النادي الطبي

GENITOURINARY SYSTEM

SUBJECT : Anatomy

LEC NO. : 10

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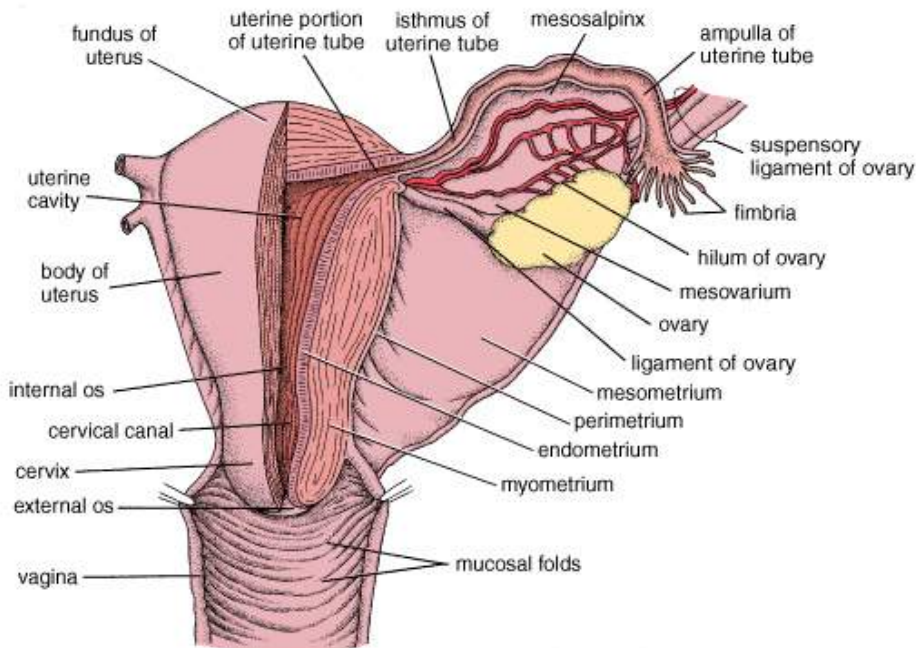
وَقُل رَّبِّ زِدْنِي عِلْمًا

Histology
of The
Female Reproductive System

The Female Reproductive System

- **Consists of:**
- **Ovary**
- **Oviduct** — Fallopian tubes
- **Uterus**
- **Vagina**
- **External genitalia**



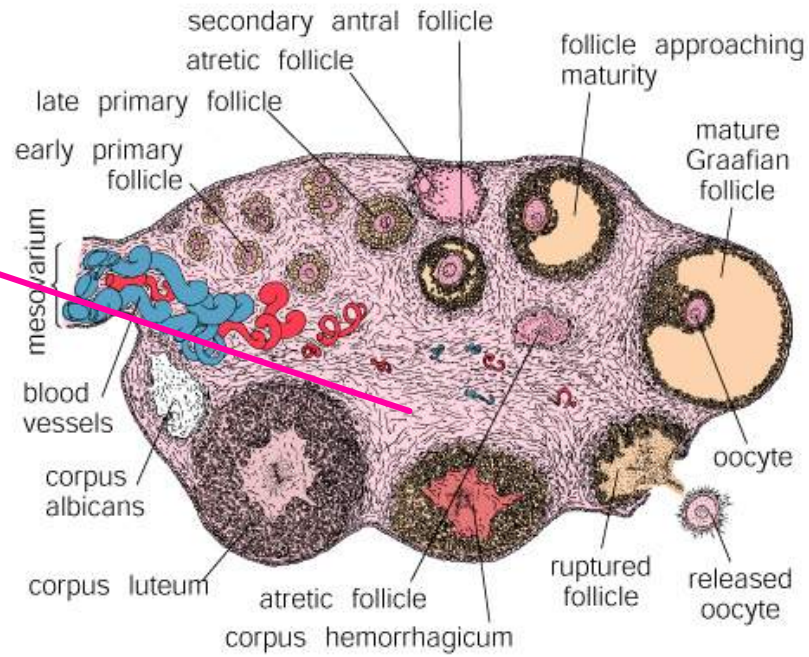
- **Function:**
- **Production of oocytes**
- **Keep and protect developed oocytes**
- **Production of hormones** — Mainly estrogen and progesterone
- **Receive and keep the conceptus** — Until complete growth and maturation

The Ovary

- **Almond-shaped body 3X1.5X1 cm**
- **Covered by Germinal Epithelium** — Part of peritoneum
- **Protected by Tunica Albuginea** — Dense connective tissue composed of collagen type two
  - For protection of ovary
- **Divided into:**

Cortex full of ovarian follicles within the stroma

Medulla is made of loose connective and is richly vascularized



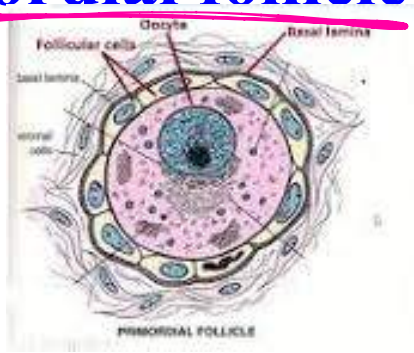
Ovarian Follicles

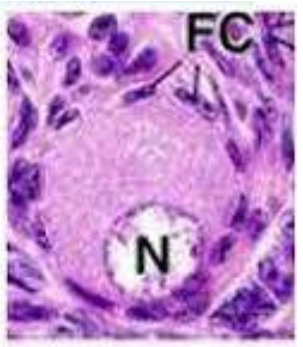
- Primordial germ cells leave the yolk sac to the ovary in the first month
- They divide and differentiate into oogonia that undergo mitotic division
- In the 3rd month, mitosis stops and the oogonia differentiate into the primary oocyte
- Primary oocytes begin the first meiotic division and stop in prophase during intrauterine life
- After birth, all primary oocytes are in prophase of the first meiotic division

Ovarian Follicles, Cont.,

- The primary oocyte surrounds itself with a single layer of flattened follicular cells and becomes a Primordial follicle
- Basal lamina surrounds follicular cells and acts as a blood-follicle barrier
- Follicular atresia
- At birth, there are about 700,000 follicles and 2/3 of them remain at puberty
- Of the 2/3 (450,000), only 450 are liberated during the female fertile life

Primary oocyte surrounded by flattered epithelium





Primary oocyte

بتمنع اي اشي بال blood vessels انه يدخل جوة ال primary oocyte

مش بهم

The death or apoptosis of follicles at different stages of development

Follicular Growth

Follicular stimulating hormone

- **At puberty, FSH induces follicular growth which coincides with the menstrual cycle** → Growth of follicle starts from the first day of menstrual cycle and ends by the end of cycle
- **It includes changes in:**
  - **Growth of oocyte (Cell and Nucleus)**
  - **Proliferation and changes in follicular cells**
  - **Proliferation and differentiation of stromal fibroblasts** ← In the medulla
- **Selection of the primordial follicle destined for growth involves many hormonal, differences in FSH receptors, estrogen synthesis, and aromatase activity.**

* Multiple follicles will grow at the same time to complete maturation but only one will be ovulated at the mid-cycle maybe two

