The University Of Jordan
Faculty Of Medicine

Histology of The Female reproductive system

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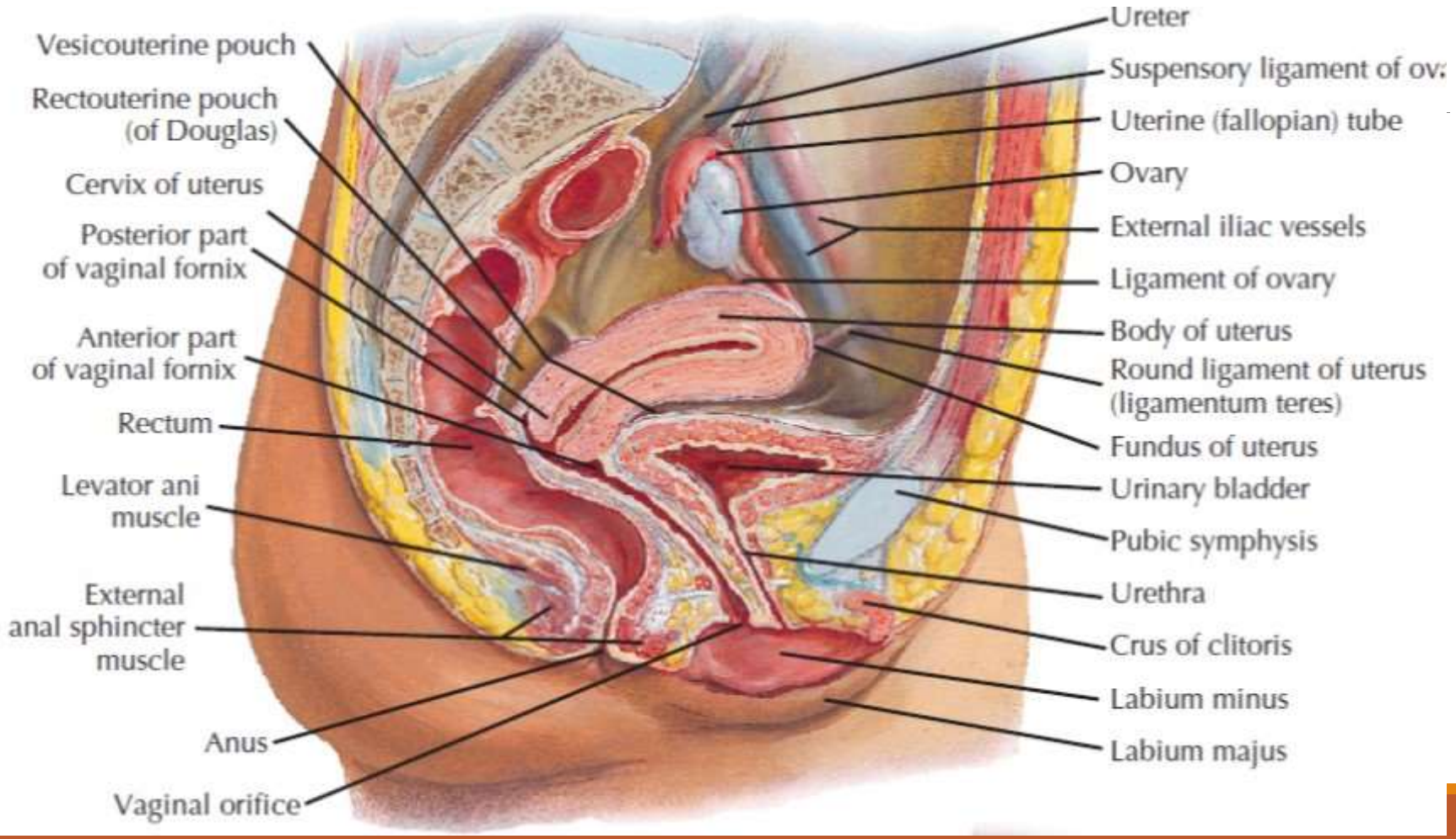
Objectives

1. Identify the components and functions of the female reproductive system.
2. Identify histological structure of fallopian tube, uterus and vagina.

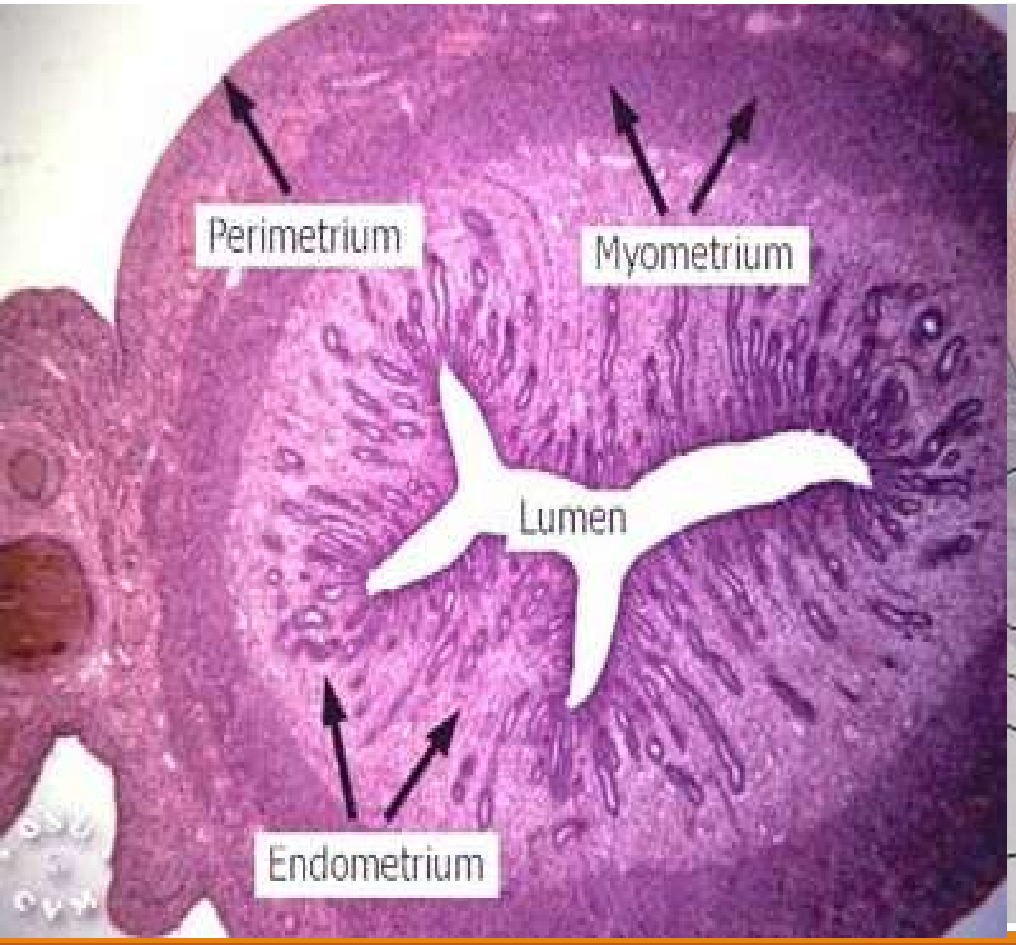
Female reproductive system

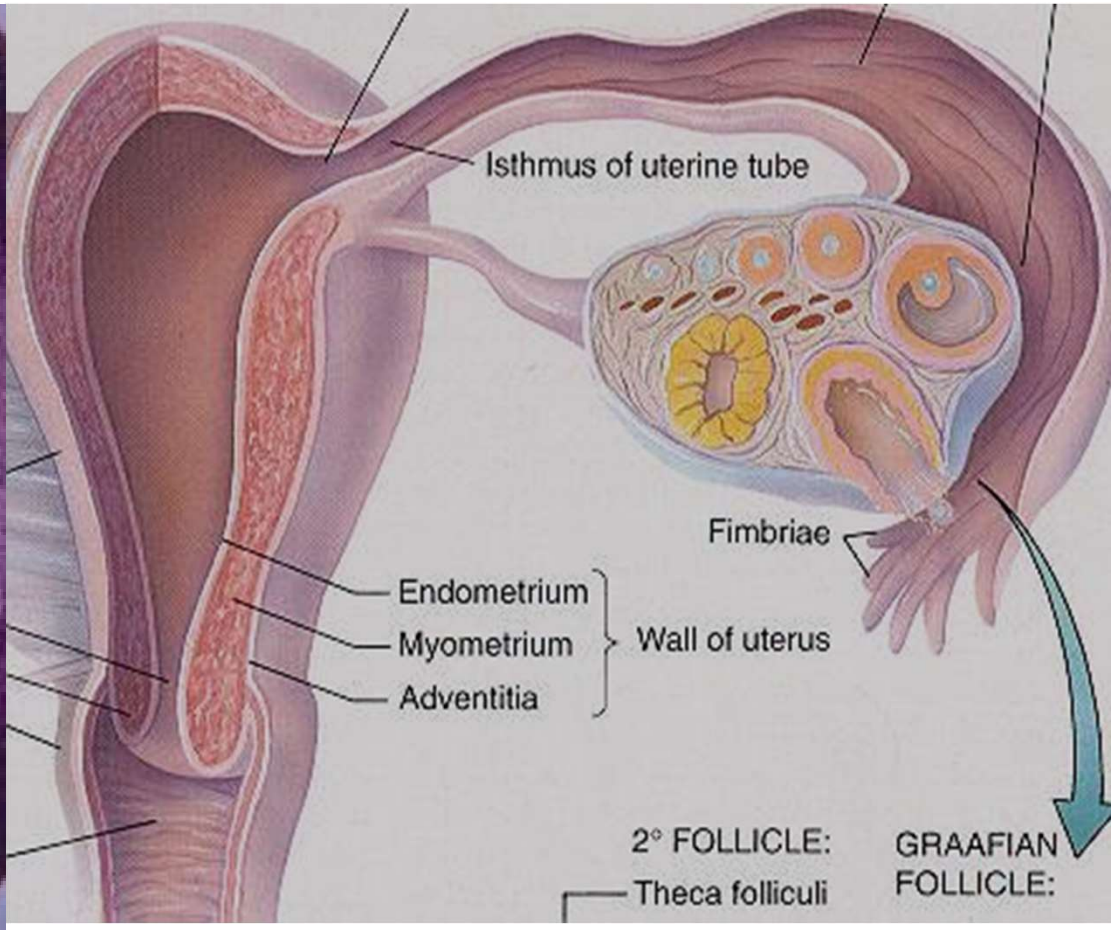


Uterus

✦Uterus is a pear-shaped structure attached to uterine tube at upper end and to vagina at lower end
✦Uterus is divided into three regions:
✦Fundus
✦ Body
✦ Cervix

