
FSH
(a) Fluctuation of gonadotropin levels
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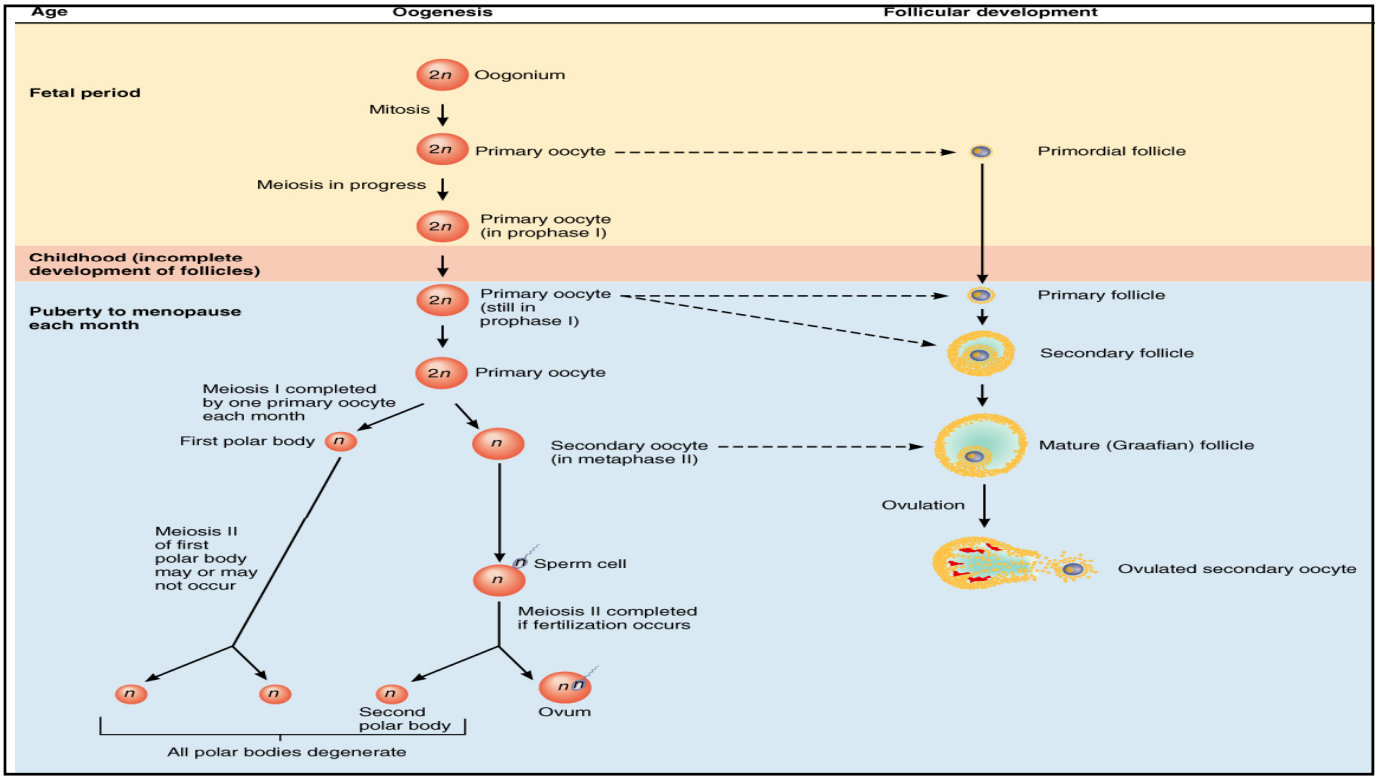
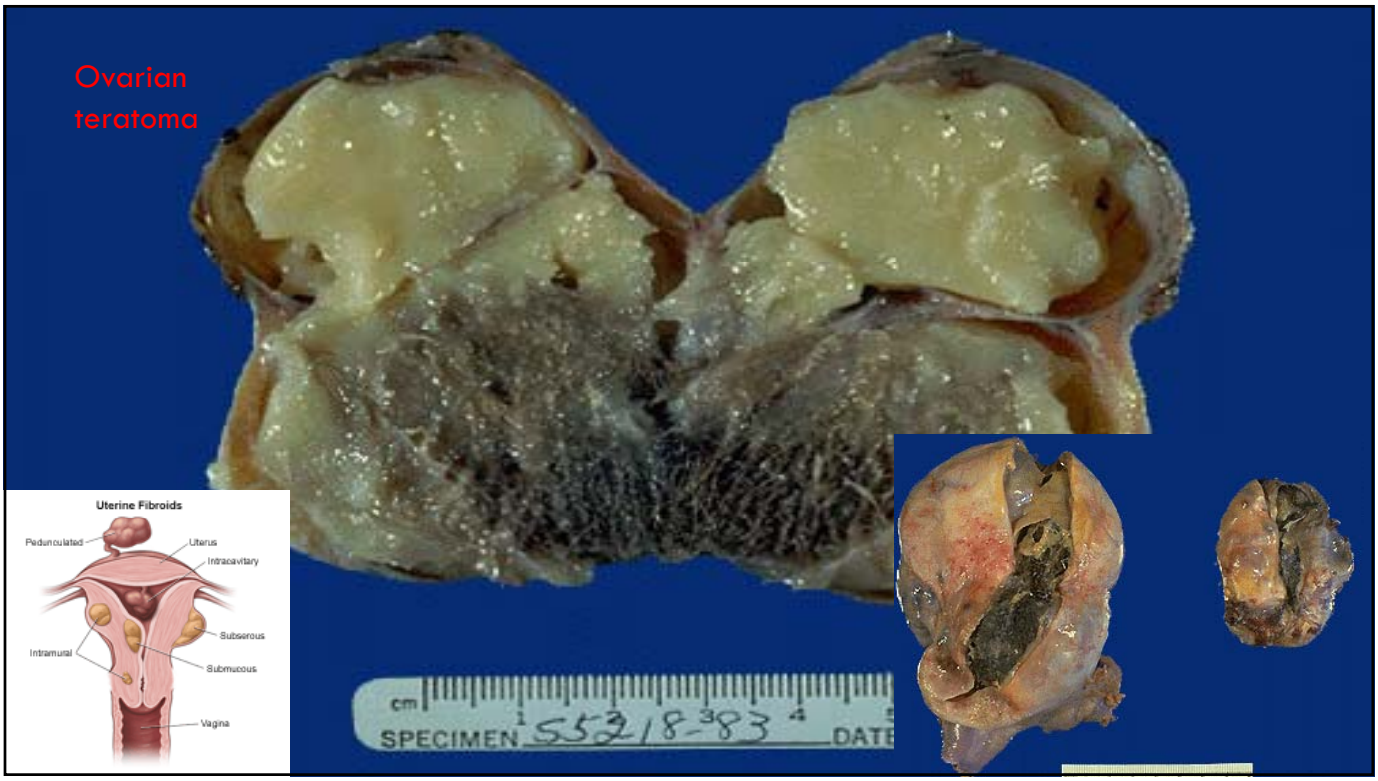
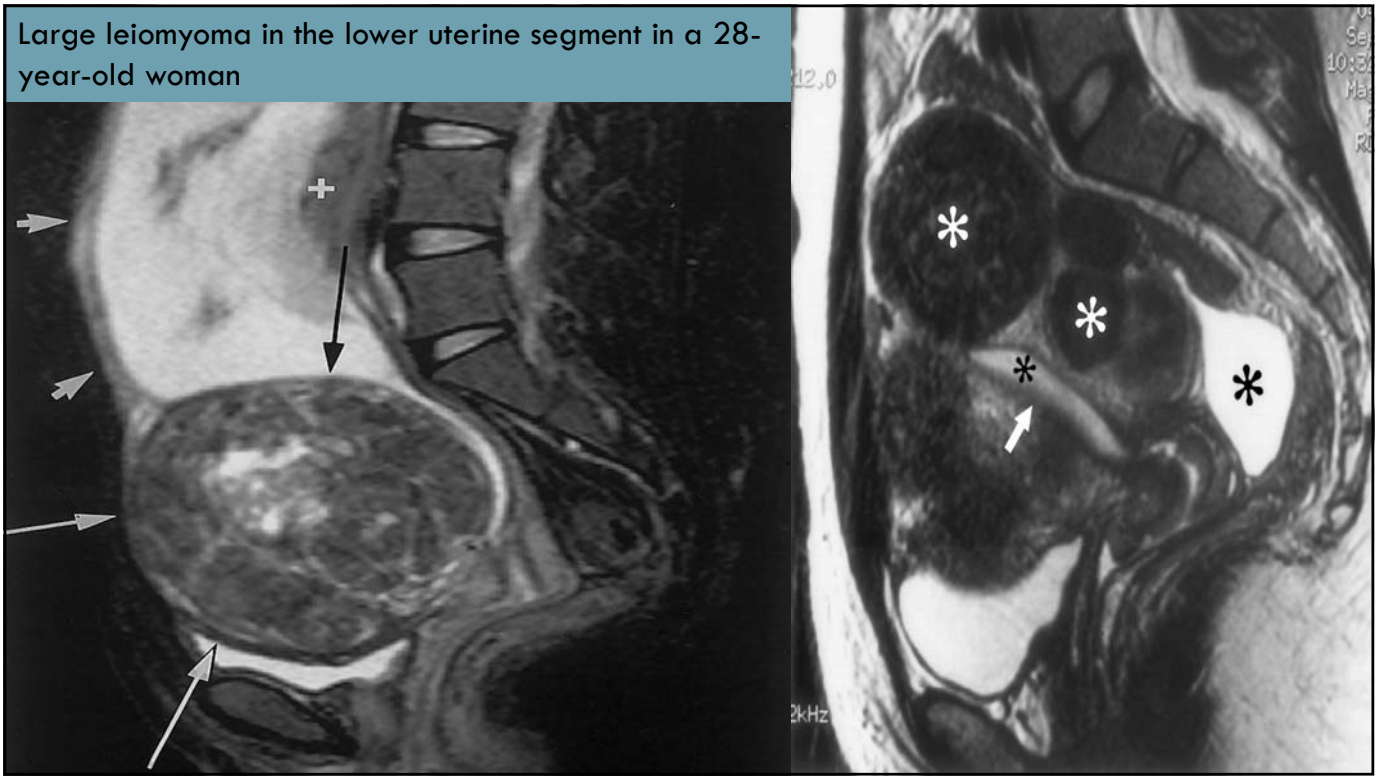
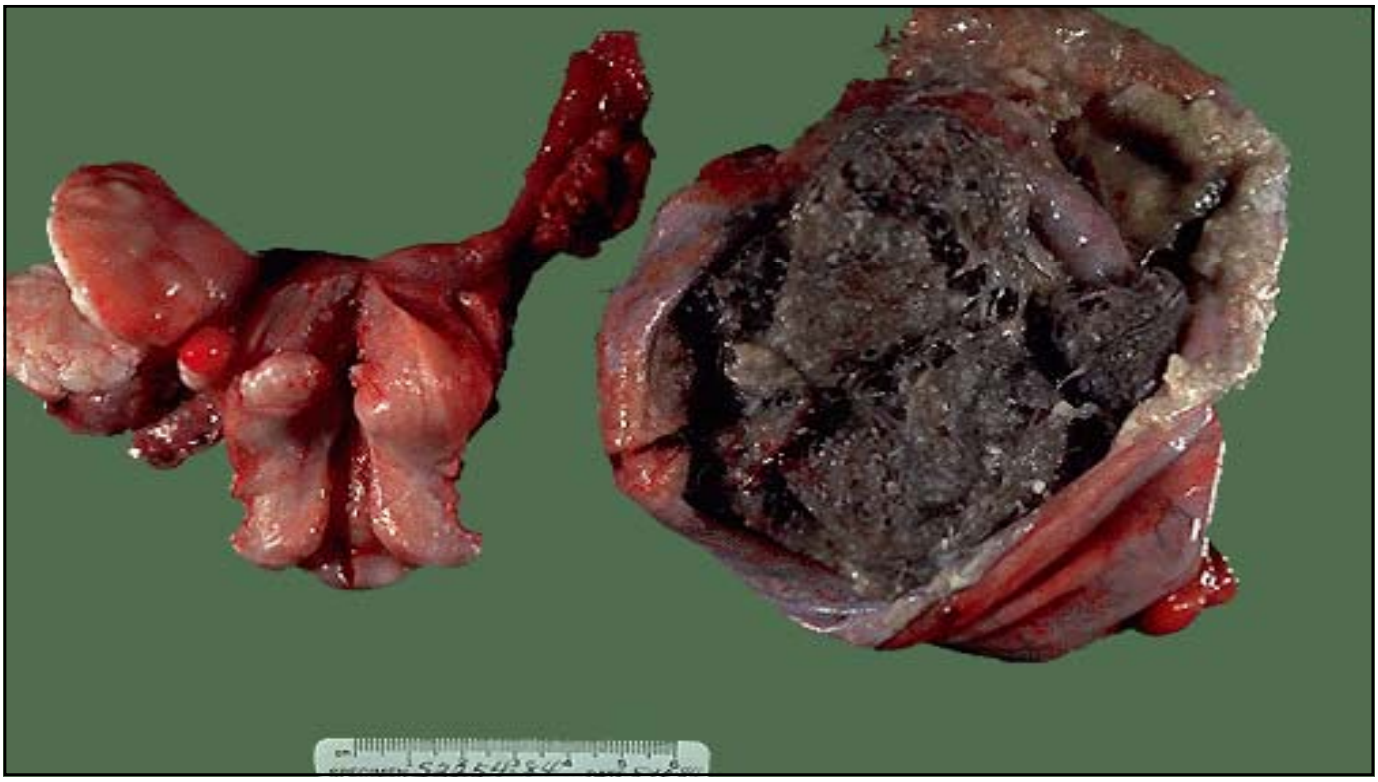