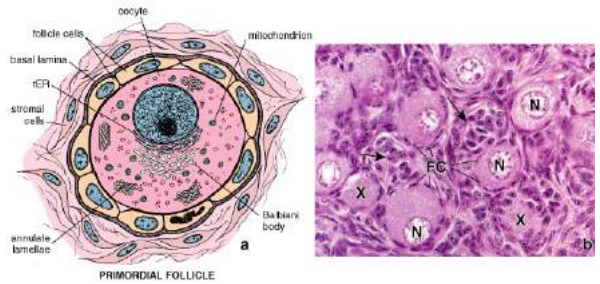
- **Polycystic ovary syndrome**

Transforms androgen to estrogen

* At the mid-cycle one of the follicles reach maturation and rupture, if it didn't rapture it will grow and increase in size with fluid » cyst

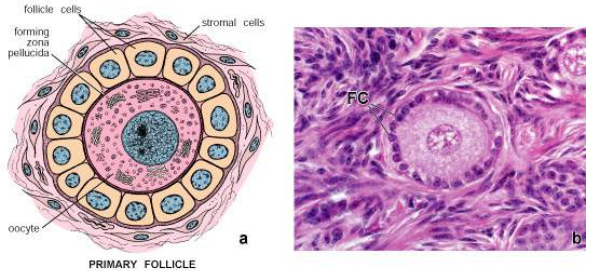
Follicular Growth

*Oocyte surrounded by a large of flattened epithelium



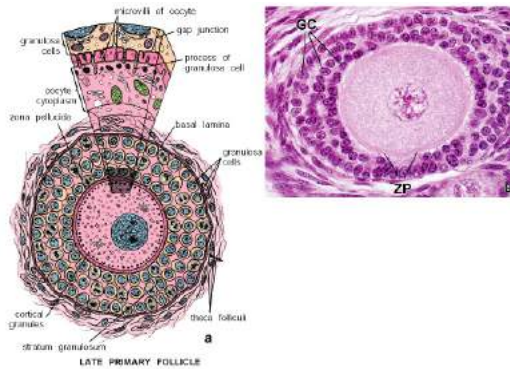
1. **Primordial follicle**

*Flattened epithelium → cuboidal epithelium

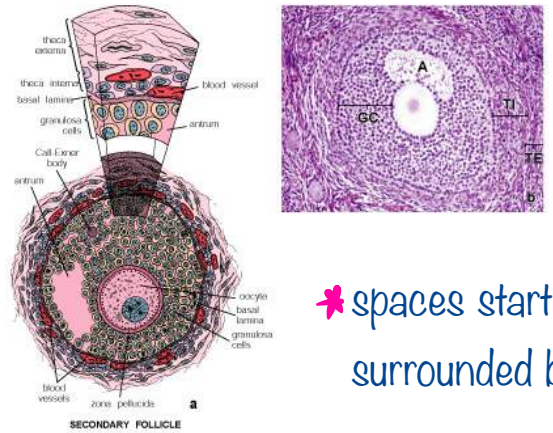


2. **Primary unilaminar follicle**

*One layer → multiple layers

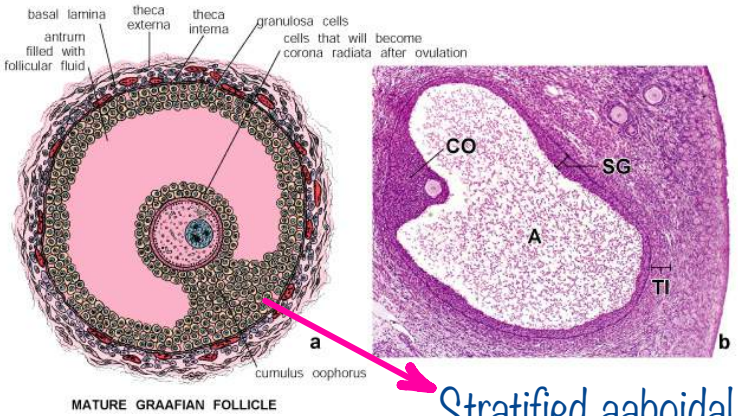


3. **Primary multilaminar follicle**



*spaces start to appear surrounded by connective tissue

4. **Secondary, Antral follicle)**



Stratified aaboidal epithelium

5. **Mature follicle**

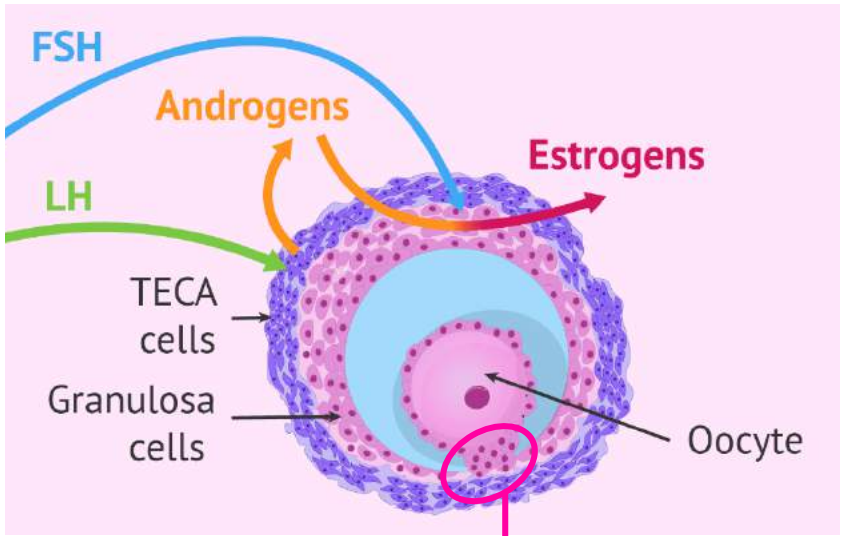
*When spaces fuse together to form a single space

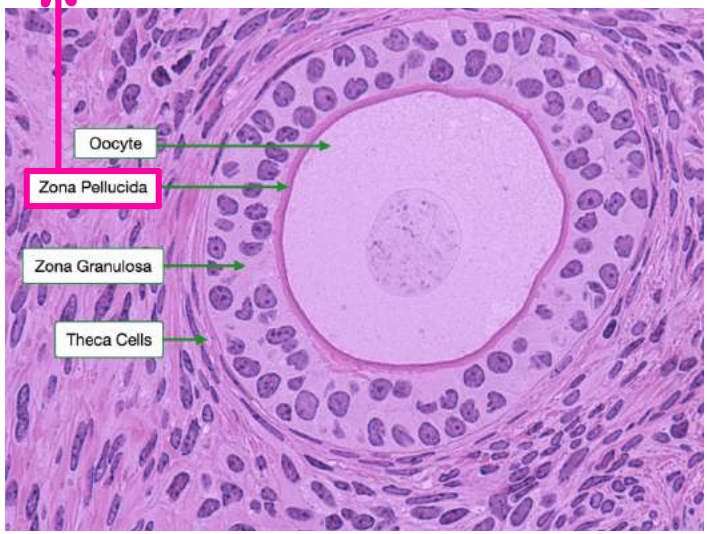
*Theca interna cells under the effect of luteinizing hormone secreate androgen then by aromataze enzyme it becomes estrogen inside follicular cells

Theca Cells

- **Stromal cells surrounding the follicle differentiate into:**
  Outer vascularized cellular layer (Theca interna) Close to basement membrane of the follicle
  Inner fibrous layer (Theca externa)
  For protection