✦Wall of **body and fundus** has 3 layers
- The lining Mucosa is called Endometrium
- The muscular layer called Myometrium
- The external layer Perimetrium

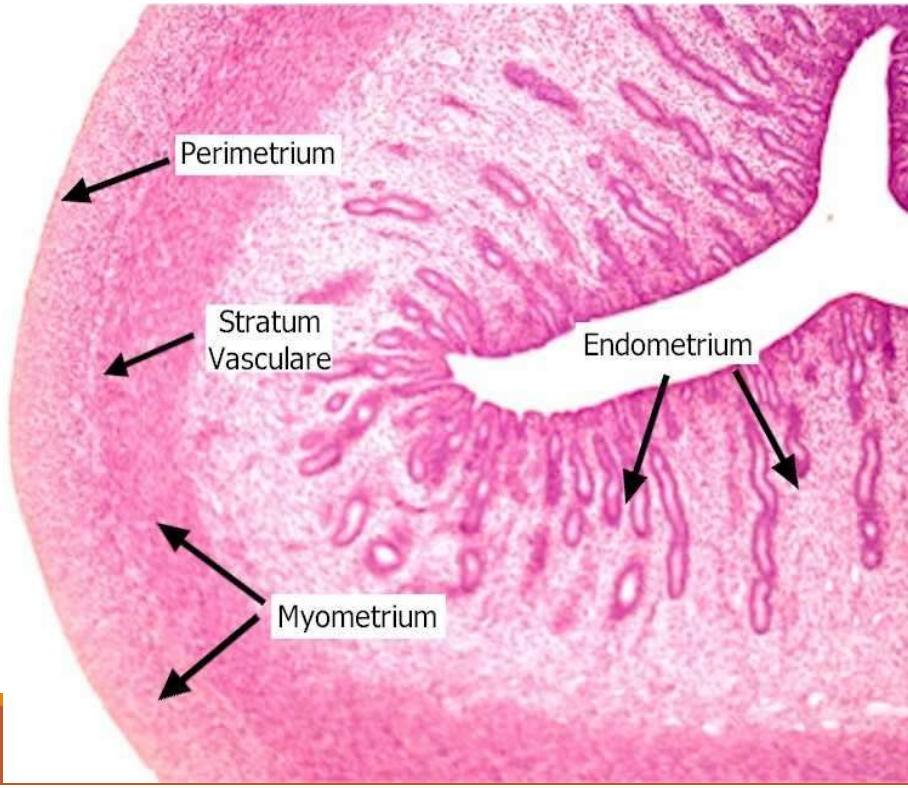

Perimetrium
Myometrium
Lumen
Endometrium


Isthmus of uterine tube
Fimbriae
Endometrium
Myometrium
Adventitia
Wall of uterus
2° FOLLICLE:
Theca folliculi
GRAAFIAN
FOLLICLE:

Perimetrium

※Anterior portion of body covered by adventitia which is composed of areolar connective tissue

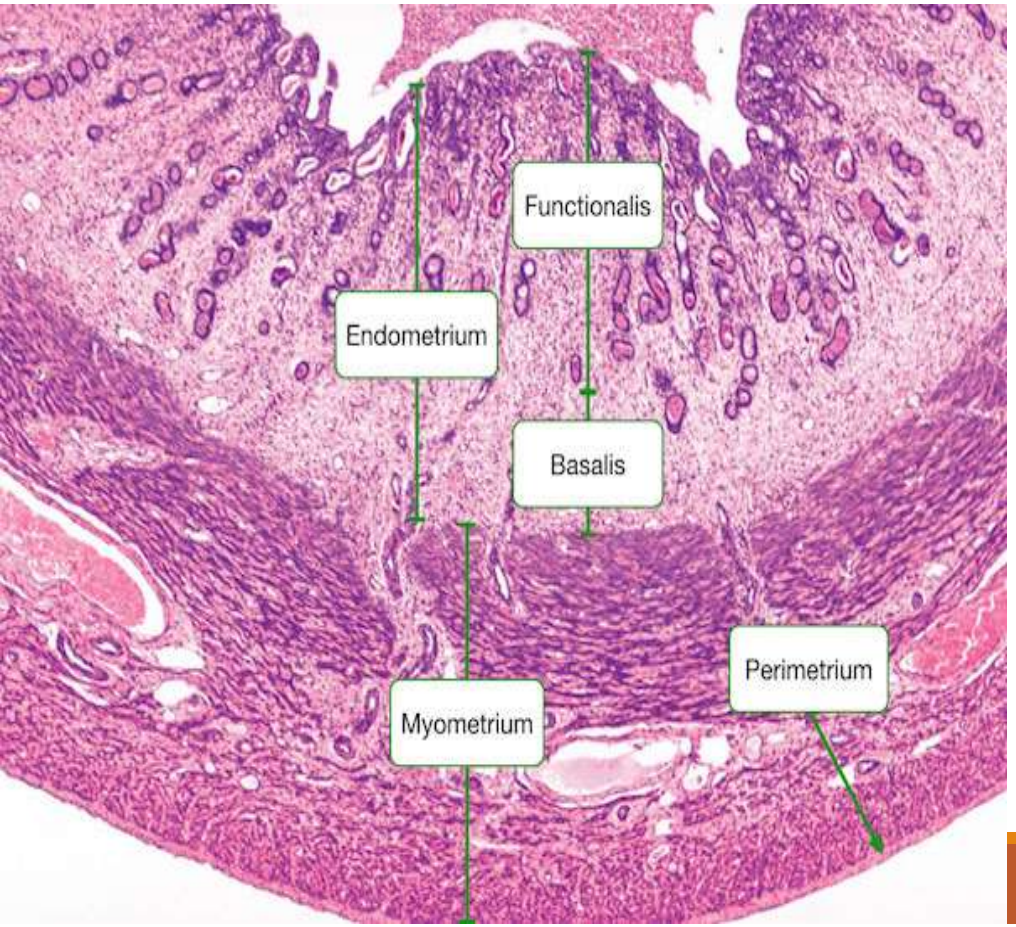
※The remaining portion of uterus covered by serosa composed of a layer of simple squamous cells (mesothelium) resting on an areolar connective tissue

