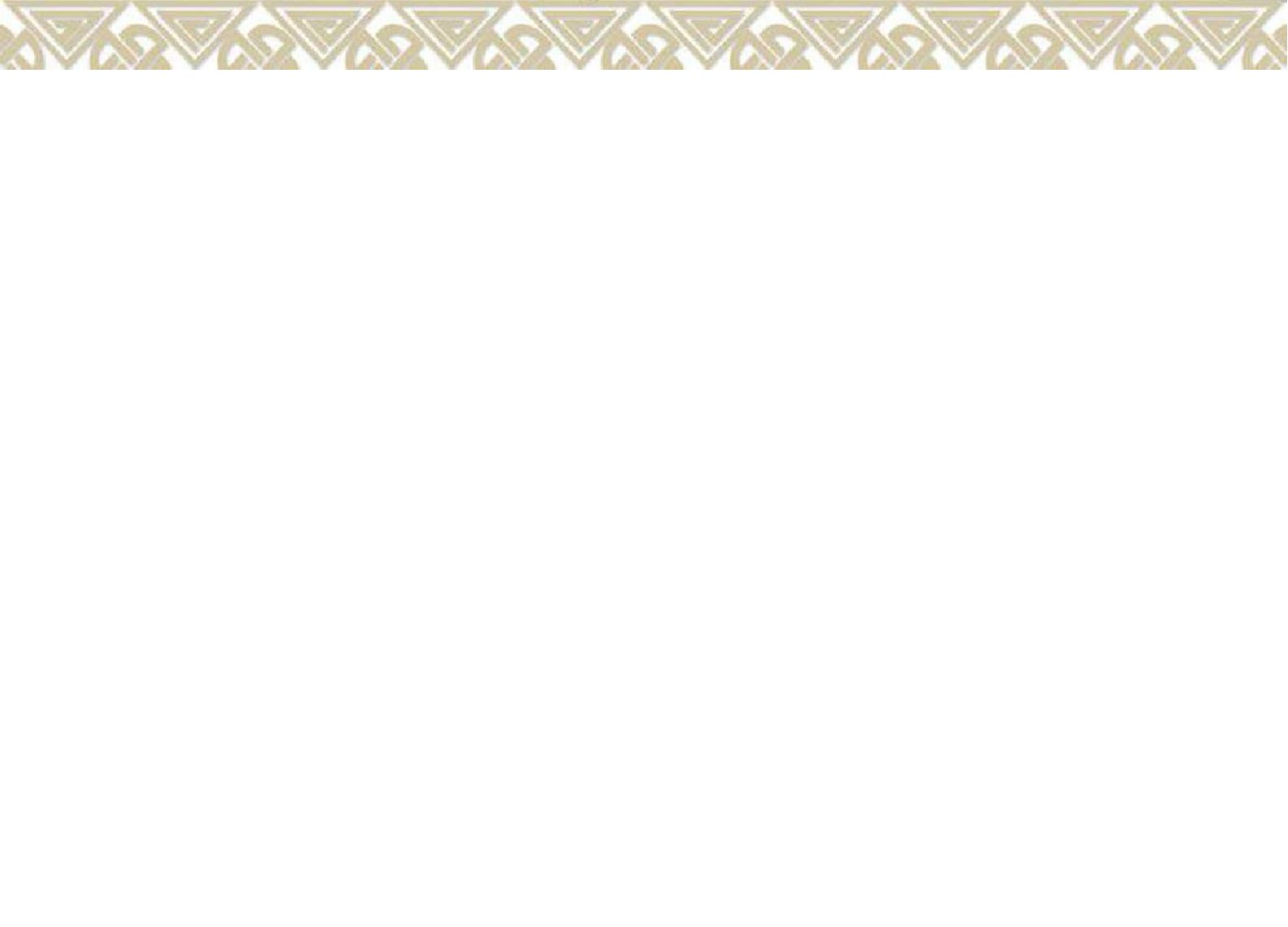


Female Reproductive System



Teaching Outline

- ❖ General description
- ❖ Structure and function of ovaries
- ❖ Structure and function of uterus

1. General description

❖ Component

❧ ovaries

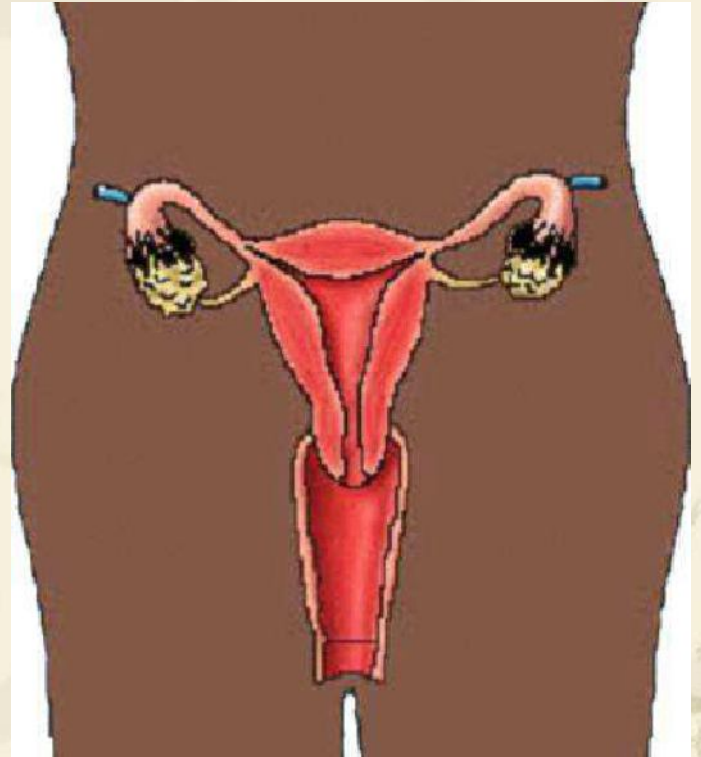
❧ oviducts

❧ uterus

❧ vagina

❧ vulva

❧ mammary glands



1. General description

❖ Function

- ☞ To produce the ovum as well as different steroid hormones (ovaries)
- ☞ Place for implantation of the fertilized ovum and growing of fetus (uterus)

1. General description

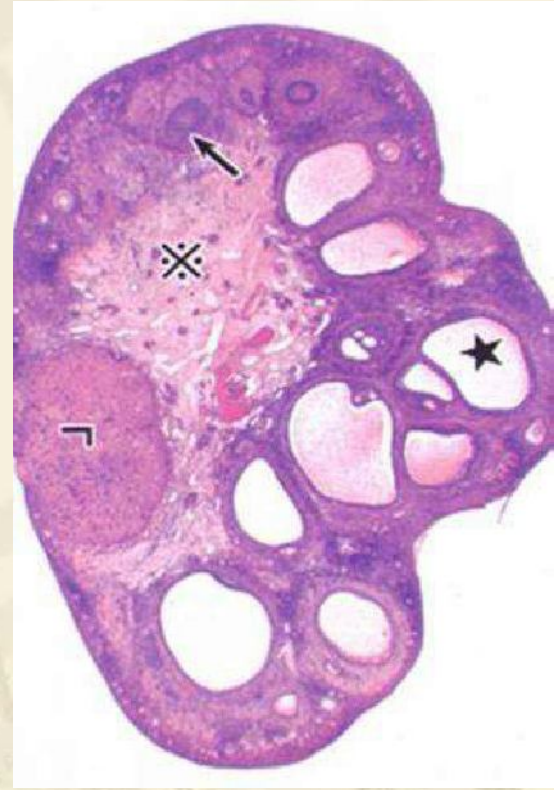
- ❖ There are different phases in the life of a female
 - ∞ Childhood
 - ∞ Puberty
 - ∞ Sexual maturity
 - ∞ Climacteric
 - ∞ Senescence

1. General description

- ❖ Stimulated by hormones of the hypothalamic-adenohypophyseal-ovarian axis
 - ☞ The genital organs become capable of reproduction during puberty.
 - ☞ In the sexual mature, non-pregnant state, the female reproductive system undergoes cyclic changes.
 - ☞ After the climacteric, female reproductive system undergo progressive atrophy.