Clear layer of glycoproteins





Cumulus oophorus » follicular cells are loosely attached to each other

Antrum

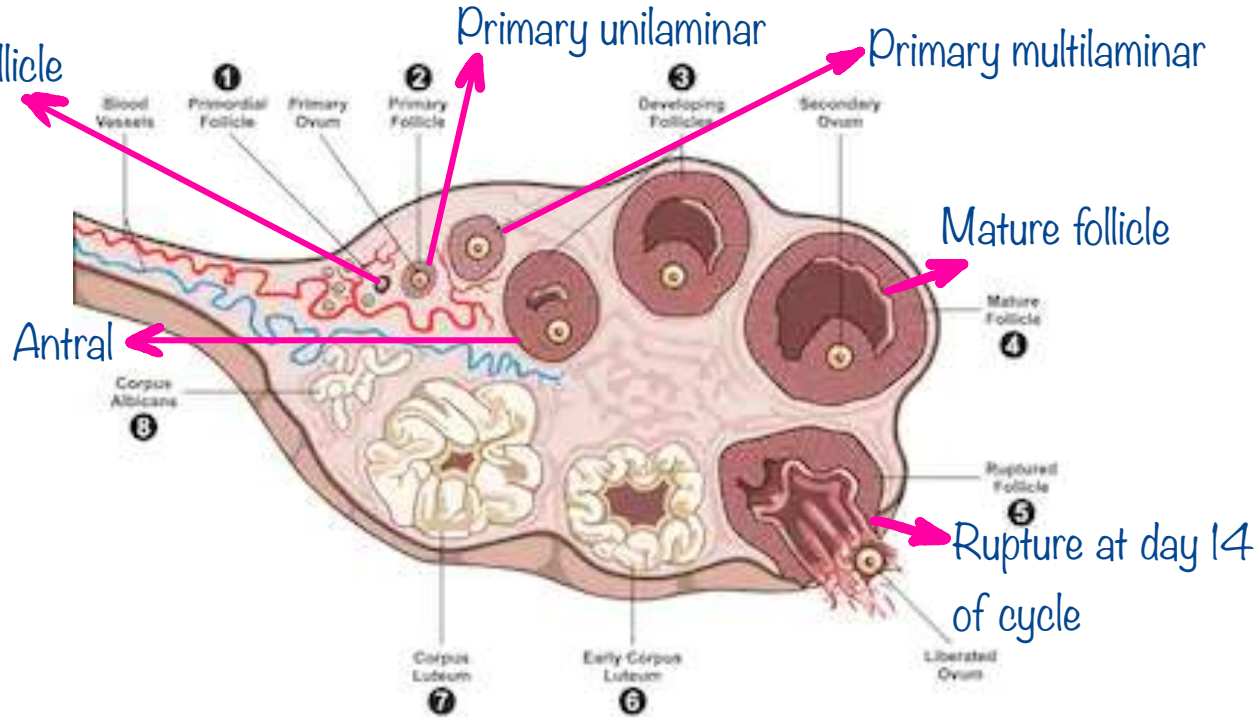
Ovulation

- **Hours before ovulation, mature follicle bulging against tunica albuginea develops a whitish or translucent ischaemic area called Stigma.** → Very thin layer
- **Rupture of the follicle and release of Oocyte.**
- **Expulsion of primary oocyte occurs at the midcycle under the effect of LH surge**

→ Sudden rise

*The first few days of menstrual cycle there's menstrual fluid after 3 to 4 days a primordial follicle that contains primary cocyte

راح يصيرلها مراحل التطور الي حكينا عنهم بسلايد ٧



Ovulation

- Following LH surge

  Granulosa cells secrete large amounts of follicular fluid (Antral fluid)

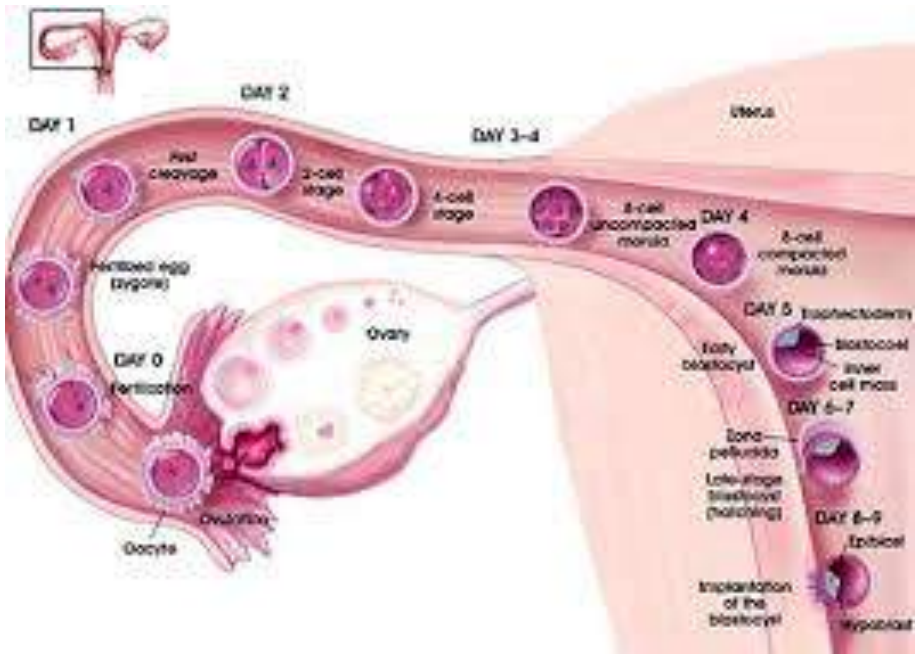
  Fluid contains prostaglandins, proteoglycans, and proteases
- Proteases release the blood-follicle barrier (Easier for the rapture)
- Cumulus oophorus (Loosely attached cells) cells secrete Hyaluronan (Proteoglycan) which increases the viscosity of extracellular fluid leading to swell of the follicle and leading to detachment of the oocyte-granulosa cell complex
- Weakness of the wall at the stigma (It's very thin wall)
- Spell of plasmin from ruptured capillaries degrades collagen in the tunica albuginea
- Contraction of muscle fibers in the theca (Externa) triggered by prostaglandin

Ovulation

- 1st meiotic division ends just before ovulation forming two cells
- They are the 1. secondary oocyte and 2. first polar body
  - Takes cytoplasm and all it's contents
  - Will die
- After the expulsion, the secondary oocyte starts 2nd meiotic division and stops at metaphase
- Expelled oocyte enters the open end of the oviduct
- Fertilization takes place within 24 hours or death of oocyte ensues
- Fertilization triggers the completion of the 2nd meiotic division
  - Resulting with 2 cells » mature oocyte and secondary polar body
    - Takes cytoplasm and all it's contents
    - Will die