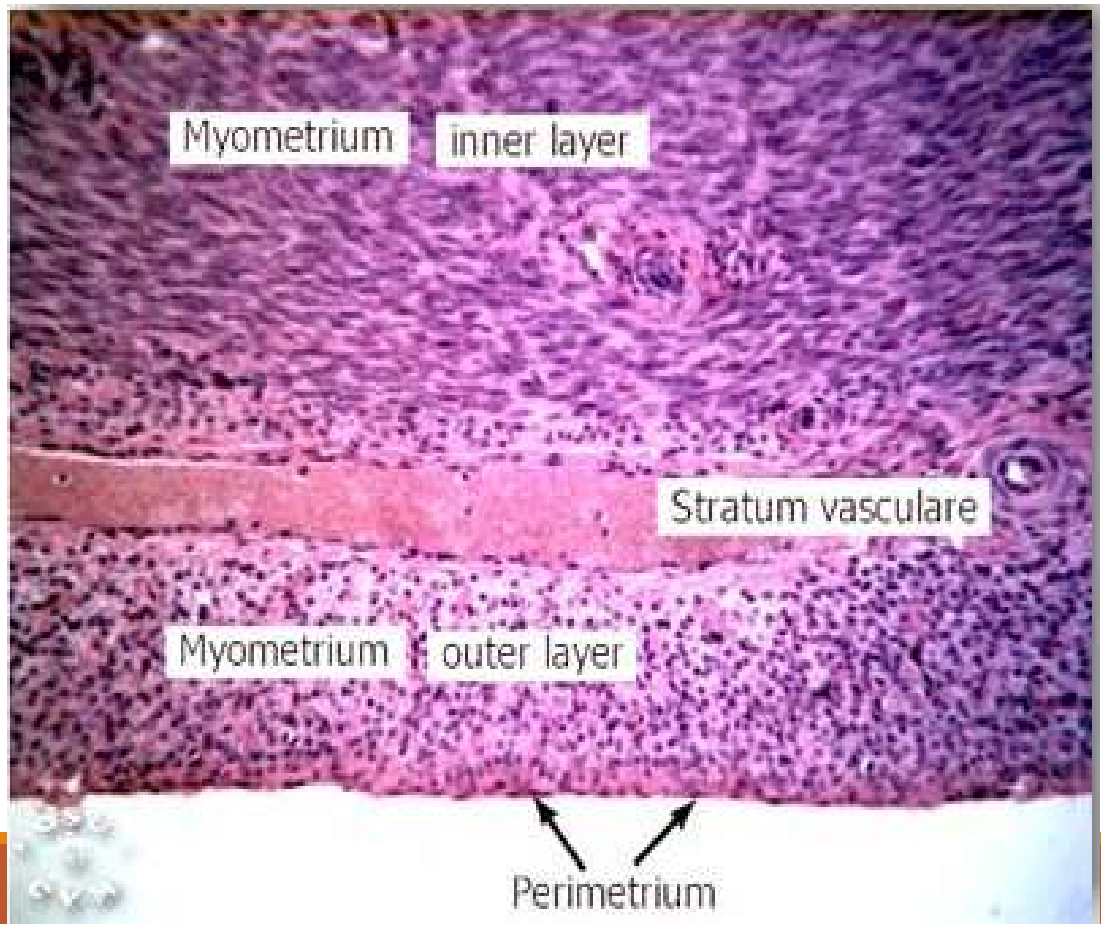


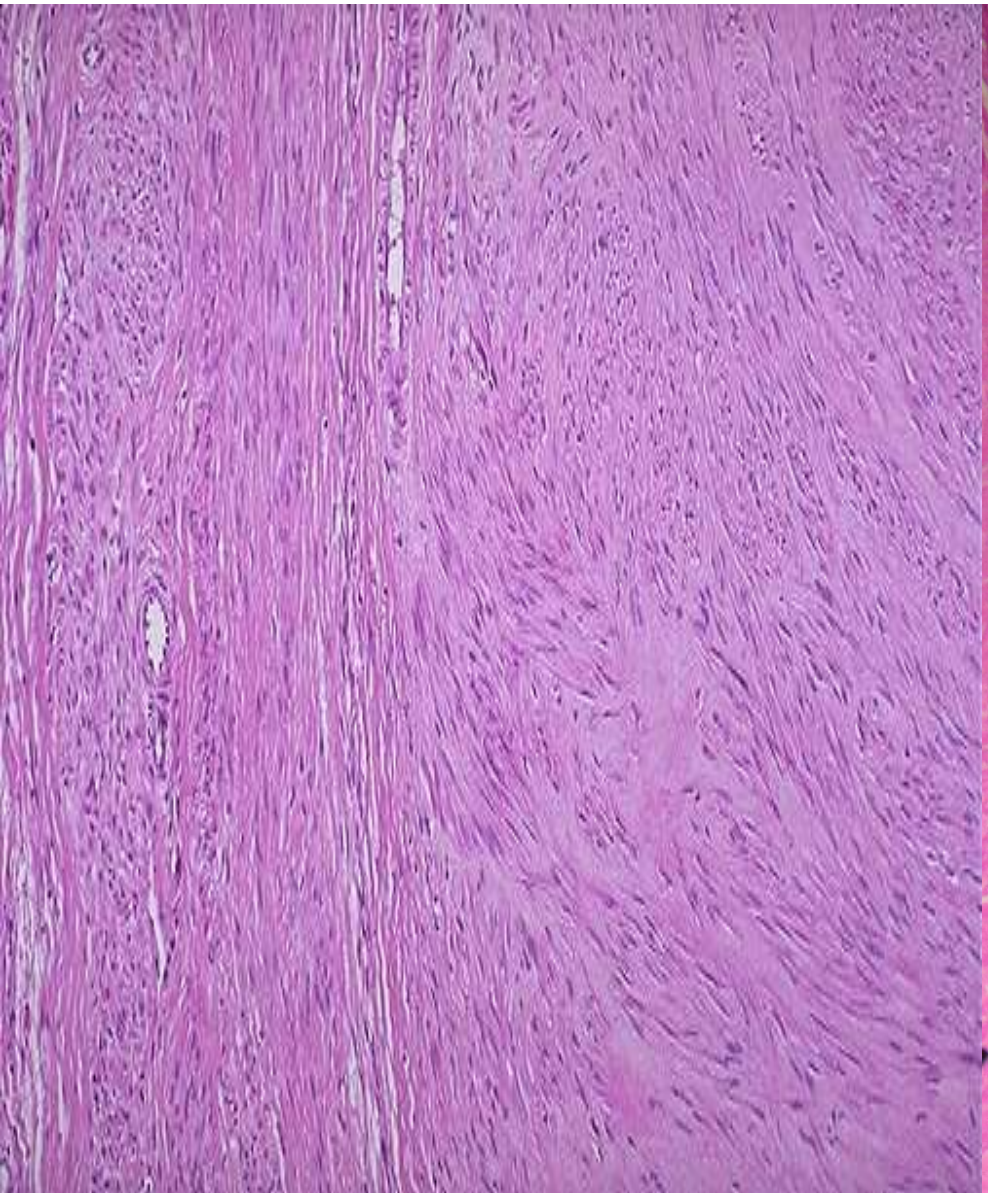
Myometrium

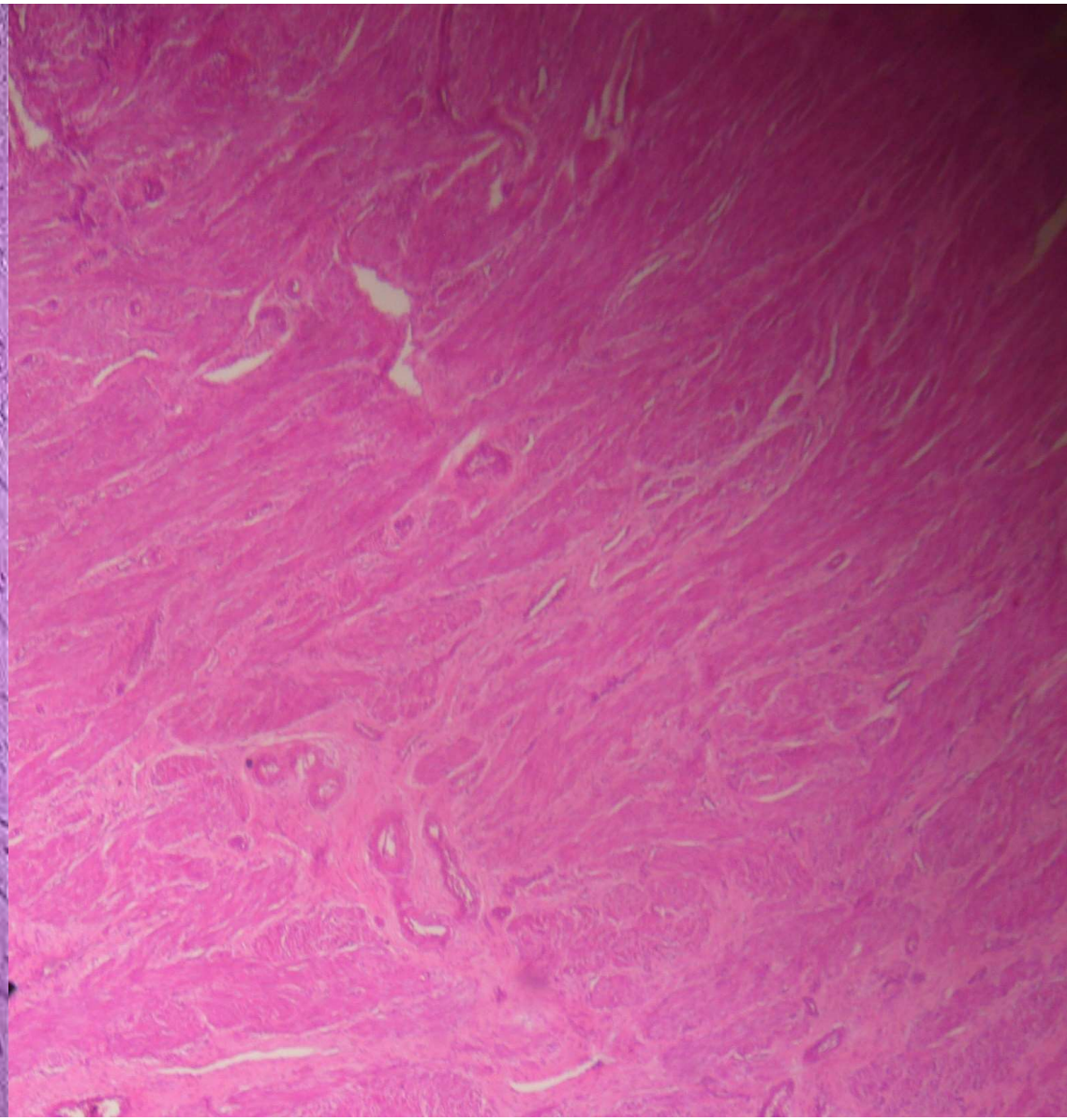
- Myometrium is the thickest layer and composed of poorly defined layers of smooth muscle separated by connective tissue
- **Inner Layer (stratum submucosa) :** thin layer composed of longitudinal and circular muscular fibers
- **Middle layer (Stratum Vasculare) :** It is thick highly vascularized with irregular arranged muscle fibers. They are run **Longitudinally , circularly ,obliquely and transversely**
- Arcuate arteries located in this layers and is known as Stratum Vasculare
- **Outer layer (stratum subserosaum)** muscles fibers are mostly **longitudinal** in orientation

- Myometrium is estrogen dependent ,it is thicken during pregnancy with more and large smooth muscle cells (hyperplasia and hypertrophy) and increased collagen fibers
- Activity of the myometrium decrease until parturition due to release of relaxin hormone produced by corpus luteum.
- At labour it undergoes strong contractions in response to oxytocin produced by neurohypophysis (Posterior lobe of pituitary gland) .


Functionalis
Endometrium
Basalis
Perimetrium
Myometrium


Myometrium
inner layer
Stratum vasculare
Myometrium
outer layer
Perimetrium





Endometrium

Before Puberty & Menopause :

-The Endometrium is lined with simple cuboidal with scanty spindle-celled stroma

- Contain rudimentary tubular glands which undergo cystic distention at menopause and fail to respond to estrogen and progesterone

During reproductive years:

-Epithelium is ciliated columnar cells and secretory columnar cells

Lamina propria composed of dense irregular connective tissue and vessels supports epithelium and houses simple coiled tubular glands

-The epithelium has (ciliated cells and non ciliated secretory cells)

Endometrial Layers

- **Functional layer** is a thick superficial layer sloughed off during menstruation and replaced during each menstrual cycle.

- Functional layer vascularized by coiled helical arteries that originate from arcuate arteries in stratum vasculare.