2. Ovaries

- ❖ General structure
 - ⌘ Superficial epithelium
 - ⌘ Tunica albuginia
 - ⌘ Cortex
 - ❖ follicles and corpus lutea
 - ❖ stroma: stromal cells
 - ⌘ Medulla
 - ❖ loose CT



2.1 Development and maturation of follicle

❖ Structure of follicles

∞ oocyte

∞ follicle cells

❖ Development of follicles

∞ primordial follicles

∞ primary follicles

∞ secondary follicles

∞ mature follicles

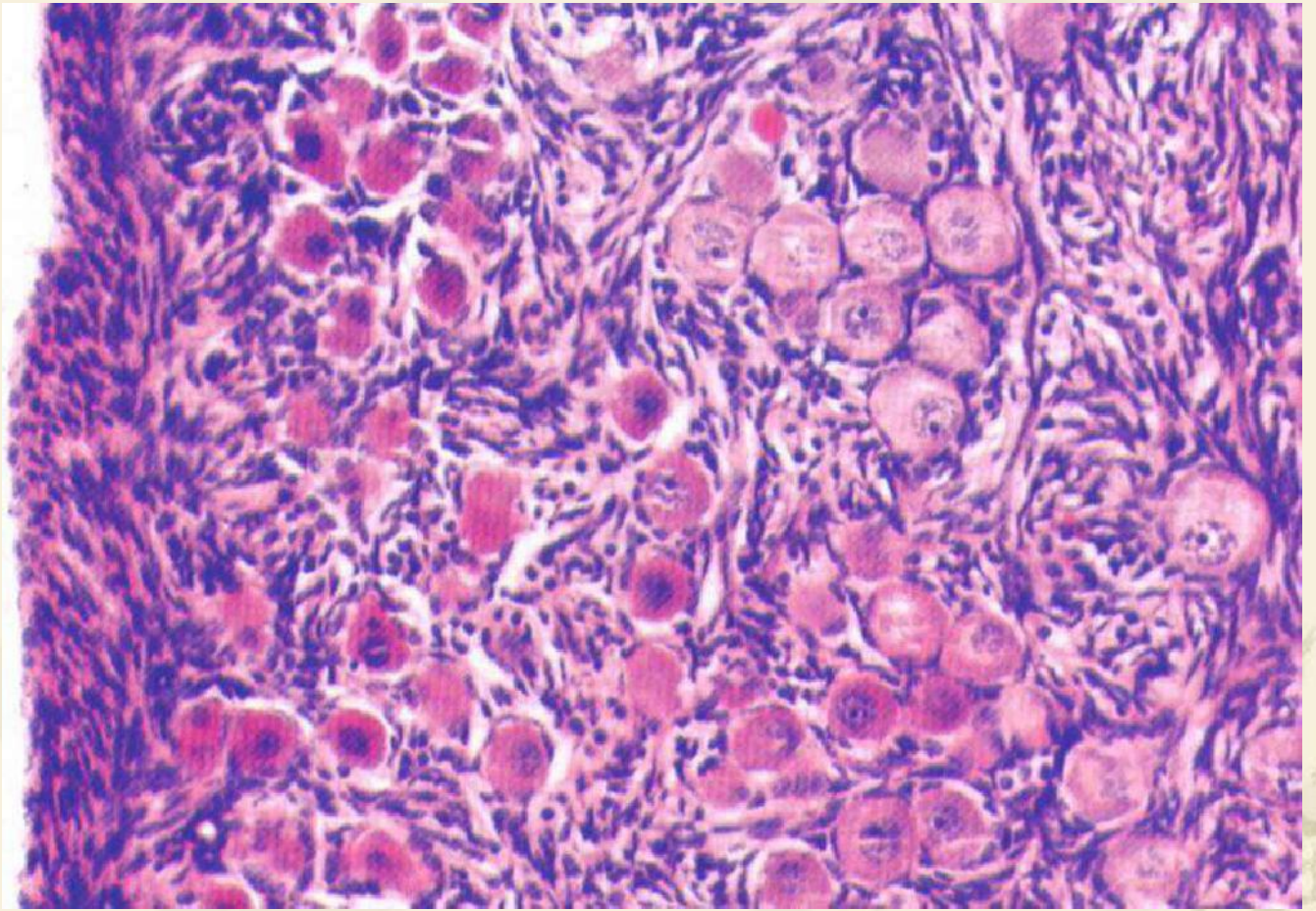
2.1.1 Primordial follicle

❖ Primary oocyte

- ❧ Nucleus: large, vesicular, prominent nucleolus
- ❧ Cytoplasm: little, eosinophilic
- ❧ Primary oocyte rests on the prophase of first meiosis