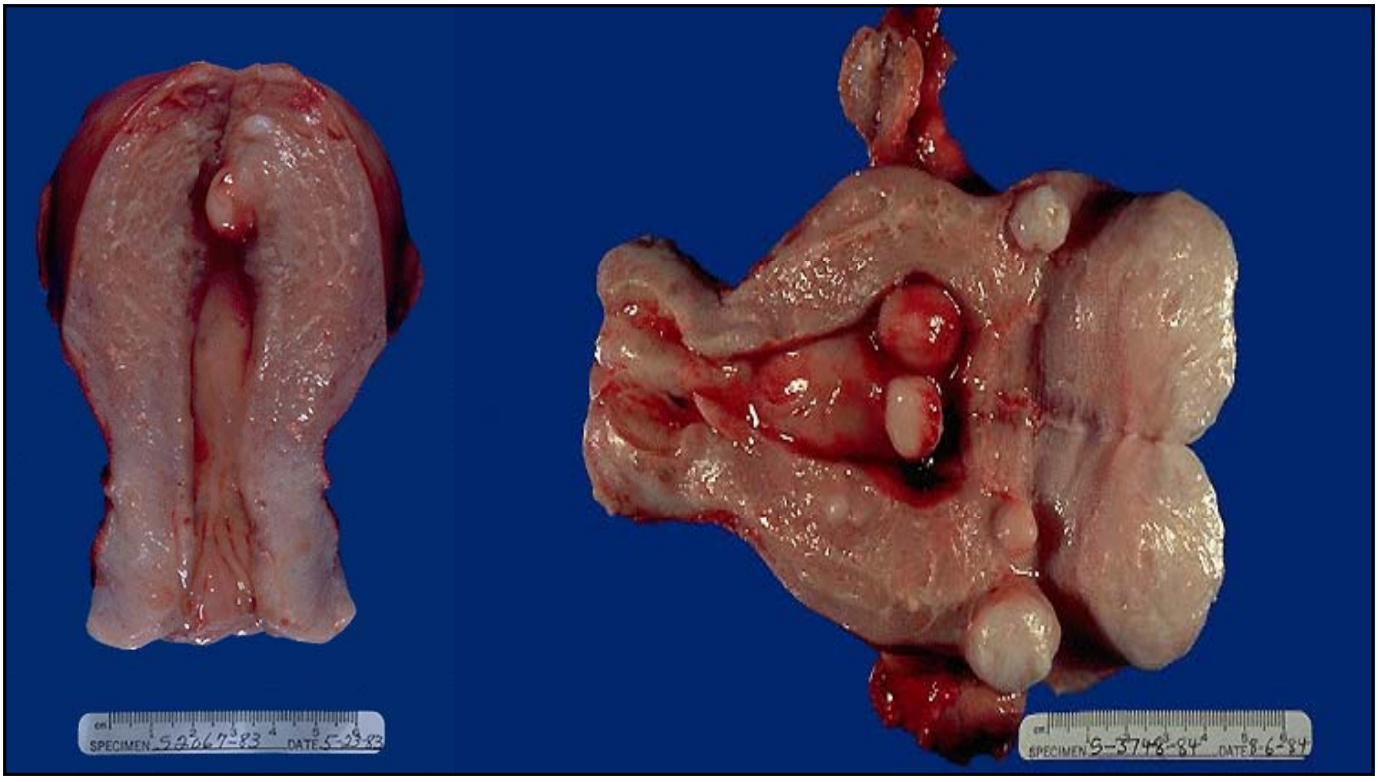

Age
Oogenesis
Follicular development
Fetal period
2n Oogonium
Mitosis
2n Primary oocyte
Primordial follicle
Meiosis in progress
2n Primary oocyte (in prophase I)
Childhood (incomplete development of follicles)
Puberty to menopause each month
2n Primary oocyte (still in prophase I)
Primary follicle
Secondary follicle
2n Primary oocyte
Meiosis I completed by one primary oocyte each month
First polar body n
n
Secondary oocyte (in metaphase II)
Mature (Graafian) follicle
Ovulation
Meiosis II of first polar body may or may not occur
n Sperm cell
Ovulated secondary oocyte
Meiosis II completed if fertilization occurs
n n n nn
Second polar body
Ovum
All polar bodies degenerate



Large leiomyoma in the lower uterine segment in a 28-year-old woman



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