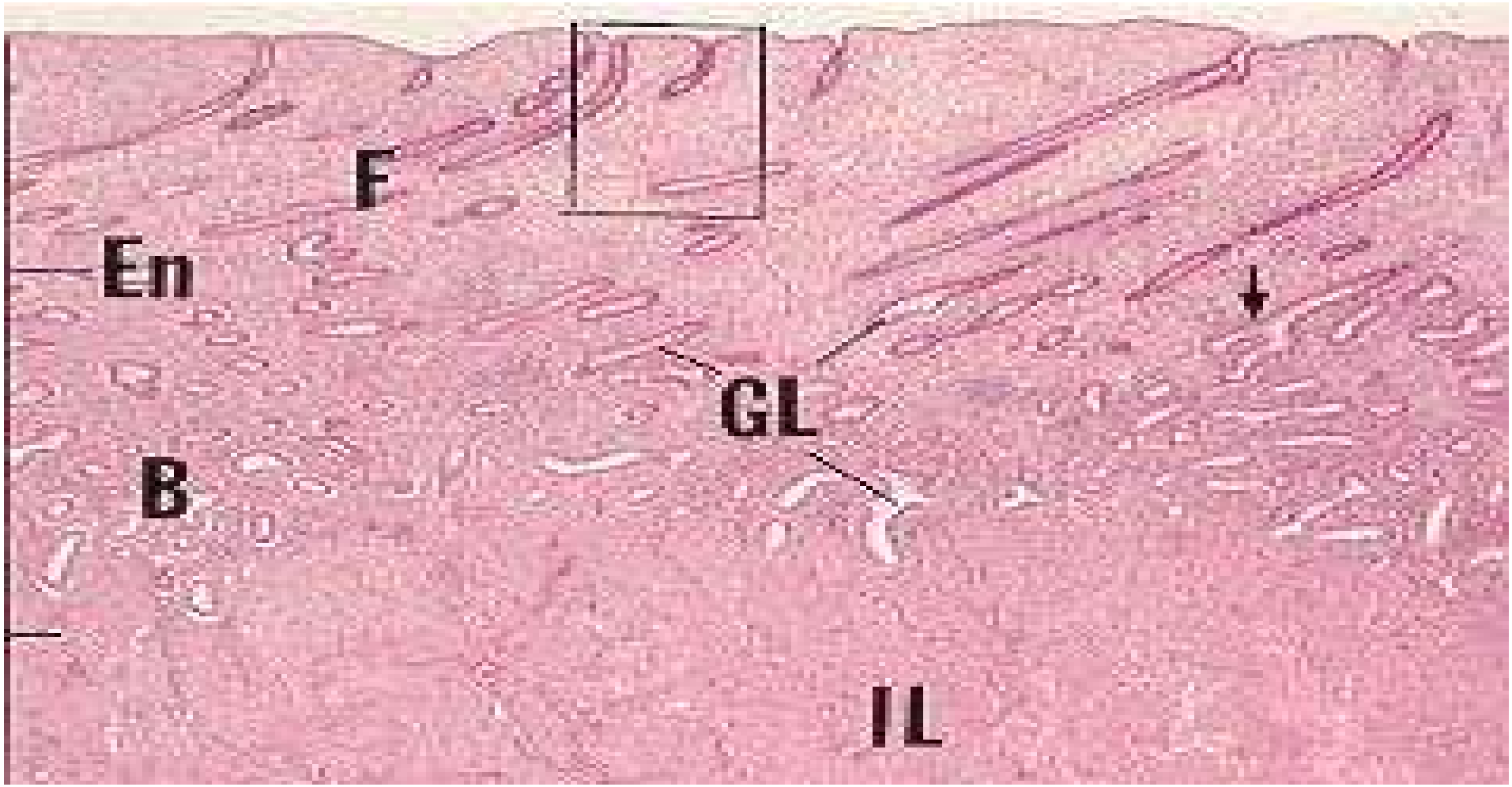
- **Basal layer** is a deep narrow layer retained after menstruation whose glands epithelium and connective tissue element regenerate functional layer.

- Basal layer supplied by short straight arteries which originate from arcuate arteries in stratum vasculare

Endometrial blood supply

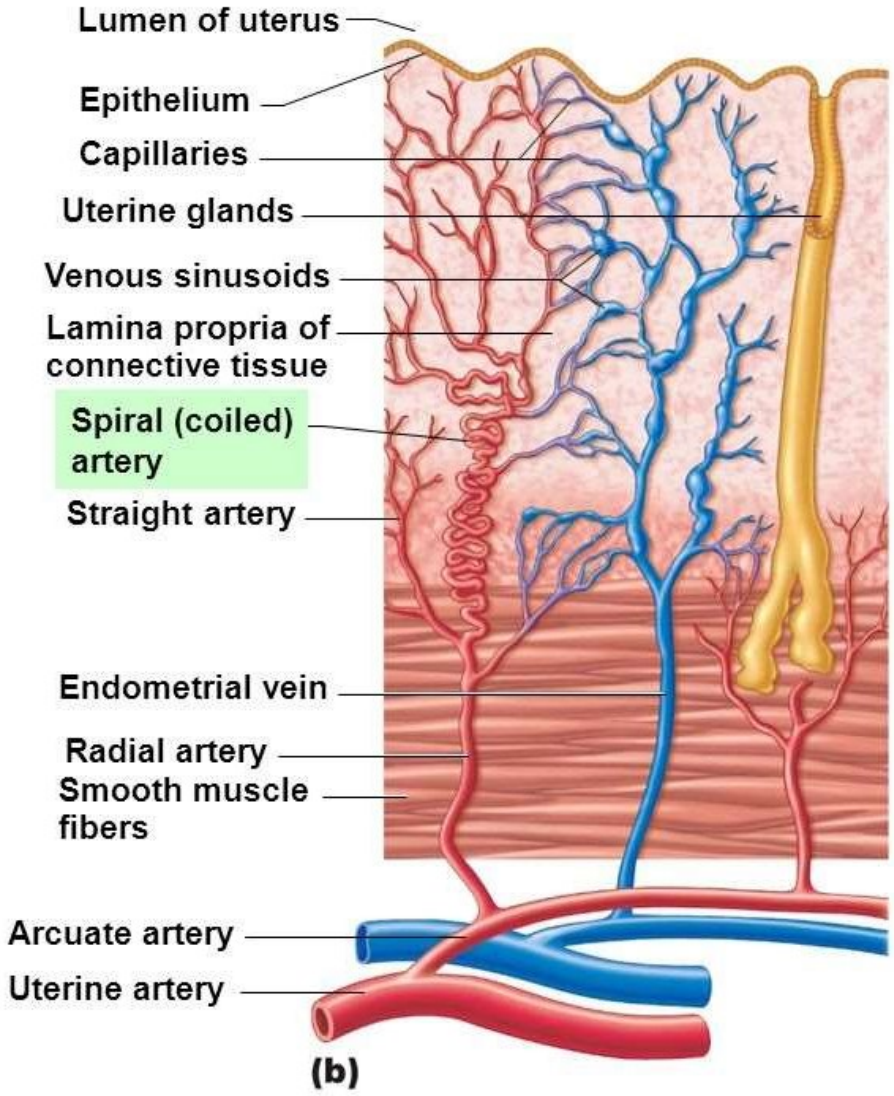
- Branches of the uterine artery penetrate the myometrium to its middle
- Give arcuate arteries.
- Arcuate arteries run supply the superficial layers of the myometrium.
- It give the radial arteries that supply the endometrium:

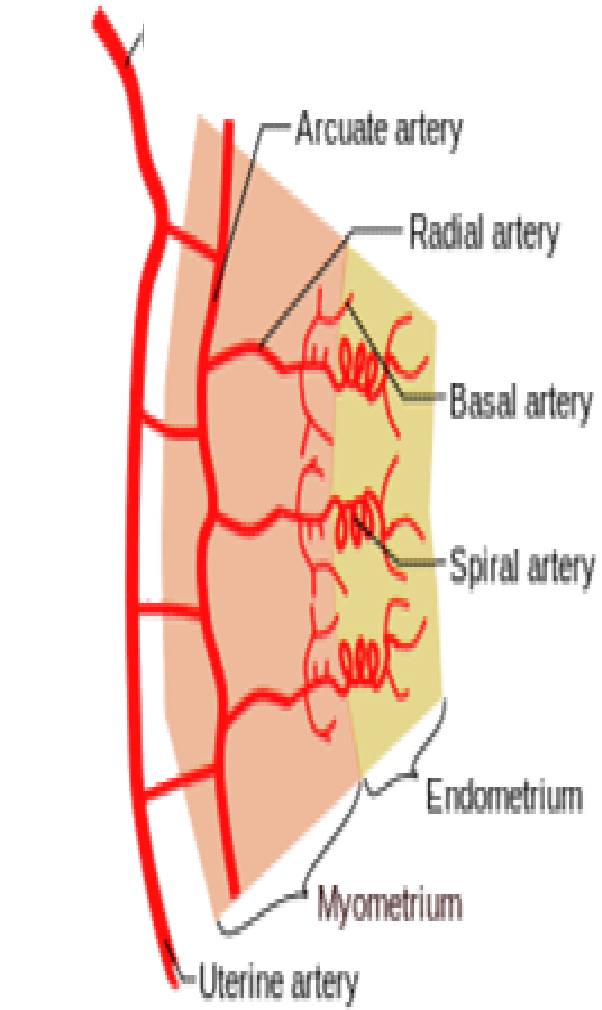
A. Straight arteries supply the **stratum basale**.
B. Highly coiled spiral arteries supply the **stratum functionale**