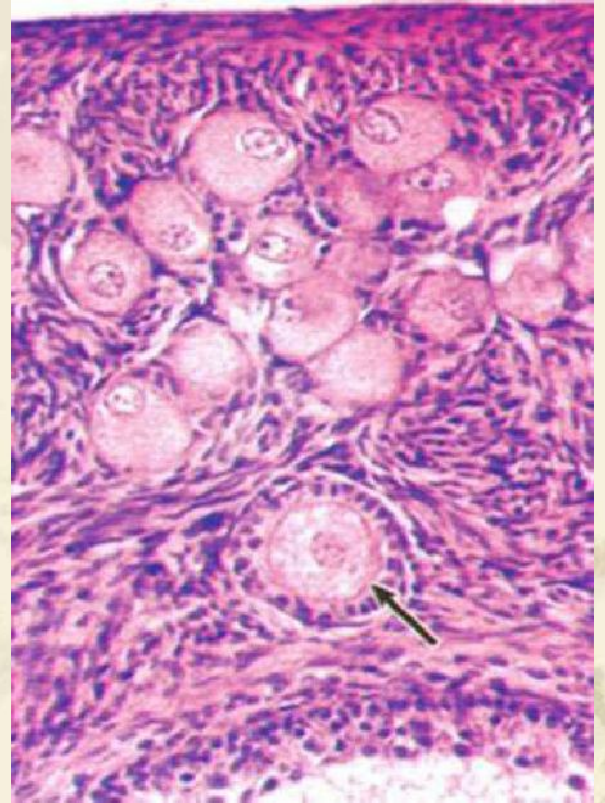
❖ Follicle cells

- ❧ one layer of flattened follicle cells



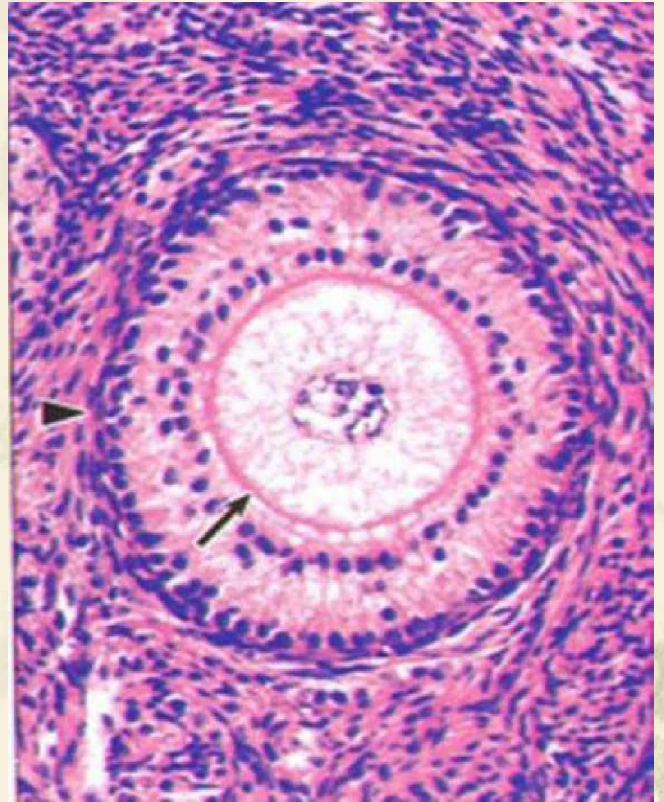
2.1.2 Primary follicle

- ❖ Primary oocyte
 - ∞ Larger
- ❖ Follicle cells
 - ∞ One layer
 - ∞ Cuboidal
- ❖ Zona pellucida
 - ∞ Homogenous eosinophilic membrane

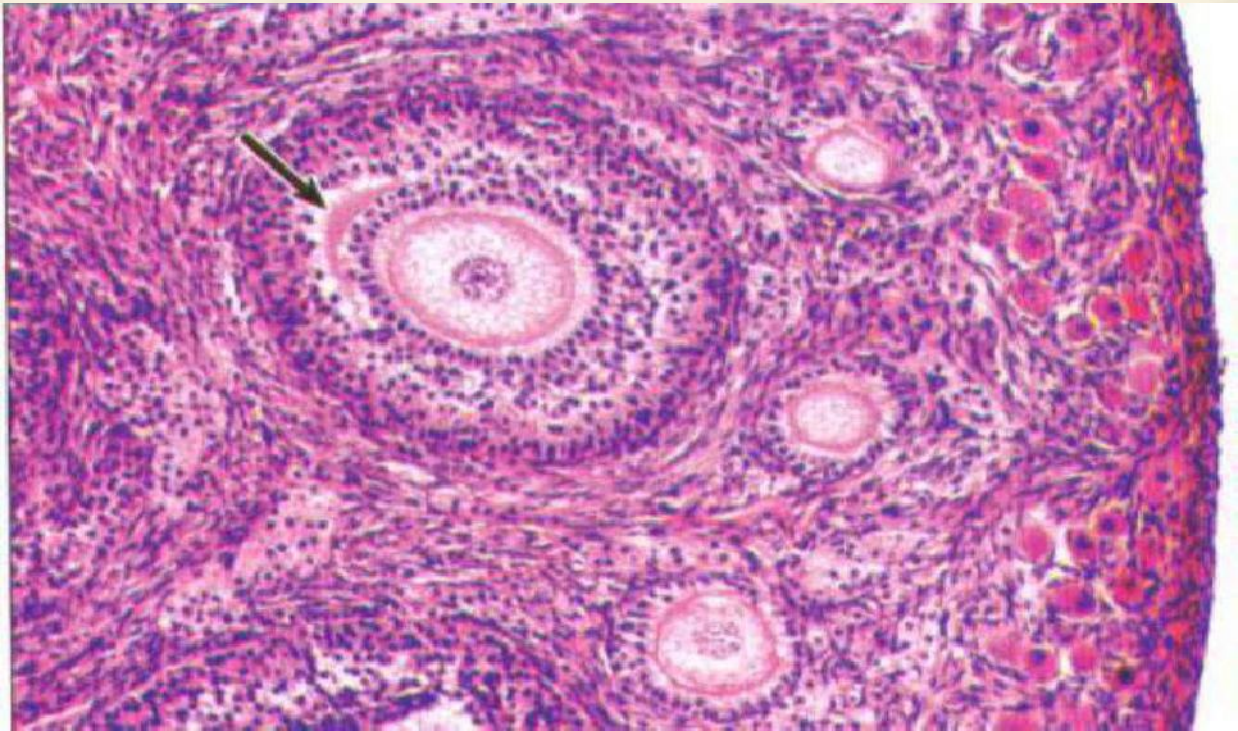


2.1.2 Primory follicle

- ❖ Follicle cells
 - ∞ more layers
- ❖ Theca folliculi
 - ∞ The surrounding connective tissue is arranged in concentric layers