*Ovulation is a stimulus forsecond mitosis to start

*Primary Oocyte gives 1 ovum

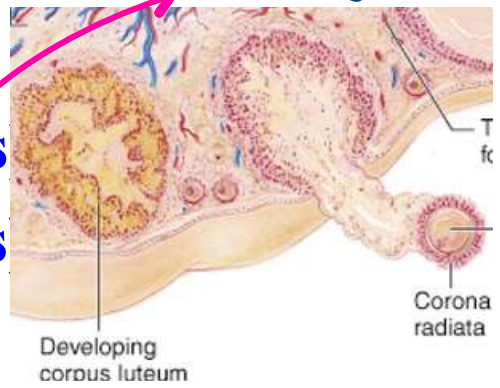


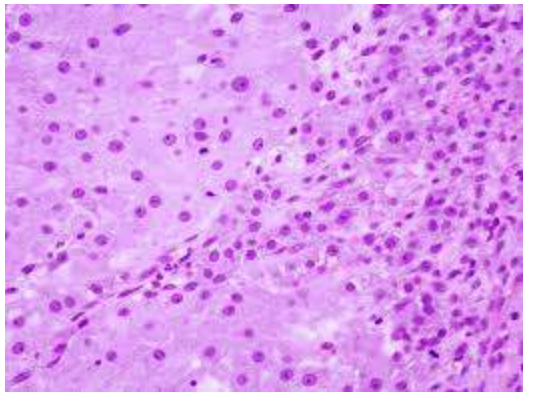
Corpus Luteum

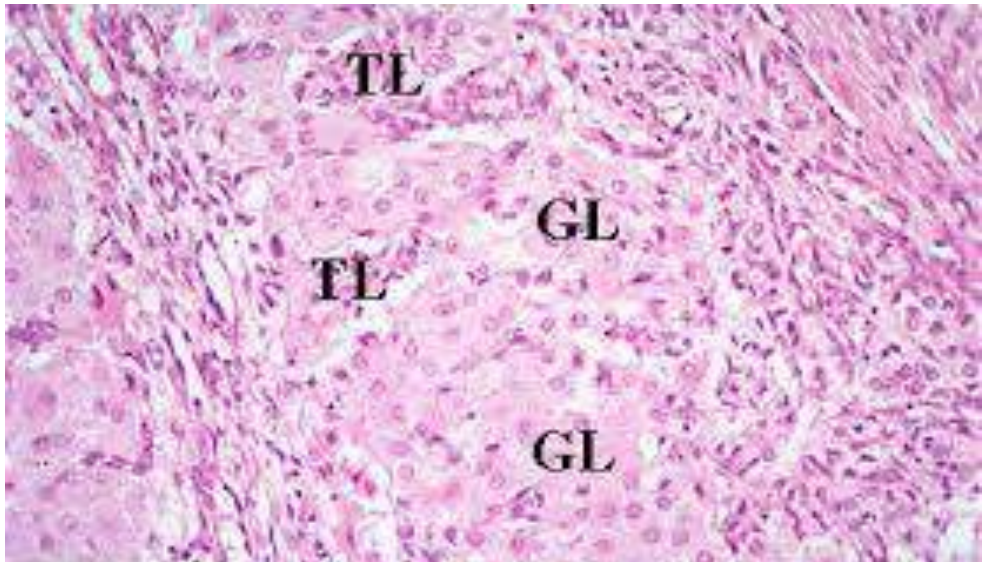
+ some capillaries

- After ovulation, granulosa cells and theca interna cells reorganize to form an endocrine gland called corpus luteum الجسم الأصفر
- Granulosa cells increase in size with steroid secreting characteristics (Granulosa lutein cells
- Theca interna cells become (Theca lutein cells
- Capillaries invade the lumen
- LH leads to the formation of corpus luteum and change the set of enzymes to secrete progesterone and androstenedione → (estrogen)

Round large cells with round nucleus







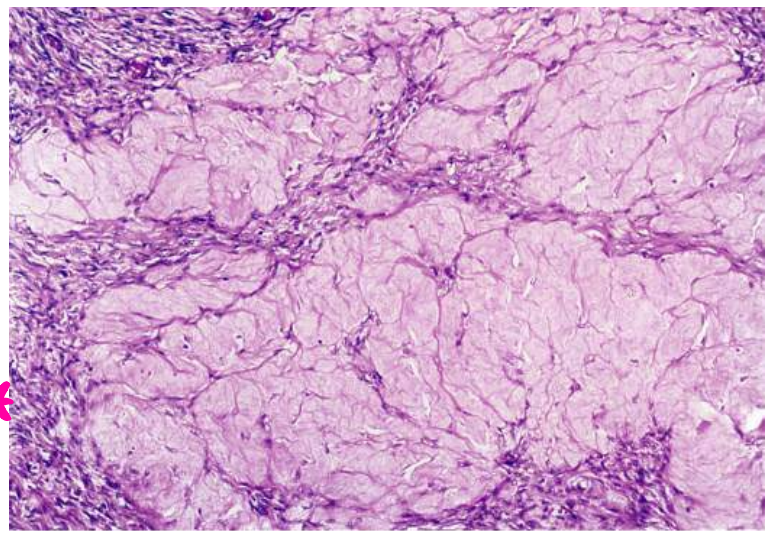
- **Corpus luteum continues to secrete hormones under the effect of LH for 10-12 days**
  ↱ Estrogen / progesterone
- **It is called the Corpus luteum of menstruation**

* ال cycle تقريبا ٢٨ حكينا على يوم ١٤ بصير ال rupture و باقي ال ١٤ يوم بكونوا تحت تاثير افرازات ال corpus luteum الي بتاثر بال LH
* الحمل لو صار راح يكون بيوم 14

Corpus Albicans

- The large amount of progesterone and estrogen from the corpus luteum leads to decreased FSH → No chance for new follicle development
- Corpus luteum of menstruation lasts for 10-12 days → * اذا ما صار حمل
- Without further LH secretion, progesterone secretion from the corpus luteum stops, menstruation ensues and FSH increases again to start a new cycle of follicular growth
- Remnants of the corpus luteum will be degenerated by apoptosis and phagocytosed by macrophages.
- The area will be invaded by fibroblast leads to the formation of scar tissue called corpus albicans → Dense connective tissue
- Corpus luteum of pregnancy

* لو صار حمل ال placenta راح تصير مصدر ال LH



Oviduct

Within the thickness of uterine wall

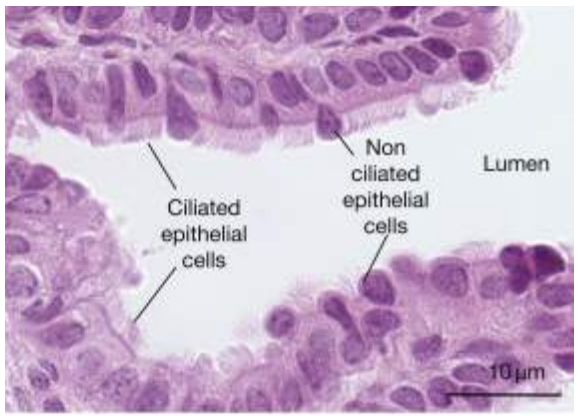
It is divided into Infundibulum, Ampulla, Isthmus and Intramural

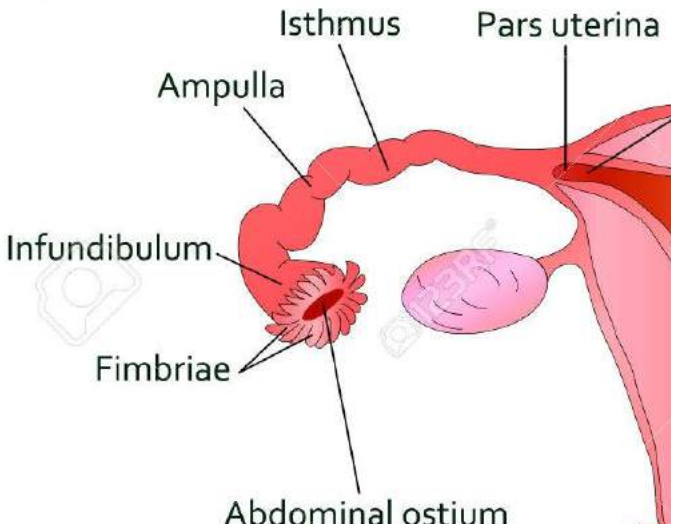
The infundibulum opens to the peritoneal cavity, while the intramural portion opens into the uterine cavity