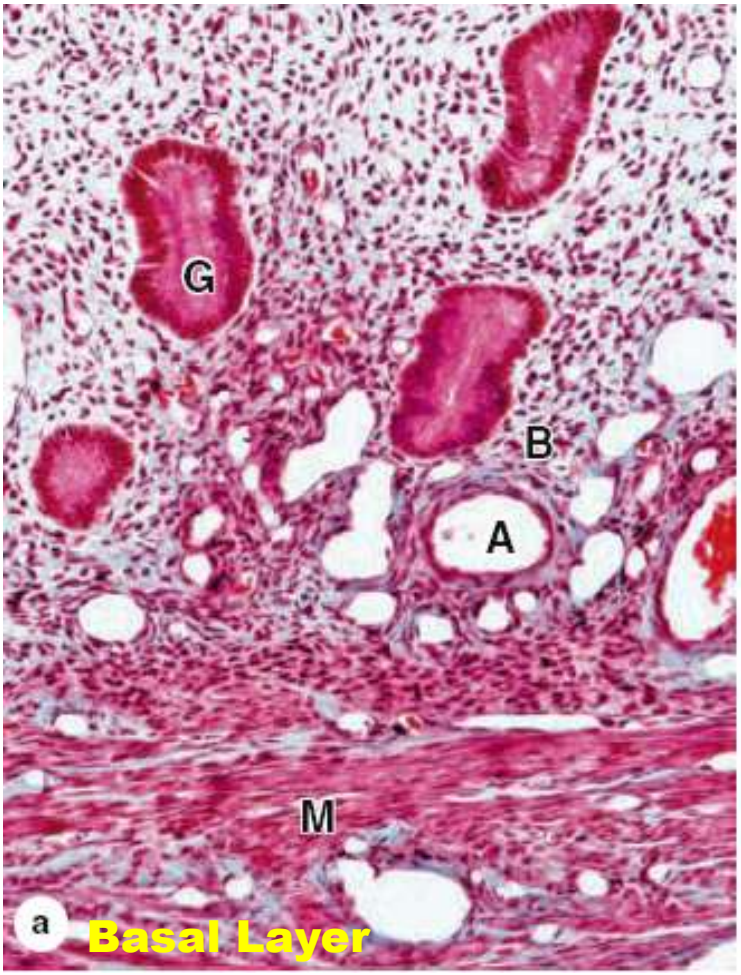


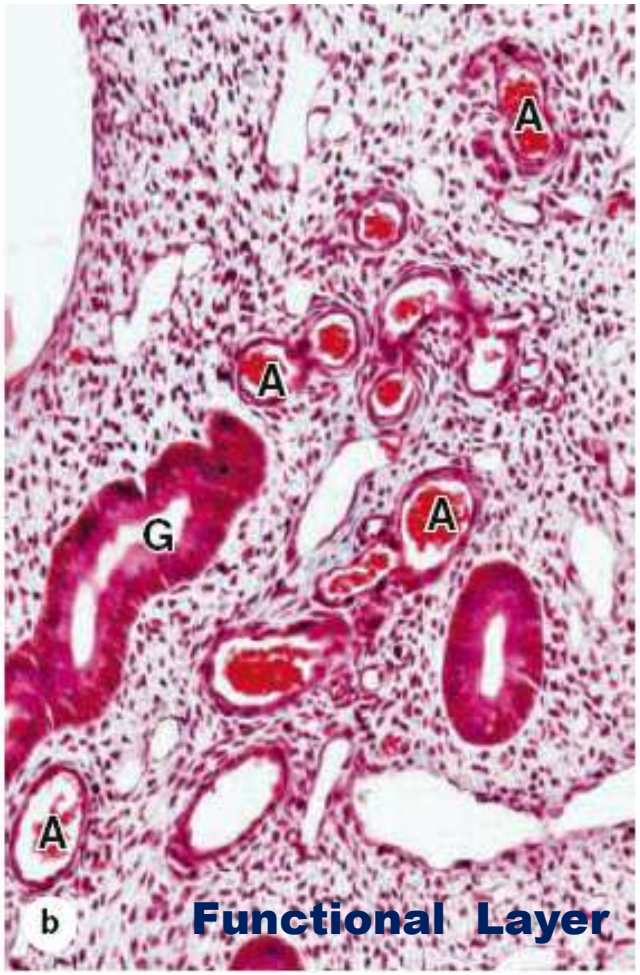
Functional layer(F) , Basal Layer (B) , Glands (GL)

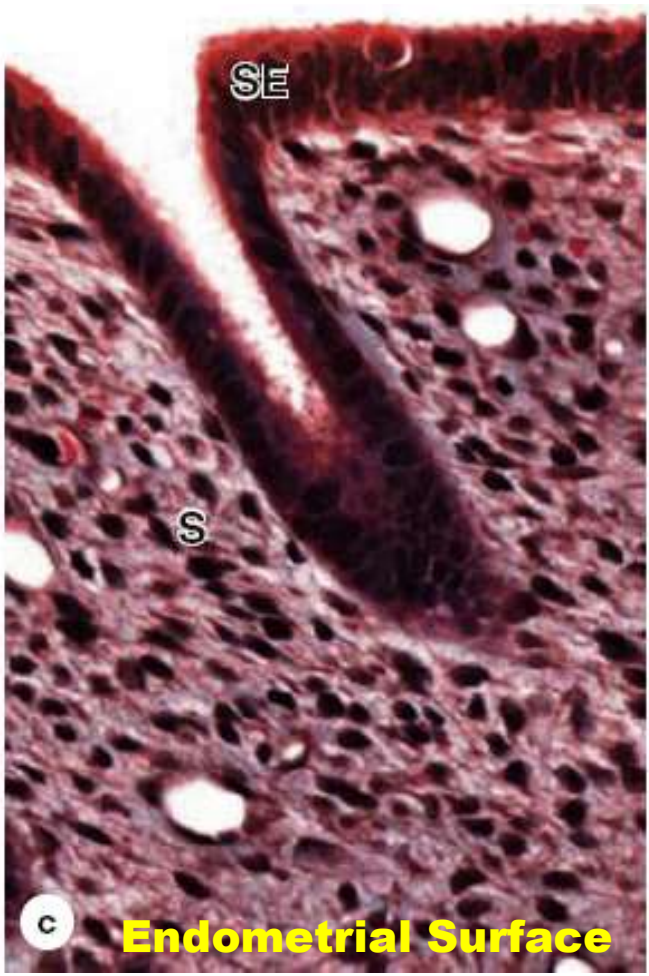
Figure 27.15b The endometrium and its blood supply.











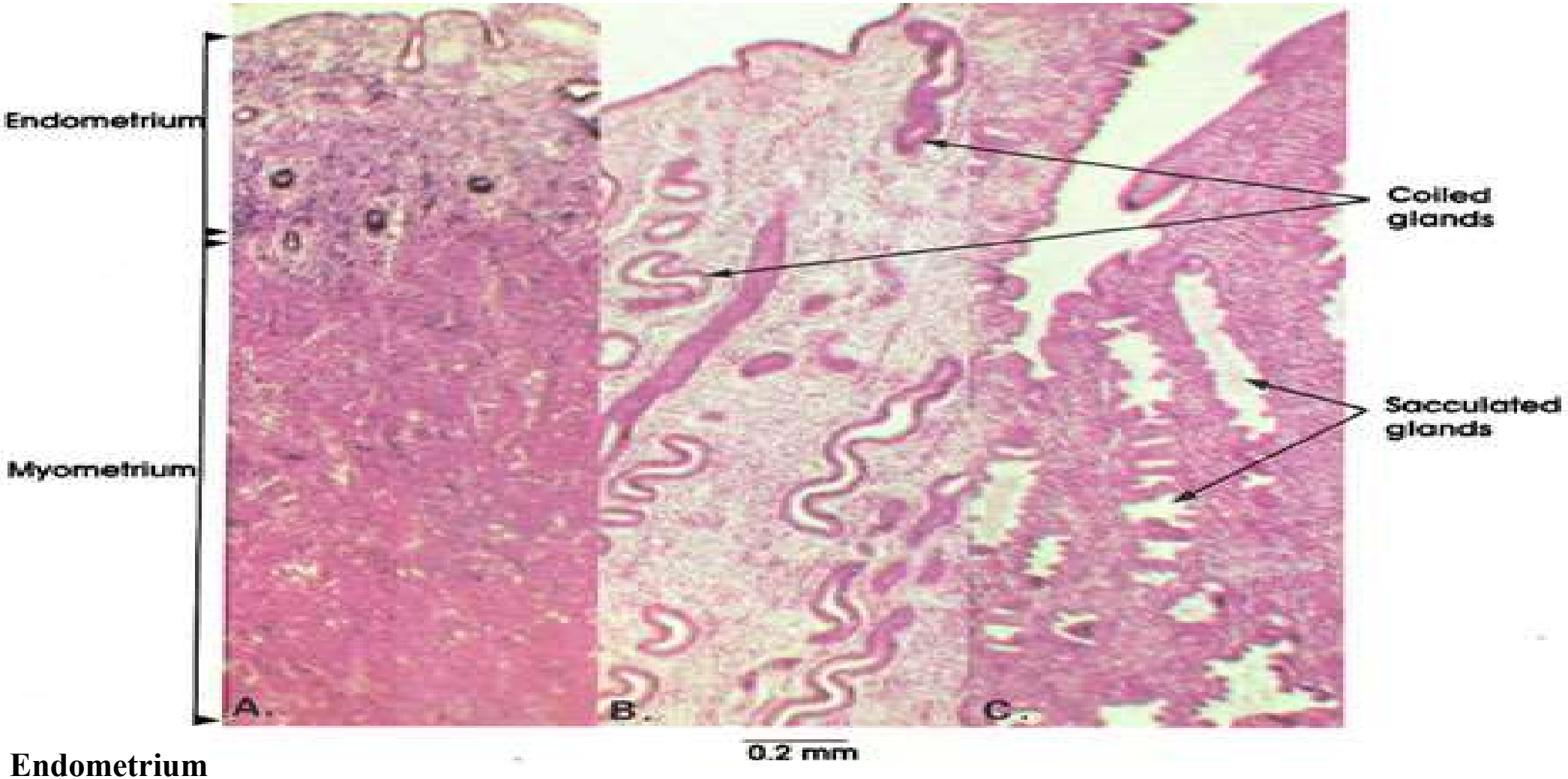
Myometrium (M) , Uterine glands (G) ,Small arteries (A),The surface epithelium (**SE**),The underlying stroma (**S**)