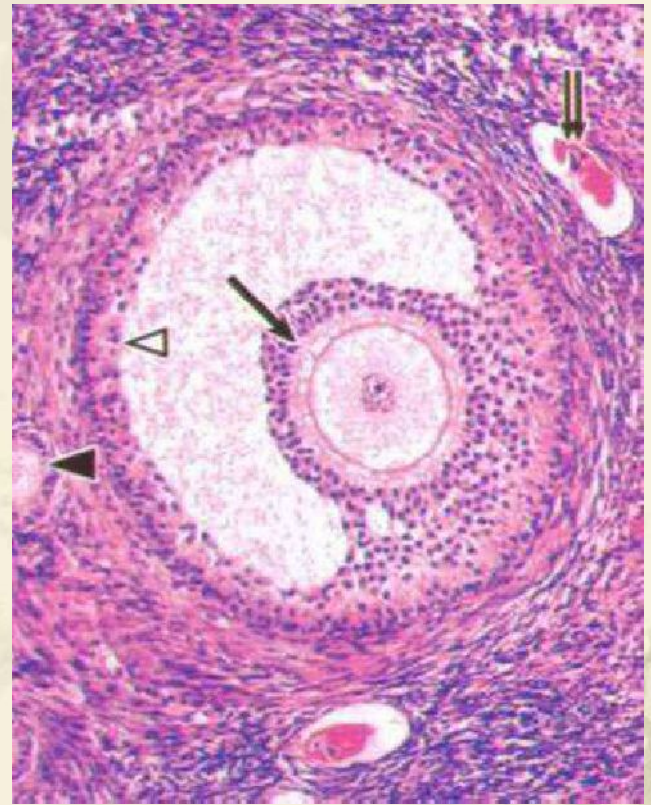


2.1.3 Secondary follicle



2.1.3 Secondary follicle

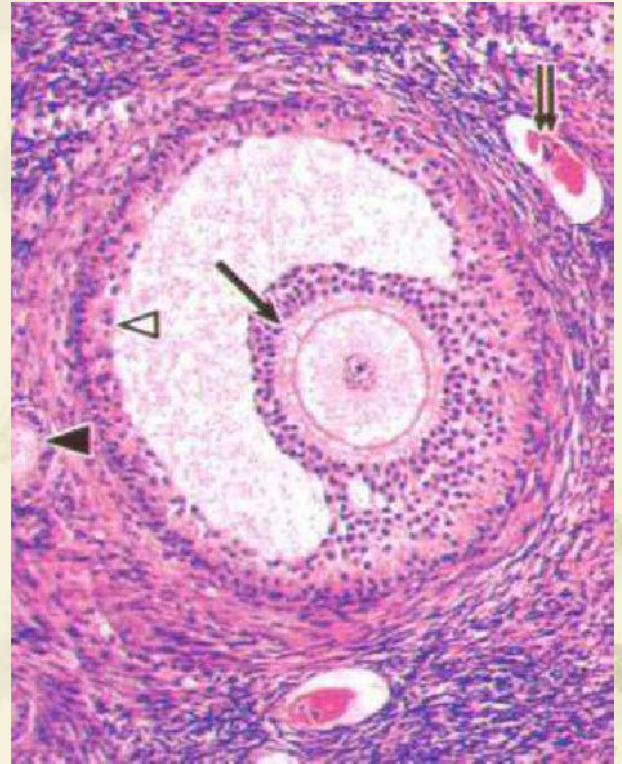
- ❖ Antrum folliculi and liquor folliculi
 - ∞ Between the follicle cells, small spaces appear.
 - ∞ Small spaces communicate to form a cavity, termed antrum folliculi.
 - ∞ Spaces and antrum are filled by liquor folliculi



2.1.3 Secondary follicle

❖ Zona granulosa
(granulosa cells)

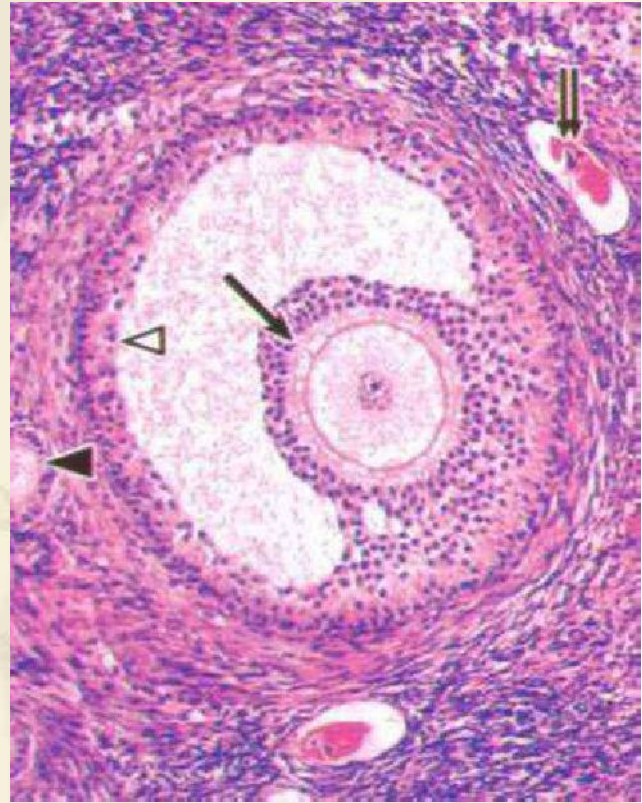
☞ The antrum folliculi is
lined by follicle cells
named zona granulosa.



2.1.3 Secondary follicle

❖ Cumulus oophorus

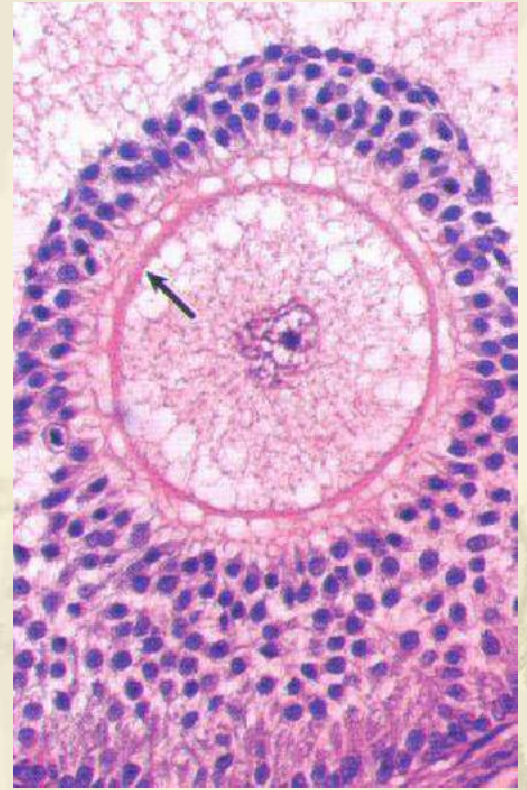
☞ With the accumulation of liquor folliculi, the oocyte and the follicle cells that surround it move to one side of the antrum folliculi and form a little mound, termed cumulus oophorus.

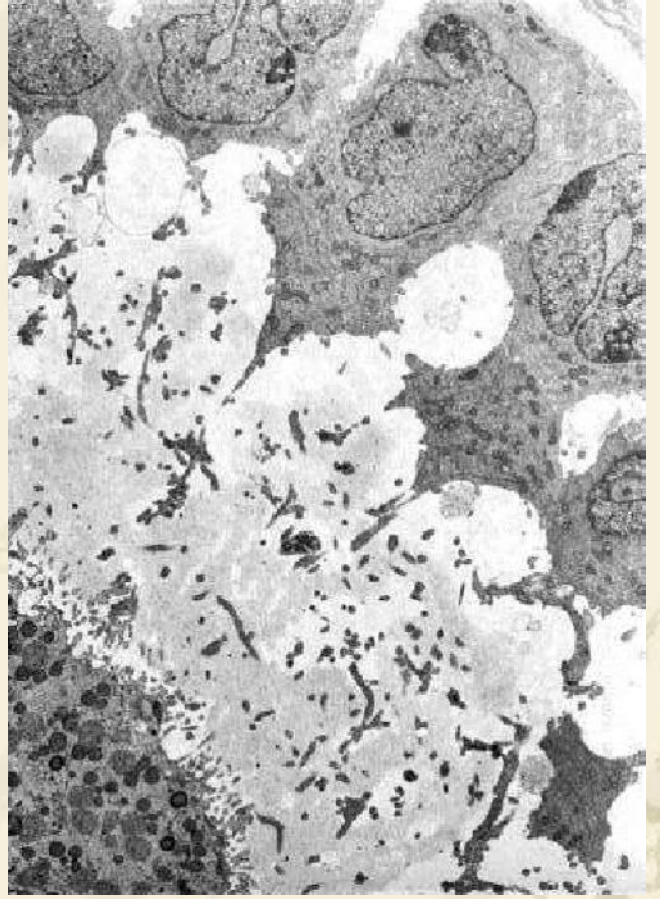
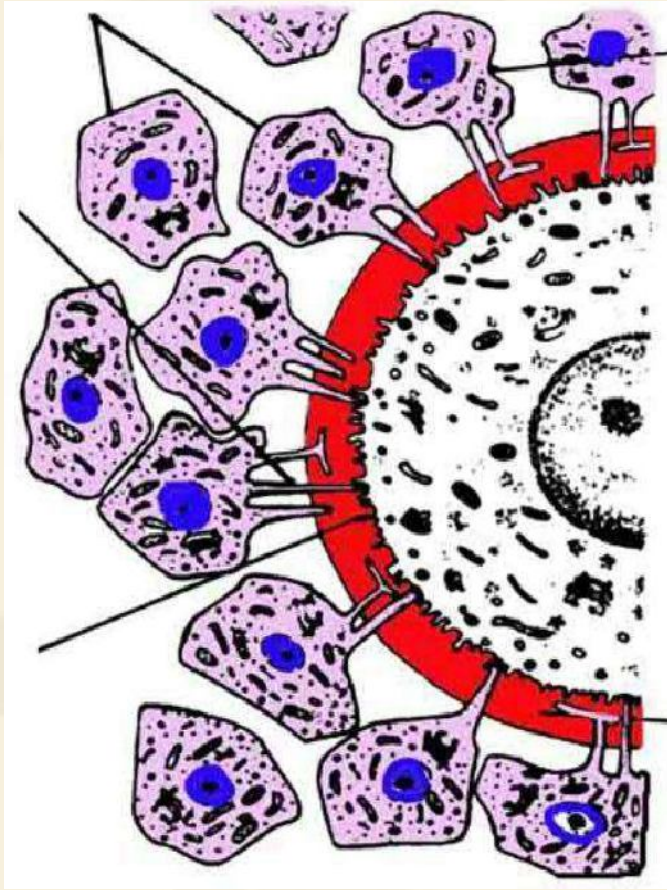