Wall consists of:

* Important in moving the sperm toward lateral part of uterine tube for fertilization and to bring back fertilized ovum to uterine cavity

1. **Mucosa: simple columnar (ciliated) and secretory cells (Peg cells)**
   - Secreate mucus to ease movement
2. **Thick muscularis (Two layers)**
3. **Serosa** Circular and longitudinal





* Peritoneum surrounded by simple squamous epithelium

Uterus

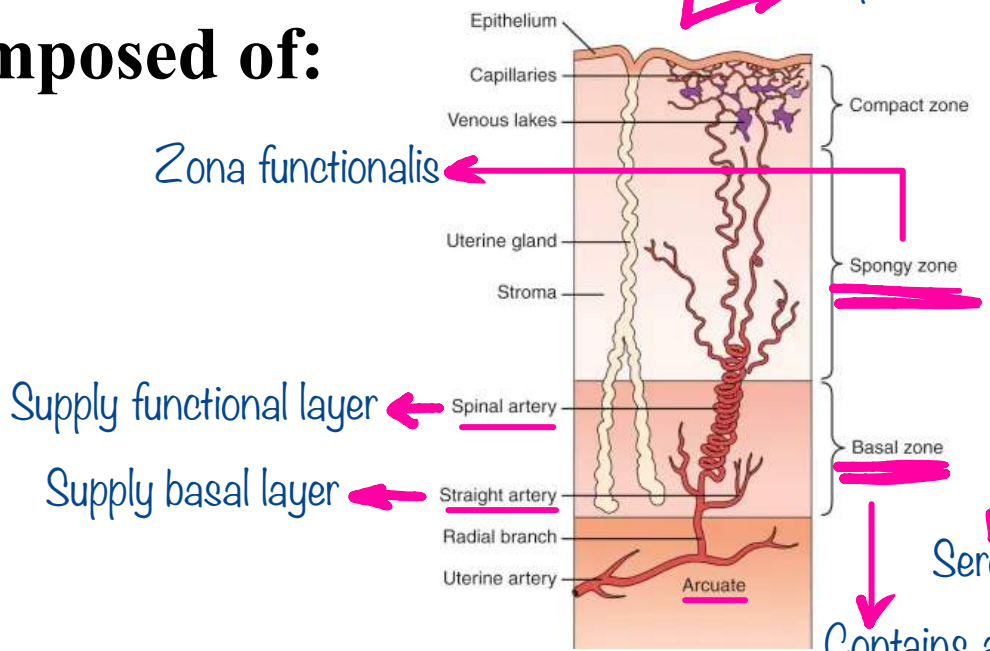
*Number of mucosal foldings determine the anatomical area of the tube, in the fimbriae and ampulla they're excessive and the holdings decrease as you're moving toward the uterus, isthmus median foldings, mural part there's almost no foldings

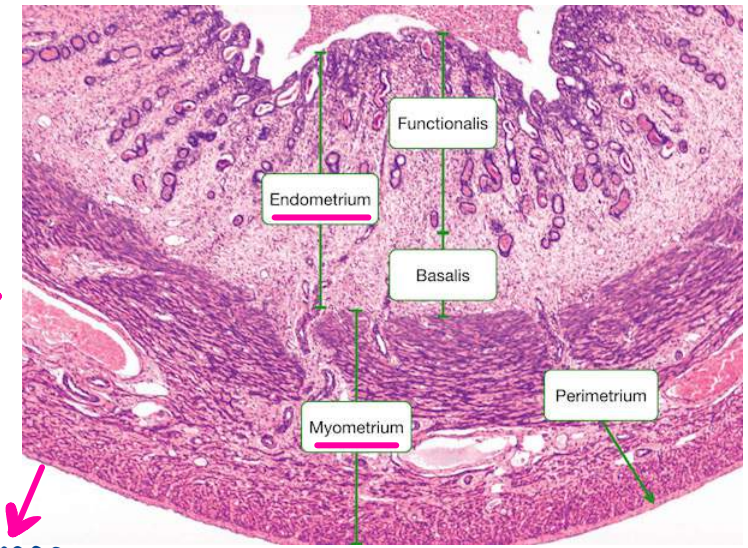
- **Wall consists of:**
- **Serosa**
- **Myometrium: 4 muscle layers** → Inner and outer layers are longitudinal
- **Endometrium: epithelium and glands** → Simple tubular they secrete proteins
- **Anatomically composed of:**

Body

Fundus

Cervix





Serosa

Contains a part of spinal artery and basal part of the gland

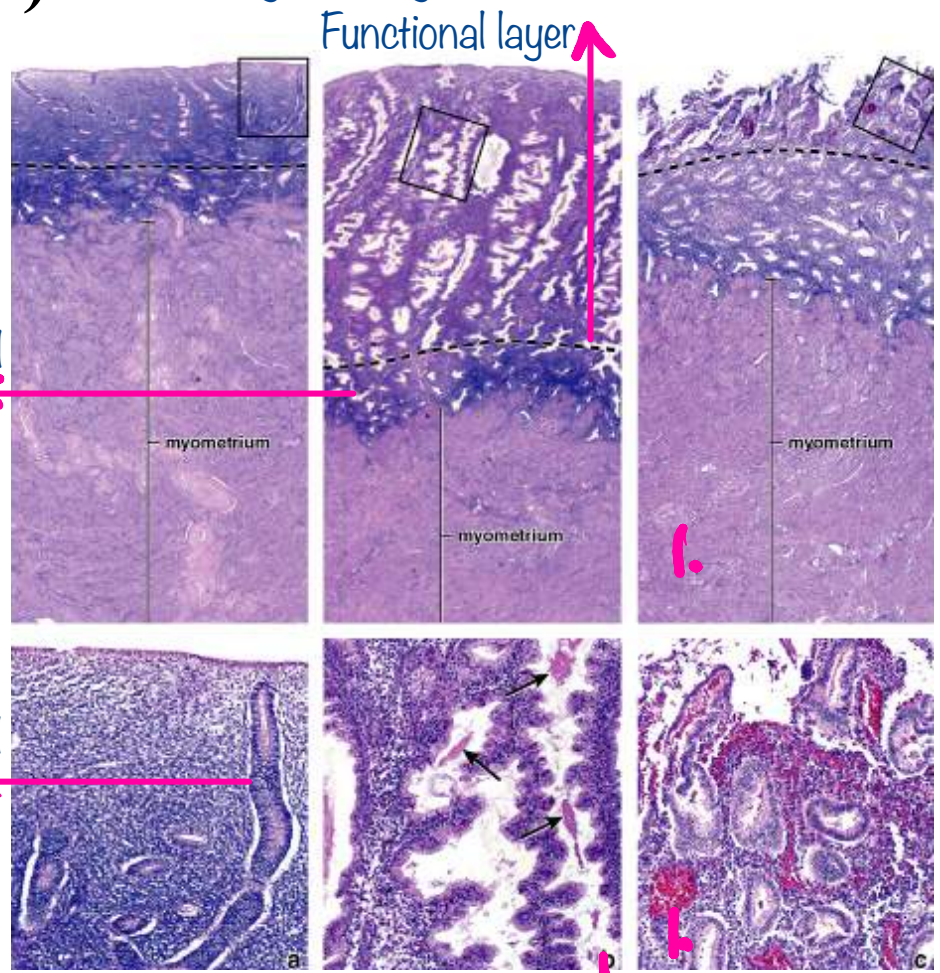
Menstrual Cycle

Thickness = 0.2 mm

1. **Menstrual phase** → Everything from functional layer to the top will be lost, menstrual fluid contains glands, blood vessels, epithelium, connective tissue .. menstrual blood isn't pure blood
2. **Proliferative phase (Follicular, Esrogenic)** → Until day 14 of cycle, thickness 2 mm
3. **Secretory phase (Luteal, Progesteronic)**