Menstrual Cycle

- Estrogen and progesterone from ovary stimulate changes in the endometrium
- The average menstrual cycle is 28 day
- Begins age is about 12-15 y and ends age is about 45-50 y
- The menstrual cycle has 3 main phases
  - ✓**Menstrual phase:** days 1-4
  - ✓**Proliferative (follicular) phase:** days 5-14
  - ✓**Ovulation around** day 14
  - ✓**Secretory (luteal) phase:** days 15-28

Proliferative (Follicular) Phase

- Days 5-14 leading up to ovulation
- Estrogen produced by theca cells of ovarian follicle
- Cells of gland bases proliferate forming simple columnar epithelium and tubular glands of endometrium
- Connective tissue cells proliferate in lamina propria
- Coiled arteries grow into regenerated lamina propria
- Glands have a straight tubes with narrow lumens but their cells accumulate glycogen
- At the day 14 the functional layer has been fully restored



Endometrium

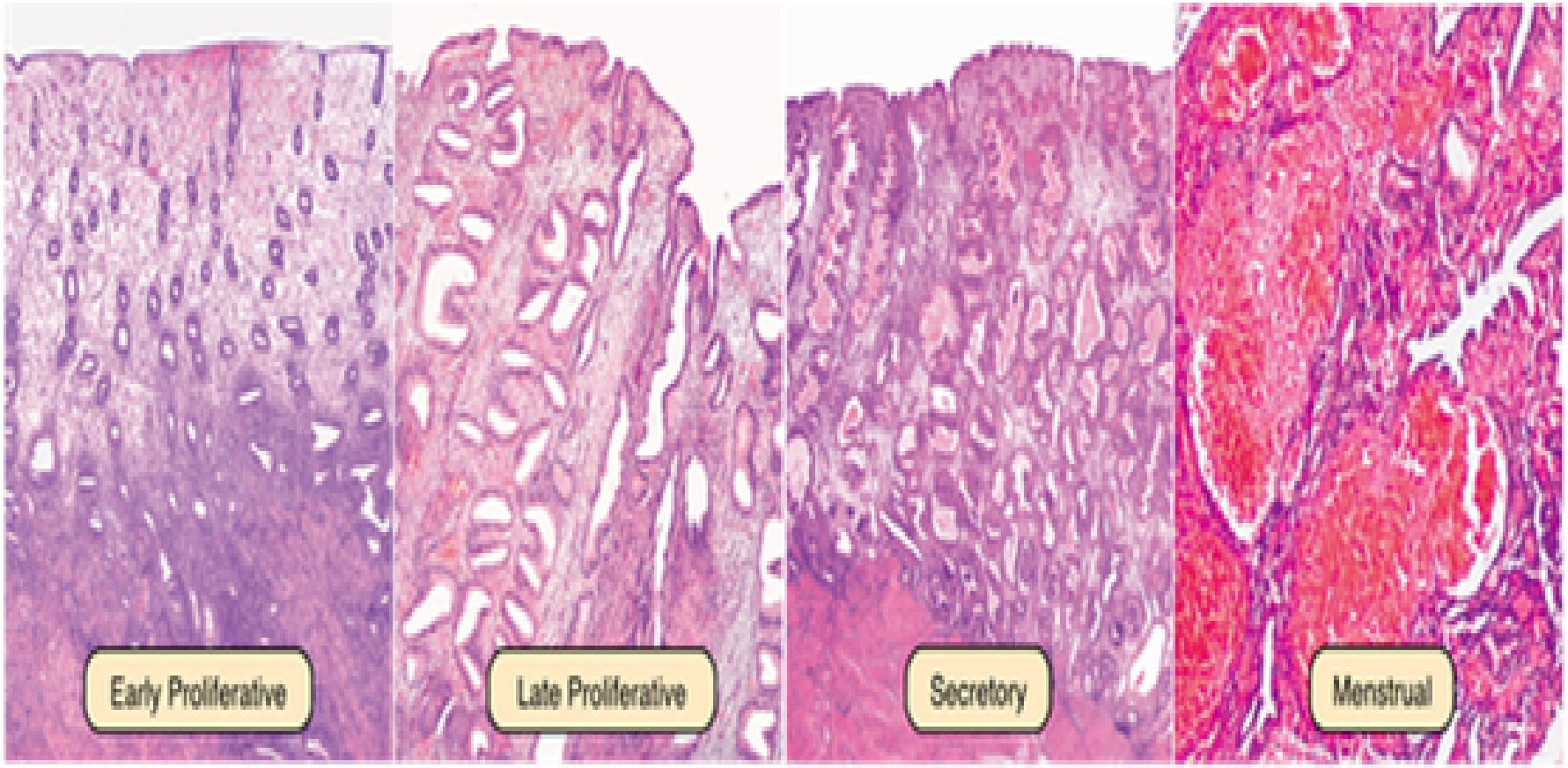
A. early postmenstrual, B. proliferative phase, C. secretory phase

Secretory (Luteal) Phase

- Begins after ovulation, days 15-28
- Corpus luteum forms and produces progesterone
- Glands develop further, become highly coiled, branched and begin to secrete
- Coiled arteries also attain full development
- Endometrium reaches 5 mm in thickness due to edema and accumulated glycogen secretions of the glands

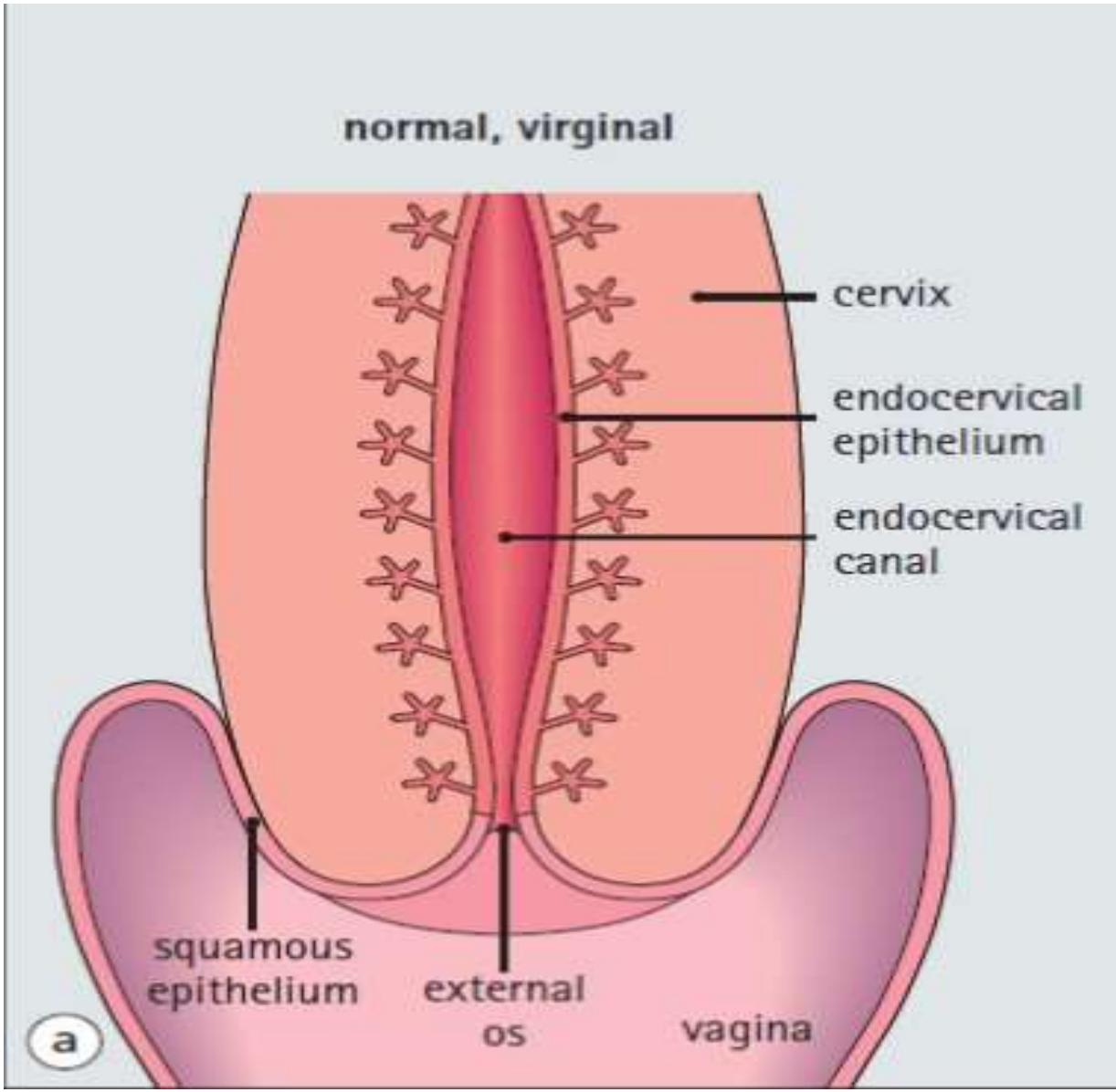
Menstrual Phase

- If fertilization does not take place the corpus luteum stops secreting hormones after about 14 days
- Progesterone and estrogen decrease causing coiled arteries to intermittently constrict cutting off blood flow to the functional layer of endometrium
- Endometrial cells die and the functional layer is sloughed off
- Then coiled arteries dilate once again, because they are weakened they rupture
- The disgorged blood removes patches of the functional layer as menses