2.1.3 Secondary follicle

❖ Corona radiata

∞ The layer of columnar follicle cells that close to the zona pellucida are arranged radially, termed corona radiata.





2.1.3 Secondary follicle

- ❖ Theca folliculi

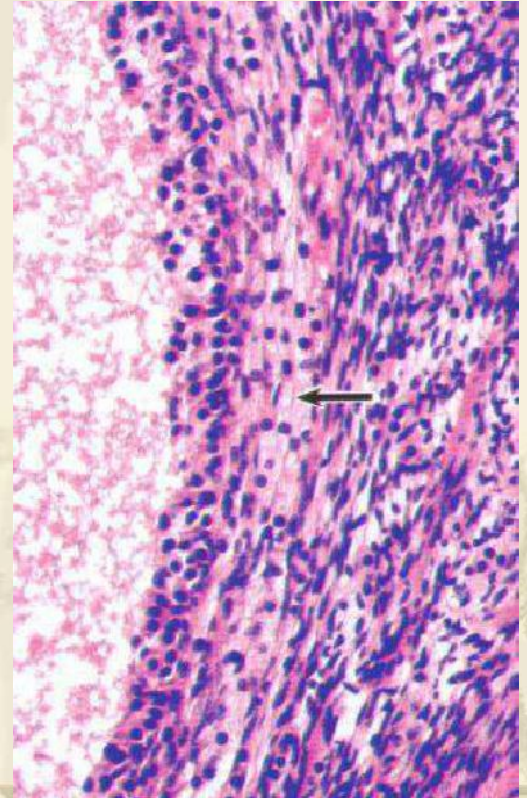
- ∞ Theca interna

- ❖ To contain more **theca cells** (spindle shaped with round nuclei)