- **Changes occur in the following:**
  - **Thickness** (Thickness = 5 mm)
  - **Glands**
  - **Blood vessels**
  - **Ground substance**

Of all items lost in menstruation



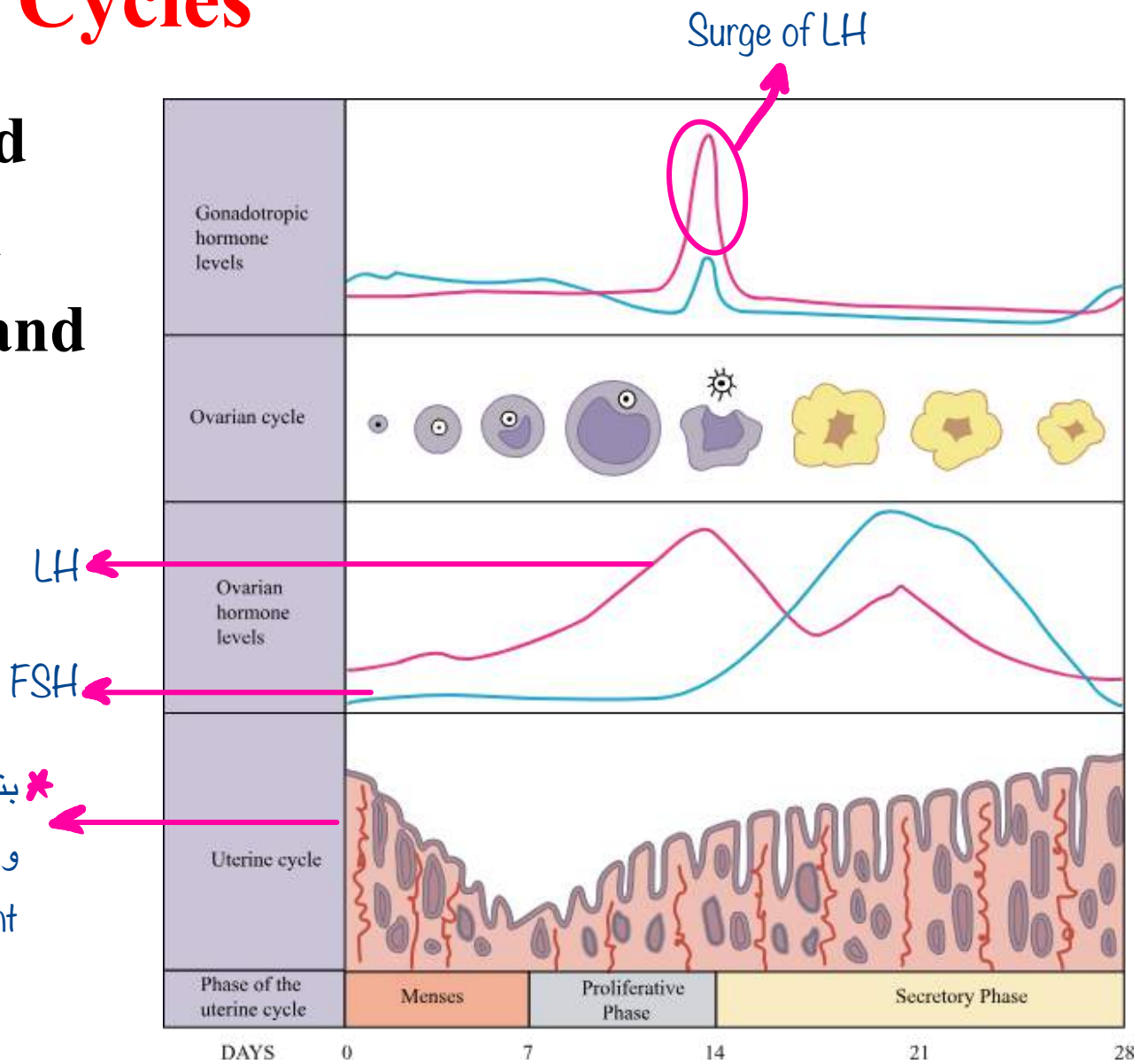
*We will be left with basal layer of endometrium

*Gland narrow and tall in proliferative phase

*Glands are dilated, ziczac line, full with secretion, more edematous in secretary phase

Ovarian and Menstrual Cycles

- **Association of the ovarian and menstrual cycles' changes and the level of steroid hormones and gonadotropin hormones**



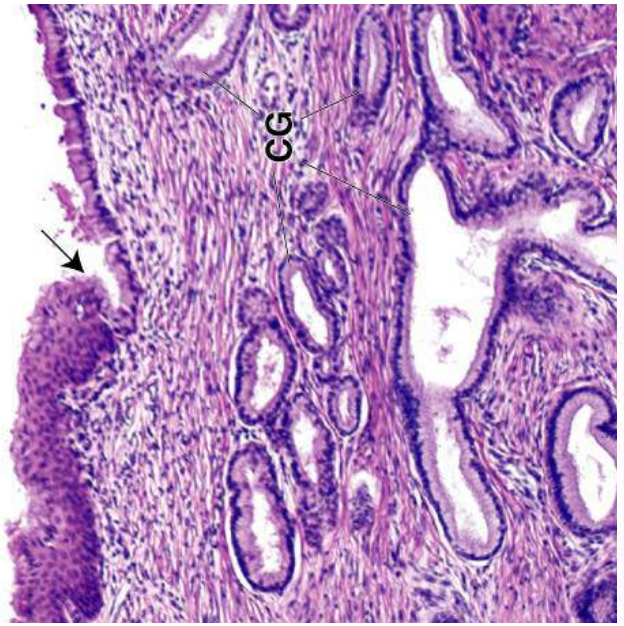
* بنلاحظ بالبداية كيف ال epithelium بقل بالحجم ليوصل 0.2 mm و بعدين بال proliferation بصير build up لل glands و follicular بعدين بال secretory صير filling لل glands development