Early Proliferative
Late Proliferative
Secretory
Menstrual

0 14 28

Nabothian follicles



Uterine Cervix

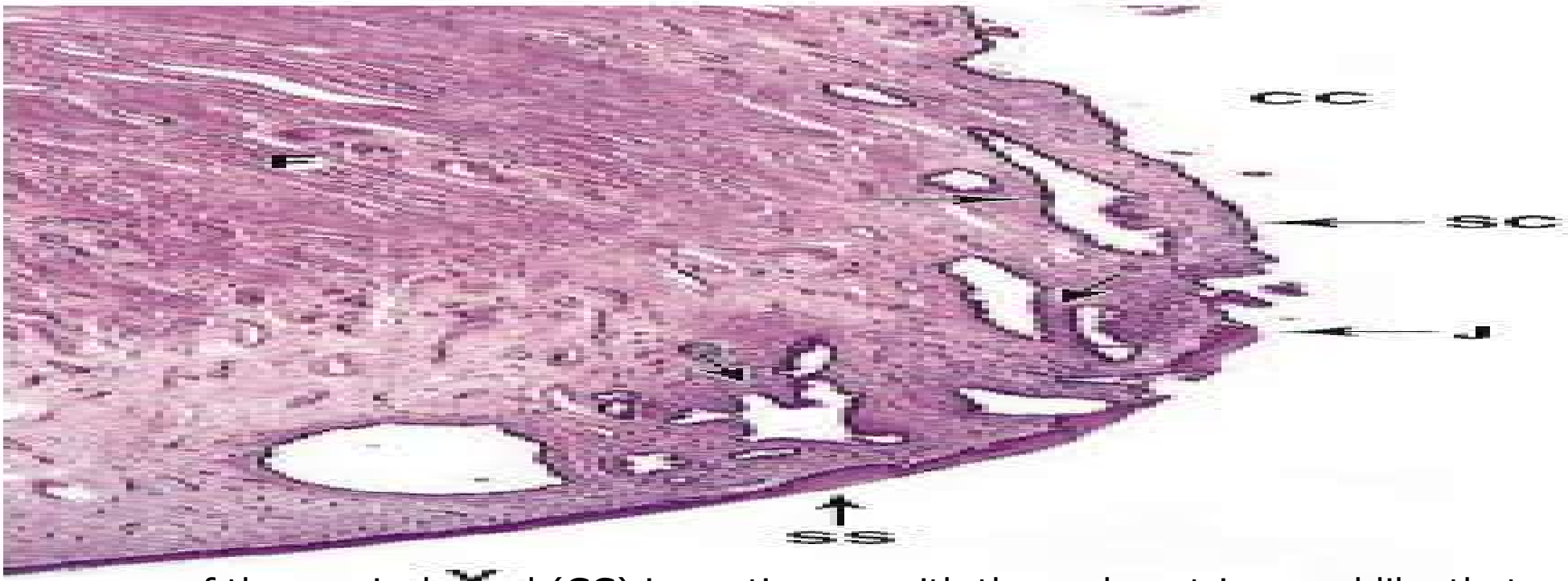
Mucosa

- The endocervix (uterine part) It is lined by mucous secreting simple partially ciliated columnar epithelium.
- Vaginal part of the cervix has stratified squamous non keratinized epithelium.
- The transition (transformation zone) from the columnar epithelium of the endocervix is abrupt as a result of vaginal acidity .
- The transition zone shows nabothian follicles or cyst (result from occlusion of ducts of mucosal glands)
- It most common also site for development of cervical cancer
- Cervical mucosa contains branched tubule-alveolar cervical glands and no spiral arteries
- Cervical Mucosa do not slough off during menstruation

- The glands show changes in secretory activity from thin alkaline fluid at mid cycle to less thick viscous after ovulation and formation of corpus luteum
- Lamina propria composed of mostly dense connective tissue and many elastic fibers and a few smooth muscle cells

Muscular layer

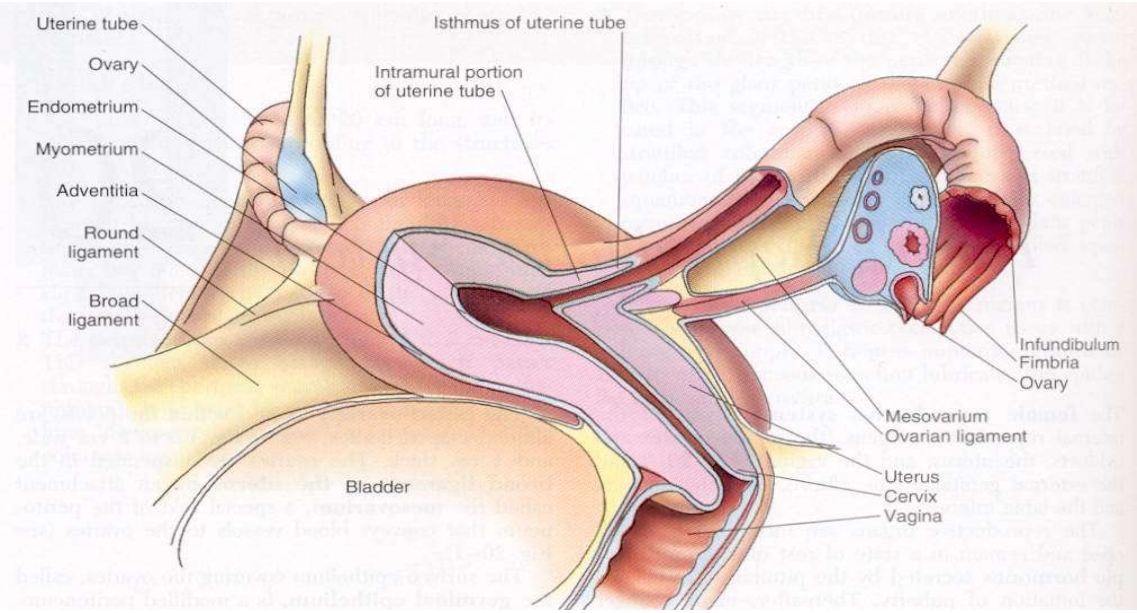
- The myometrium is made of inner circular and outer long muscle layers.
- Softening of cervix during parturition is due to lysis of collagen



The mucosa of the cervical canal (**CC**) is continuous with the endometrium and like that tissue is lined by simple columnar epithelium (**SC**). This endocervical mucosa includes many large branched cervical mucous glands (**arrows**). At the external os, the point at which the cervical canal opens into the vagina (**V**), there is an abrupt junction (**J**) between the columnar epithelium and the stratified squamous epithelium (**SS**) covering the exocervix and vagina. Deeper, the cervical wall is primarily fibromuscular tissue (**F**).
(Junqueira's Basic Histology Text and Atlas, 14th Edition

Uterine Tube

- It has 4 segments
  - Intramural part in uterine wall
  - Isthmus is adjacent to uterine wall
  - Ampulla is dilated part
  - Infundibulum is funnel-shaped part near ovary with fimbriae

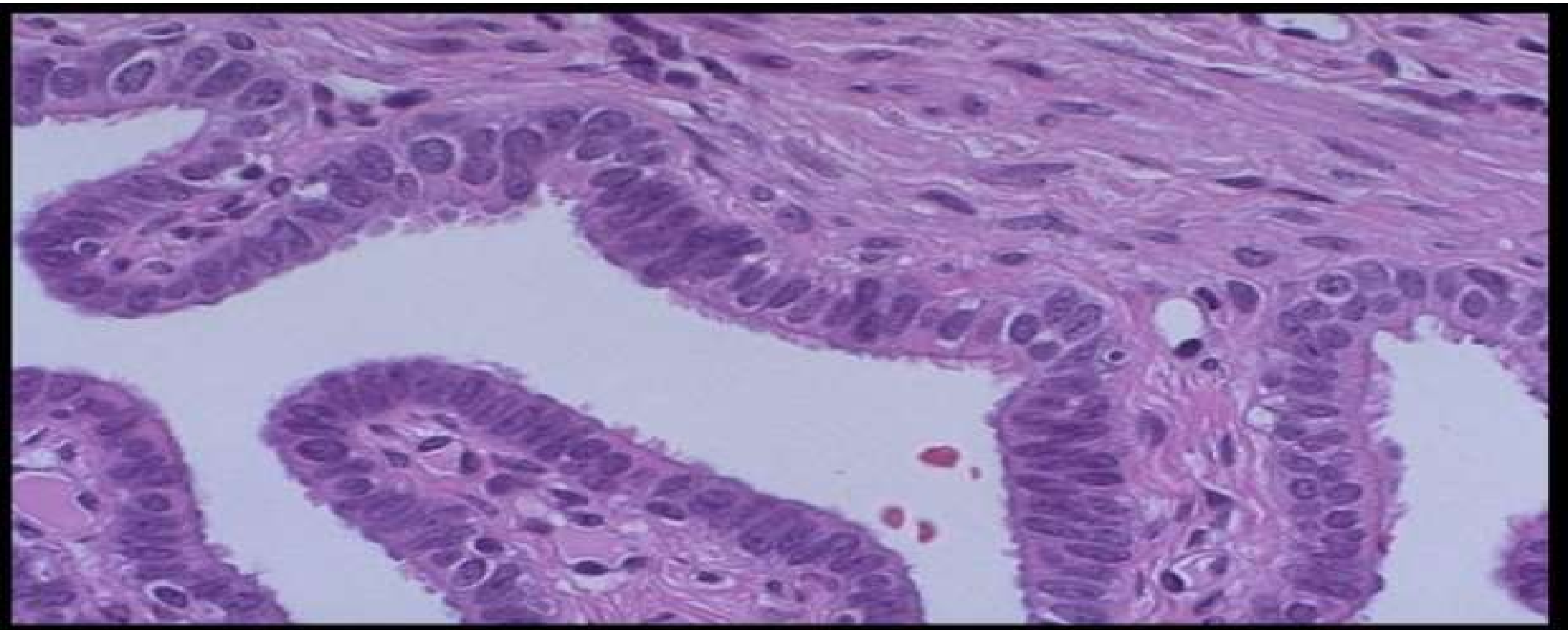


- Mucosa has many longitudinal folds which are prominent in the ampulla
- Mucosa has a simple columnar epithelium consist of ciliated cell and non ciliated peg cell
- **Peg cells** are secretory cells that produce a watery tubal fluid which nourish spermatozoa ,zygote
- Lamina propria composed of loose connective tissue ,reticular cell ,fibroblast ,mast cells and lymphoid cells.