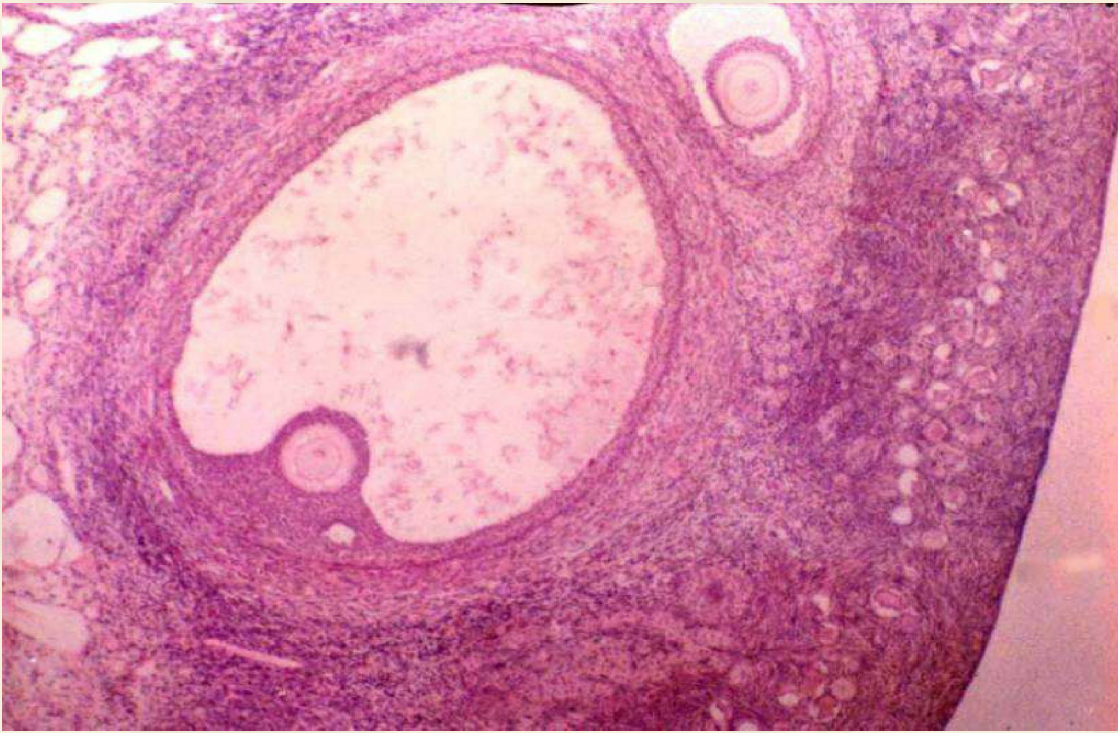
- ❖ To be richly vascularised

- ∞ Theca externa

- ❖ To contain more collagenous fibers



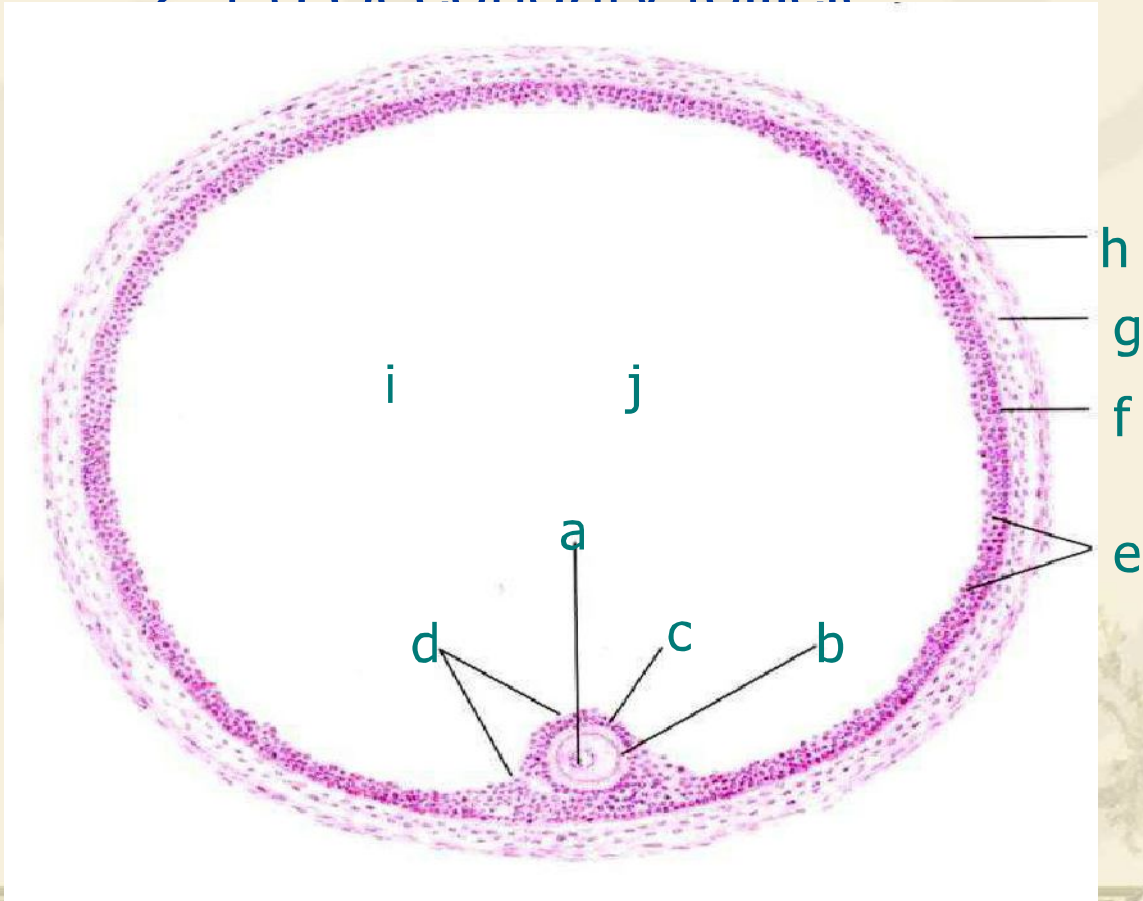
2.1.3 Secondary follicle



2.1.3 Secondary follicle

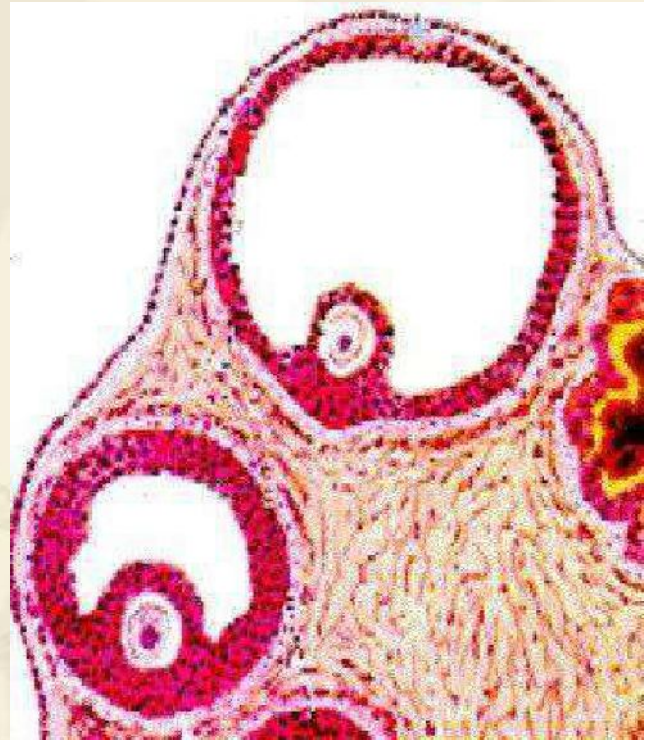
- ❖ primary oocyte
- ❖ zona pellucida
- ❖ corona radiata
- ❖ cumulus oophorus
- ❖ antrum folliculi
- ❖ liquor folliculi
- ❖ zona granulosa (granulosa cells)
- ❖ theca folliculi (theca interna & theca externa)

2 1 3 Secondary follicle



2.1.4 Mature follicle (Tertiary follicle)

- ❖ The follicle continues to grow, the antrum enlarges and the zona granulosa becomes thinner.
- ❖ Mature follicle occupies the thickness of the cortex and form a bulge on the surface of the ovary (stigma).



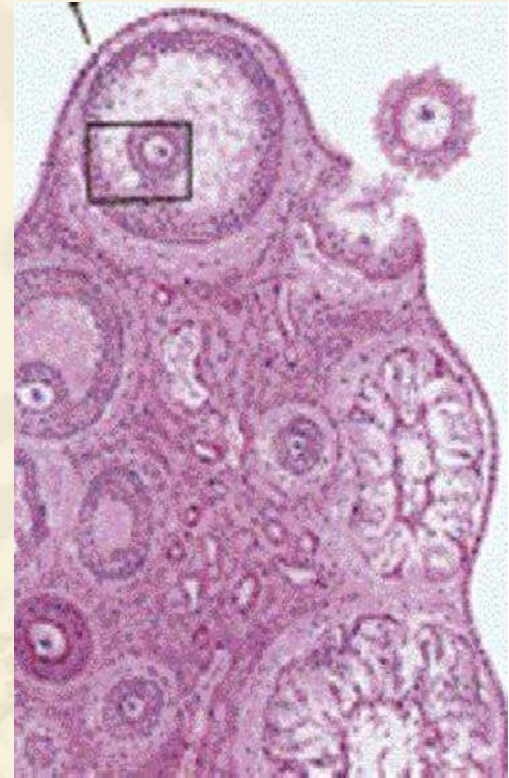
2.1.4 Mature follicle (Tertiary follicle)

- ❖ Small spaces appear between the follicle cells at the base of cumulus oophorus.
- ❖ Shortly before ovulation
- ❖ 1st meiosis is completed; 2nd meiosis begins
- ❖ The oocyte is termed secondary oocyte (23, X)



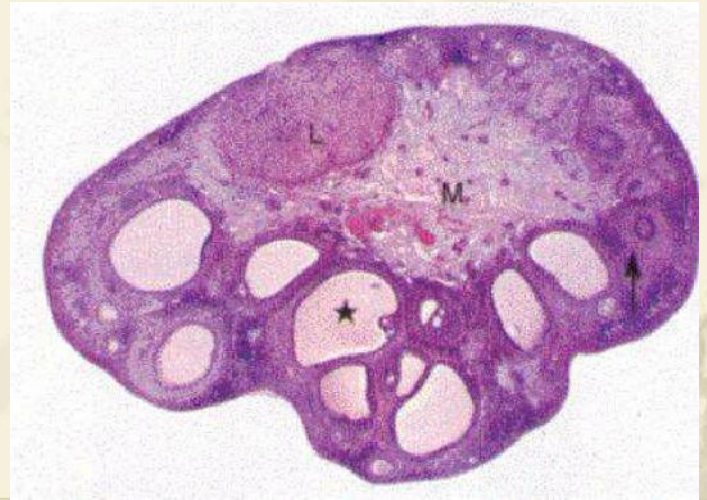
2.2 Ovulation

- ❖ 14 days before the expected onset of next menstruation
- ❖ Serum level of LH reaches a peak.
- ❖ The follicular wall is ruptured.
- ❖ The secondary oocyte, with its zona pellucida, corona radiata, liquor folliculi are released into the pelvic cavity.