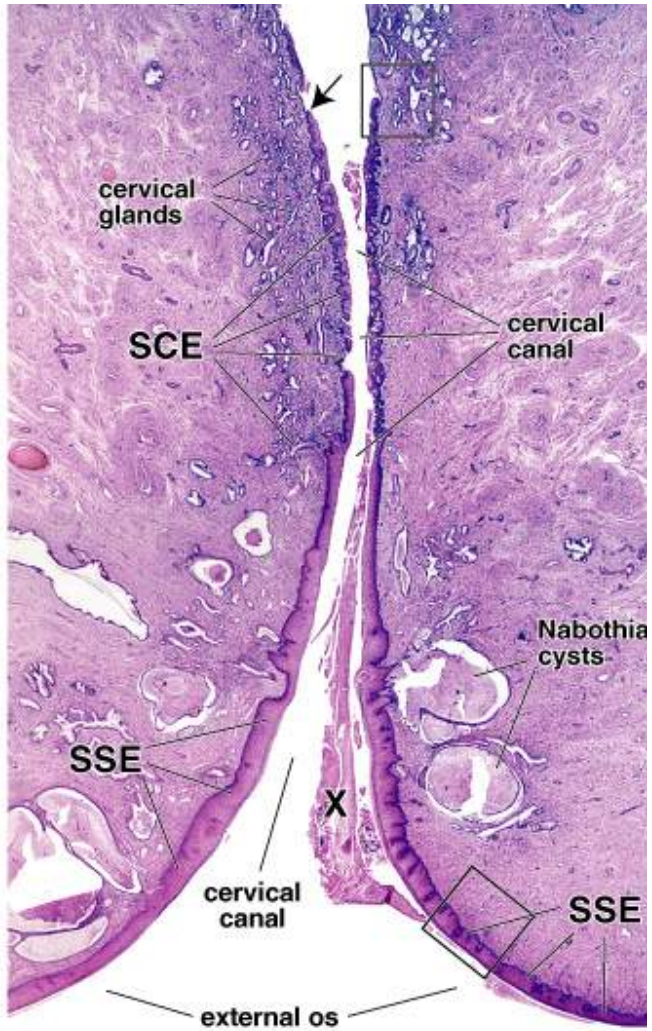
Uterine Cervix

وقفن هون راح نكمل المحاضرة الجاي

It differs from the rest of the uterus.

- **Lining epithelium**
- **Glands**
- **Connective tissue**
- **Muscle fibers**

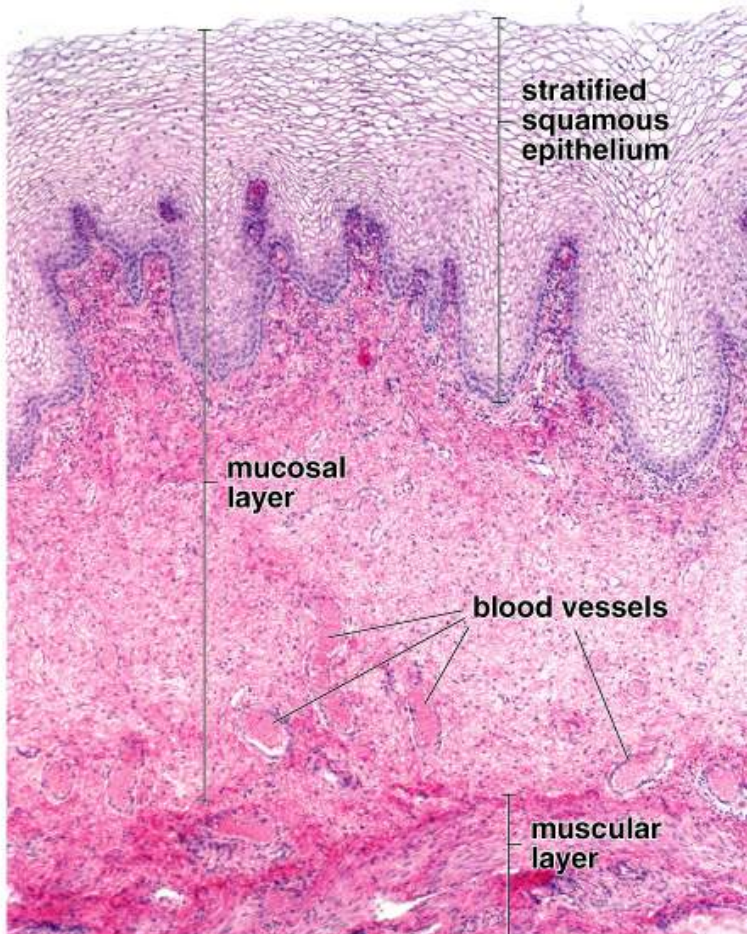




Vagina

Consists of three layers

- Mucosa
- Muscularis
- Adventitia

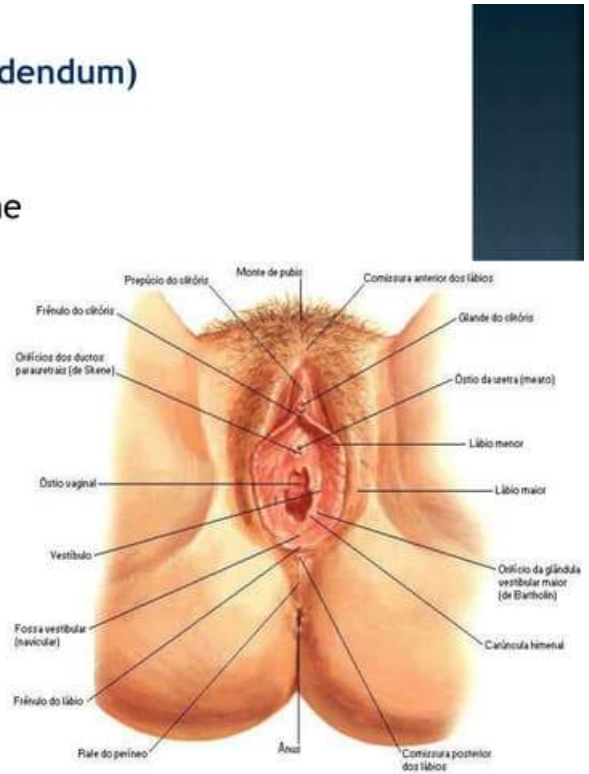


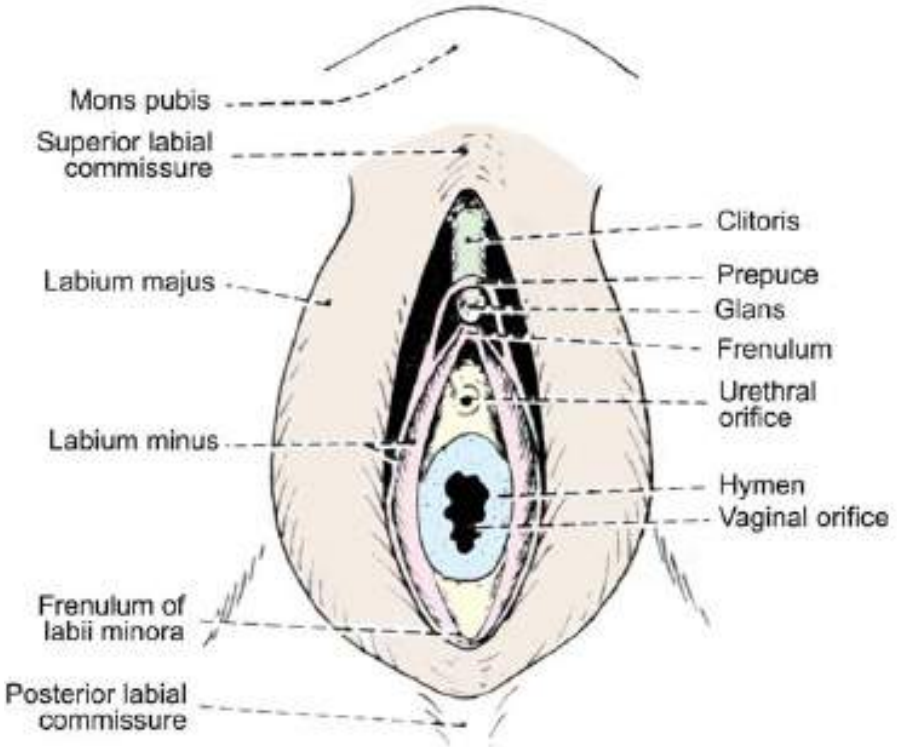
External Genitalia

- **EXTERNAL GENITALIA**
  (Synonyms: Vulva, Pudendum)