- Muscularis consists of poorly defined Inner circular layer and outer longitudinal layer of smooth muscle cells

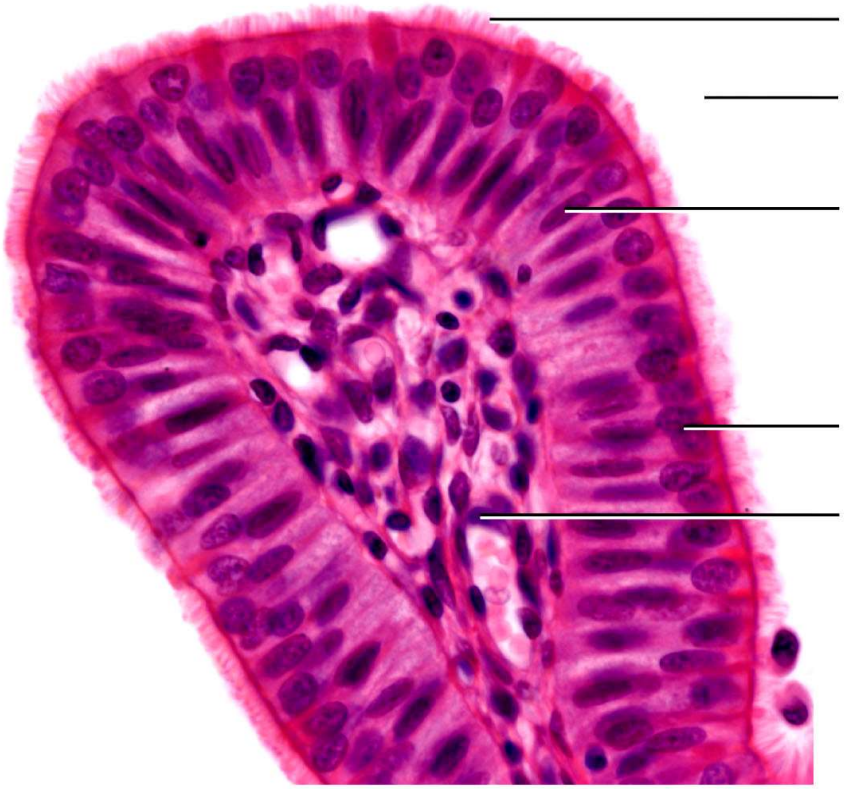
- Muscularis peristaltic movements with the beating of the cilia of epithelium help to propel oocyte to the uterus

- Serosa is a connective tissue layer lined by a simple squamous epithelium contains blood vessels, and nerves



Normal adult fallopian tube has ciliated columnar cells lining

Histology of the uterine (fallopian) tube



(a) Details of epithelium in sectional view

(b) Details of epithelium in surface view

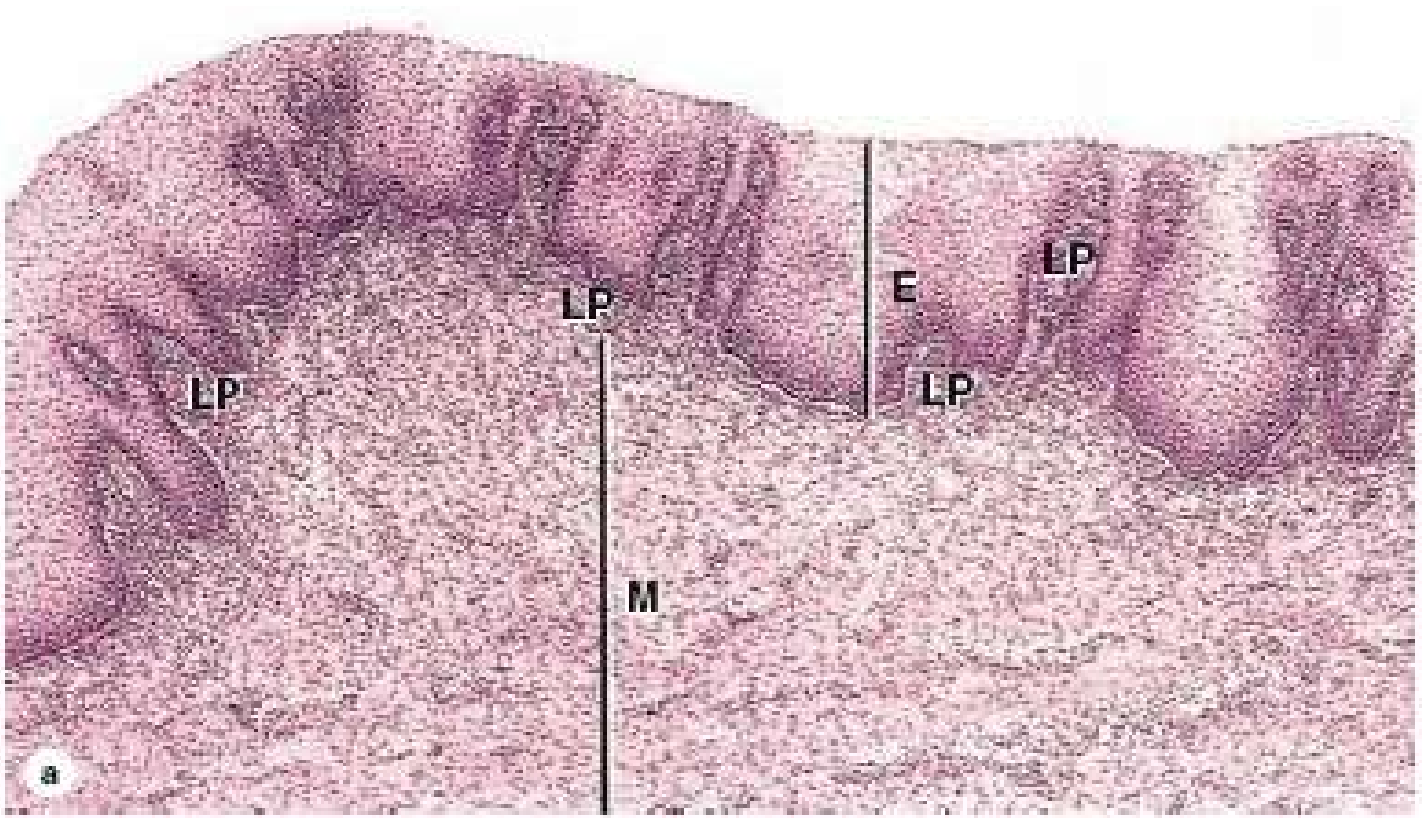
Cilia of Fallopian tube

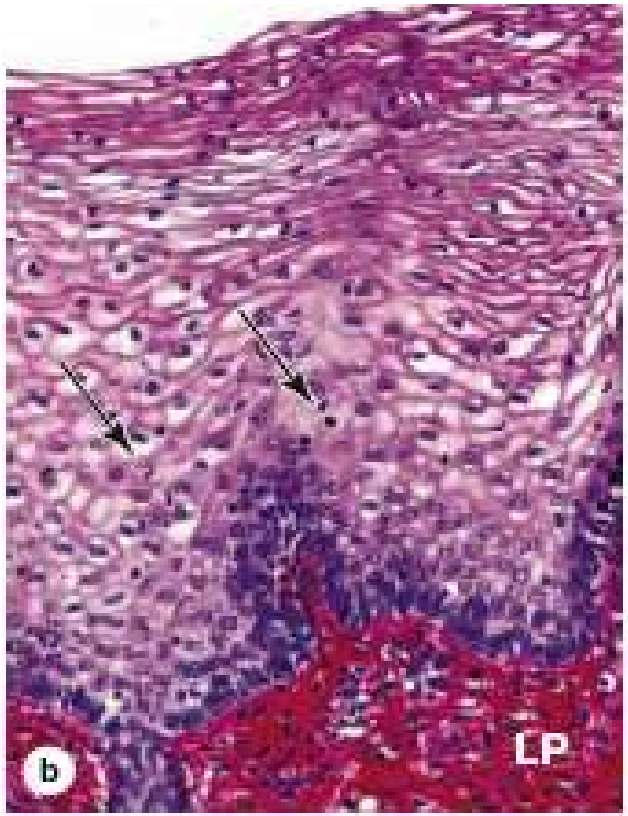
Vagina

- **The mucosa** is lined by A thick stratified squamous non keratinized epithelium , rich in glycogen
- The vaginal bacterial flora use glycogen to synthesis lactic acid
- Underlying lamina propria composed of dense connective tissue that highly vascularized with many elastic fibers
- Mucosa has not glands but increment of fluid during sexual arousal is due to transudate from vessels of lamina propria and secretion of cervical glands.

- Before puberty and after menopause the epithelium is thin
- During reproductive years the epithelium thickened under the activity of estrogens
- This thickens due to increased mitotic activity of the basal cells and parabasal layer. The superficial cells increase in number and size due to accumulation of glycogen and lipid within the cytoplasm.

- **Muscular layer** of circular and a longitudinal smooth muscle fibers
- **Adventitia** of fib-collagenous tissue containing elastic fibers, many vessels and nerves.
- The elastic fibers is responsible of vaginal distension during parturition





The lamina propria (**LP**) is highly cellular and extends narrow papillae into the thick, non-keratinized stratified squamous epithelium (**E**). The muscular layer (**M**) has bundles of smooth muscle arranged in a circular manner near the mucosa and longitudinally near the adventitia.


Thank you