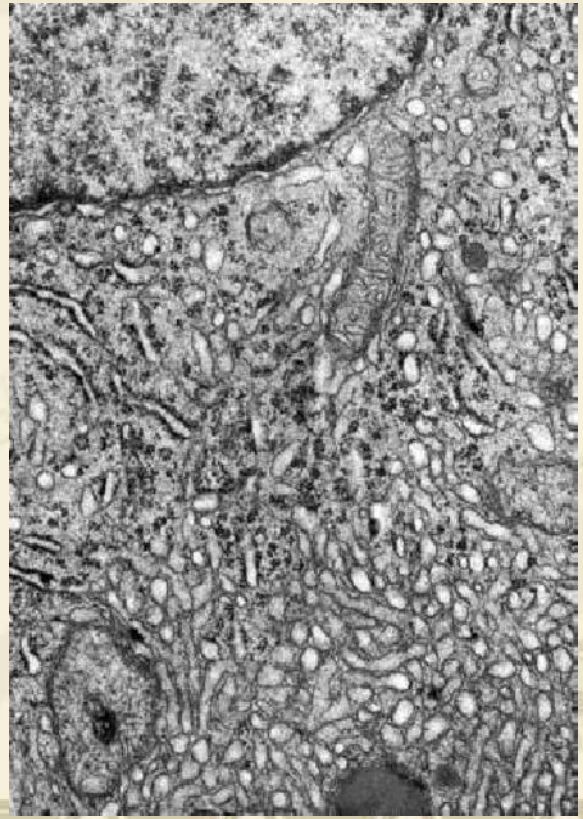
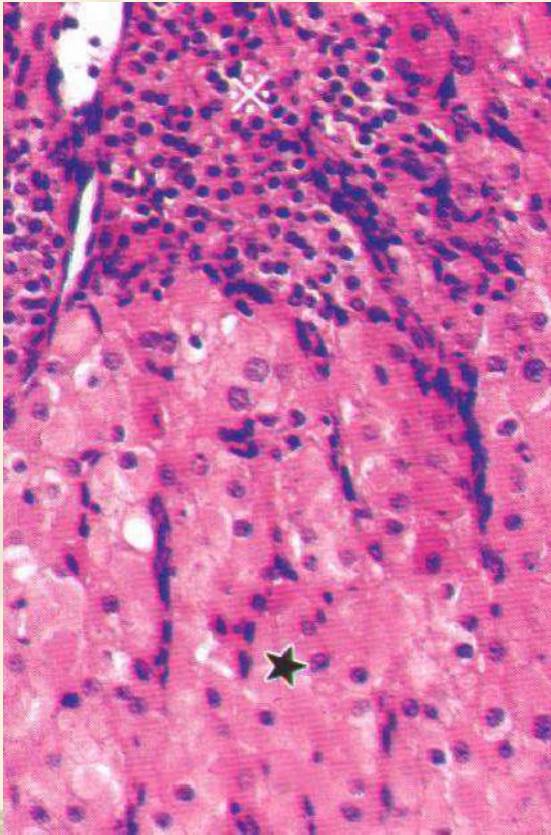


2.3 Corpus luteum

- ❖ After ovulation, the zona granulosa and theca folliculi are collapsed into the antrum folliculi.
- ❖ Under the control of LH, they develop to a mass of endocrine cells
 - ∞ granulosa lutein cells
 - ∞ theca lutein cells
- ❖ Be richly vascularised



2.3 Corpus luteum



2.3 Corpus luteum

❖ Function

☞ To secrete progesterone (granulosa lutein cells) and estrogen (granulosa lutein cells and theca lutein cells)

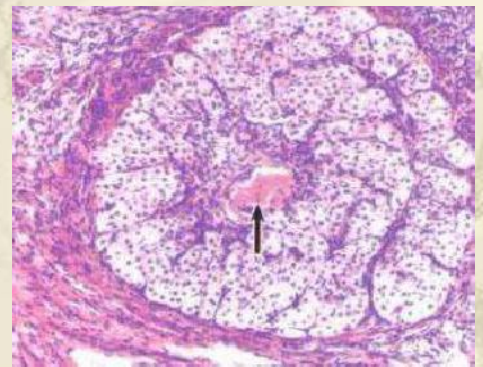
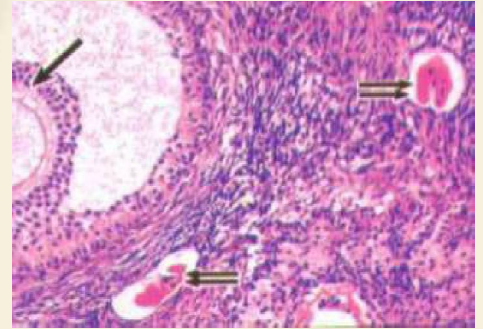
❖ Classification

☞ The corpus luteum of menstruation

☞ The corpus luteum of pregnancy

2.4 Atretic follicles and Interstitial gland

- ❖ Follicles can degenerate and perish at any stage.
- ❖ Primordial follicles and primary follicles degenerate to **atretic follicles**
- ❖ Secondary follicles and mature follicles degenerate and develop to **interstitial glands**.



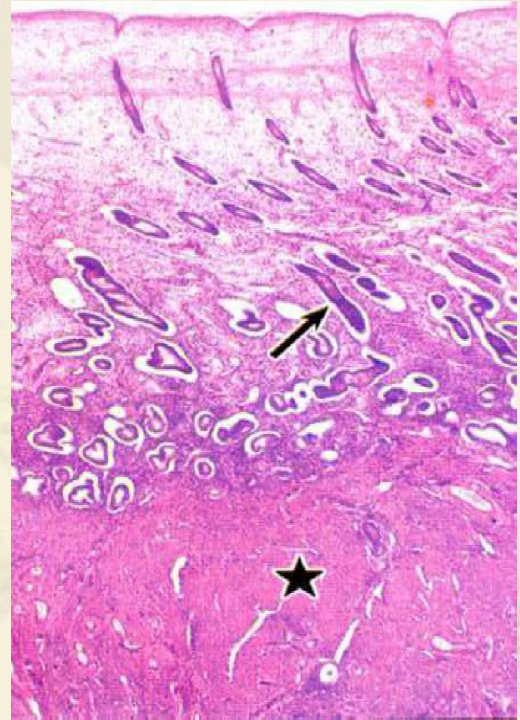
2.5 Function of ovaries

- ❖ To produce the ovum
- ❖ To produce different steroid hormones
 - ∞ **Estrogens are mainly produce by theca cells and granulosa cells of follicles, and granulosa lutein cells and theca lutein cells of corpus luteum.**
 - ∞ **Gestagens (progesterone) are secreted by granulosa lutein cells.**
 - ∞ **Androgens can be produced by theca cells and hilus cells (in the hilus of ovary) .**

3. Uterus

❖ 3.1 Structure

- ∞ Endometrium
- ∞ Myometrium
- ∞ Perimetrium



3.1.1 Endometrium

- ❖ Epithelium: simple columnar
 - ❧ ciliated cells
 - ❧ secretory cells
- ❖ Lamina propria
 - ❧ connective tissue
 - ❧ uterine glands
 - ❧ stromal cells
 - ❧ helical arteries
- ❖ a functional layer (stratum functionale)
- ❖ a basal layer (stratum basale)

❖ 3.1.2 Myometrium

☞ smooth muscle cells

- ❖ Inside circular layer
- ❖ Centrally reticular layer
- ❖ Outside circular layer