The vulva or pudendum includes all the visible external genital organs in the perineum.
Vulva consists of the following:

- mons pubis
- labia majora
- labia minora
- Hymen
- Clitoris
- Vestibule
- vestibular bulbs
- urethra
- Skene's glands
- Bartholin's glands





Breast

- In girls and boys:

  Lactiferous sinuses

  Very small branching ducts

- At puberty:

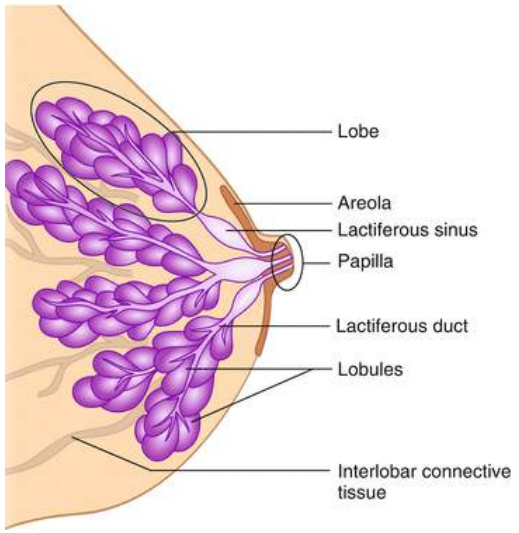
  Ducts elongate

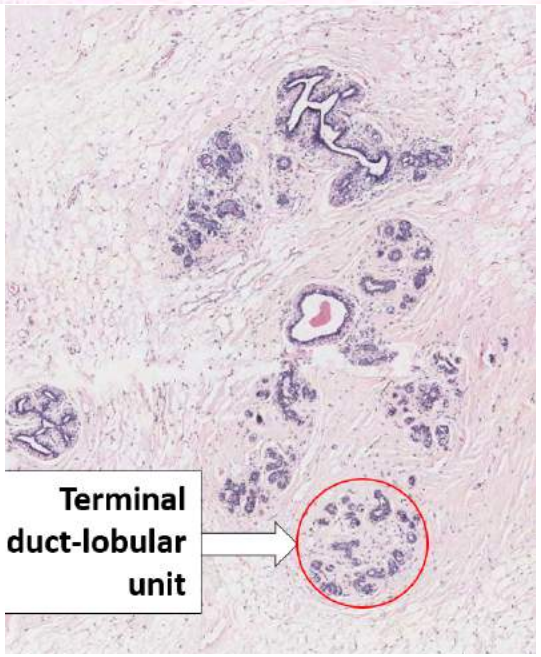
  Adipose tissue deposition (estrogen)

- Adult (non-pregnant)

  Many lobules

  Each lobule consists of small, branching ducts with rudimentary small secretory units





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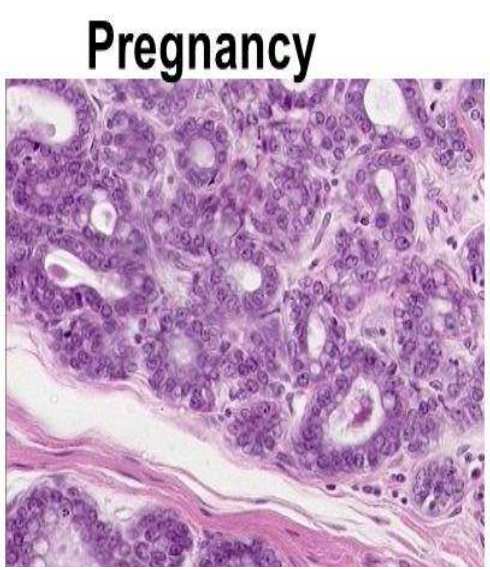
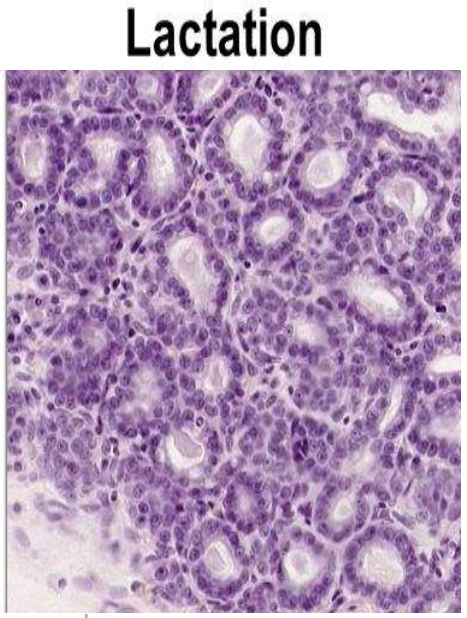
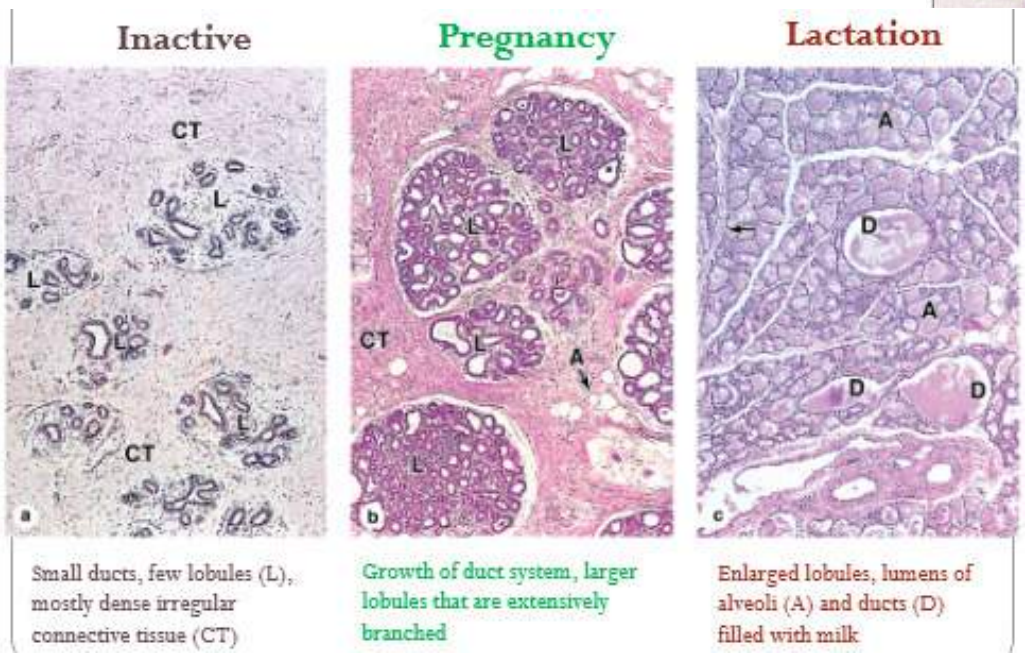
Inactive


Pregnancy


Lactation


Inactive
Pregnancy
Lactation
CT
L
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c
Small ducts, few lobules (L), mostly dense irregular connective tissue (CT)
Growth of duct system, larger lobules that are extensively branched
Enlarged lobules, lumens of alveoli (A) and ducts (D) filled with milk

Thank You