❖ 3.1.3 Perimetrium

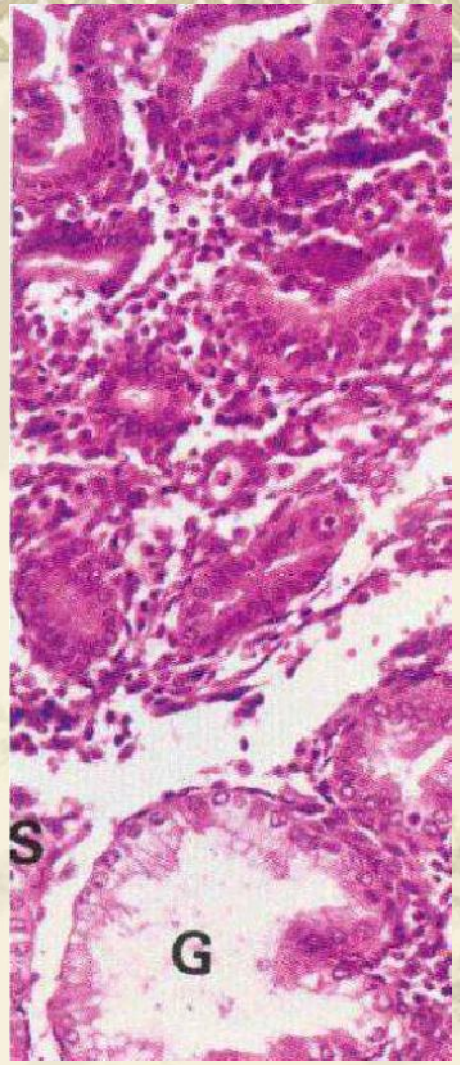
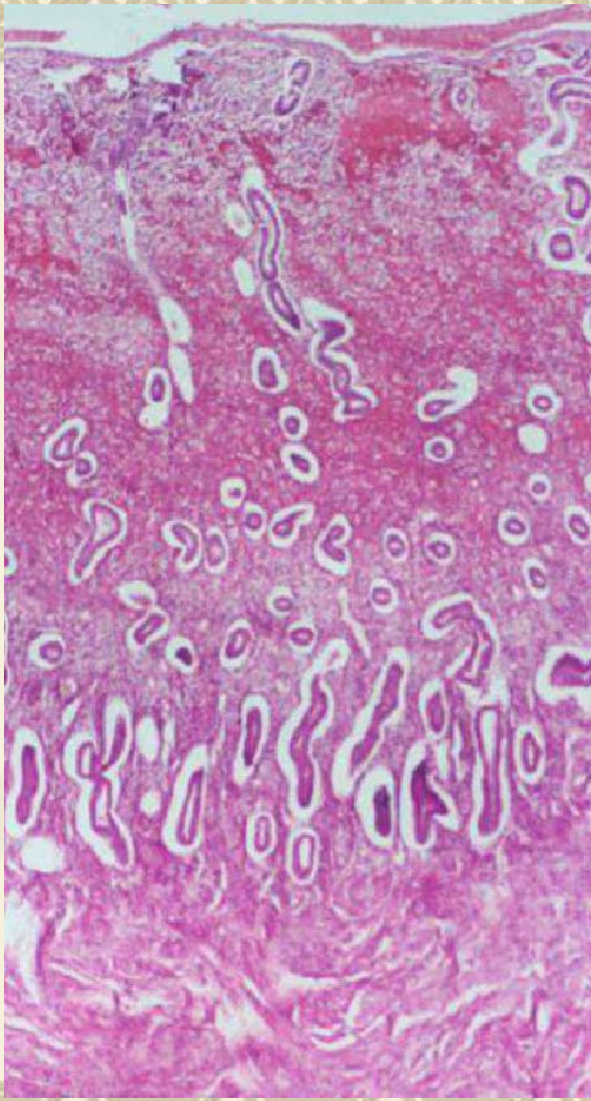
☞ mainly serosa

3.2 Menstrual cycle (28 days)

- ❖ In the sexually mature, non-pregnant female
- ❖ Caused by hormones of the hypothalamic-adenohypophyseal-ovarian axis
- ❖ Genital organs undergo periodically-recurring changes
 - ☞ menstrual phase
 - ☞ proliferative phase
 - ☞ secretory phase

3.2.1 Menstrual phase (days 1-5)

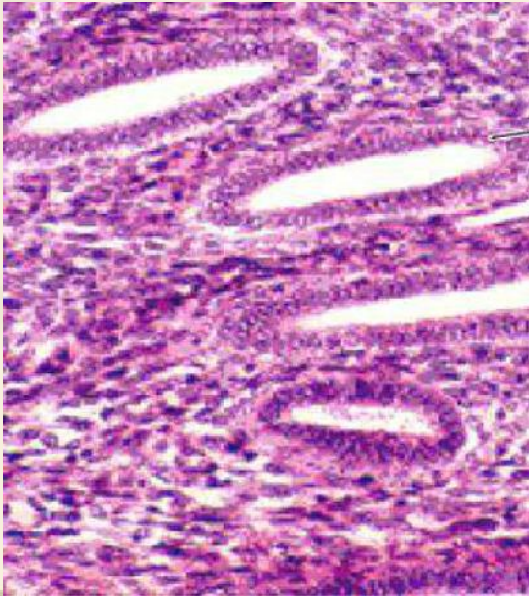
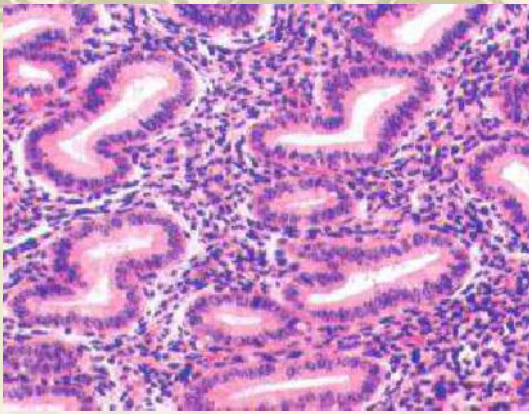
- ❖ 14 days after the preceding ovulation, the functional layer is sloughed.
 - ∞ Corpus luteum degenerates, progesterone and estrogen subside, vasoconstriction of helical arteries leads to ischemia, degeneration and necrosis of functional layer
 - ∞ Estrogen level rises again, vasodilatation cause bleeding and shedding of necrotic tissue (menstruation)



3.2.2 Proliferative phase (days 6-14)

- ❖ **Stimulated by the estrogen of developing follicles**
- ❖ The functional layer is regenerated from the cells of the basal layer
 - ⌘ **Uterine glands:** be tubular and become coiled
 - ⌘ **Glandular cells:** start to store glycogen
 - ⌘ **Helical arteries:** begin to sprout

 - ⌘ **Endometrium thickness is increased**



3.2.3 Secretory phase(15-28)

- ❖ **Shortly after ovulation, stimulated by the progesterone of developing corpus luteum**
 - ☞ **Uterine glands:** more coiled
 - ☞ **Glandular cells:** accumulate glycogen and start to secrete
 - ☞ **Helical arteries:** more and more coiled
 - ☞ **Endometrium:** maximum thickness
 - ☞ **The structural changes assure a receptive environment for implantation of the zygote**

