

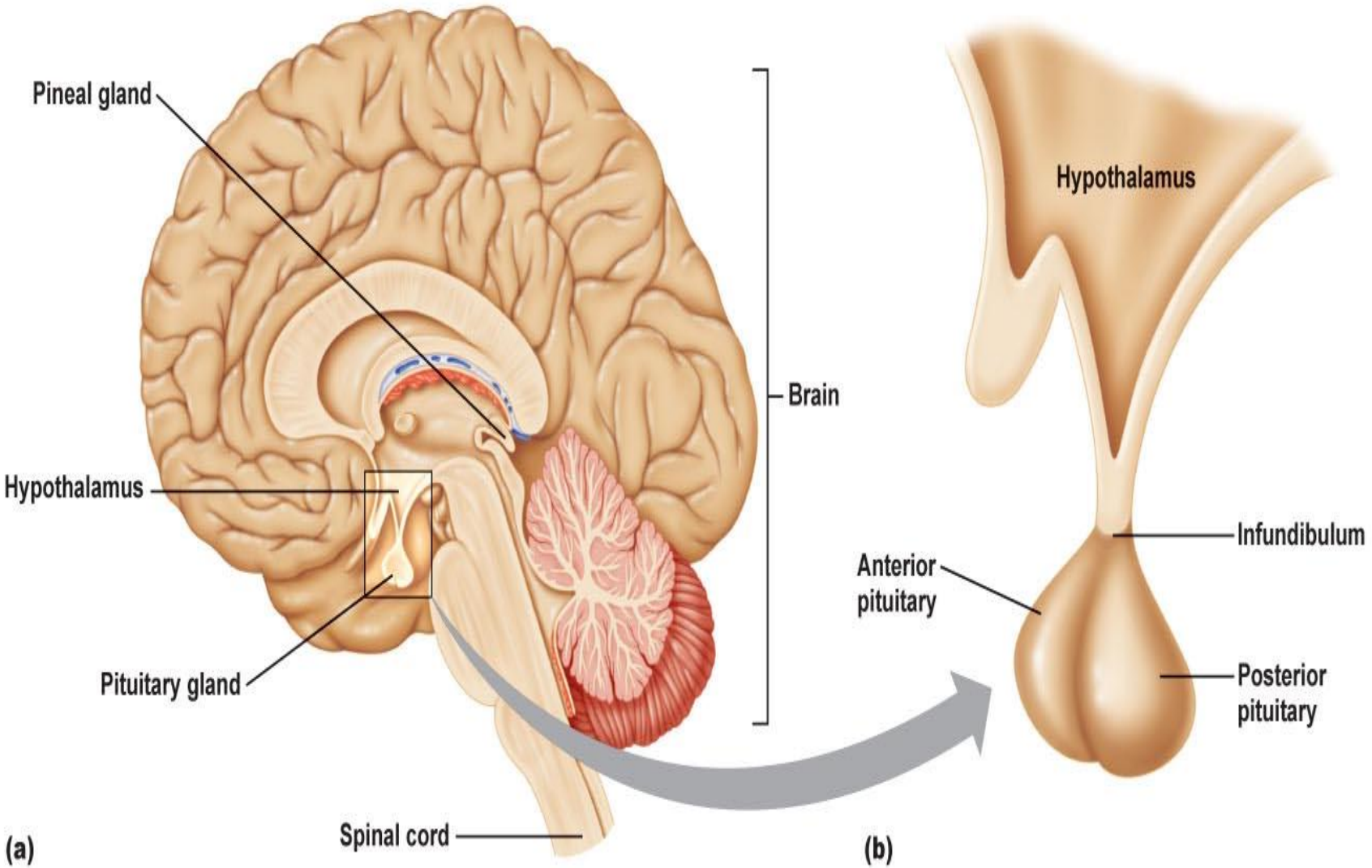


# Endocrine system

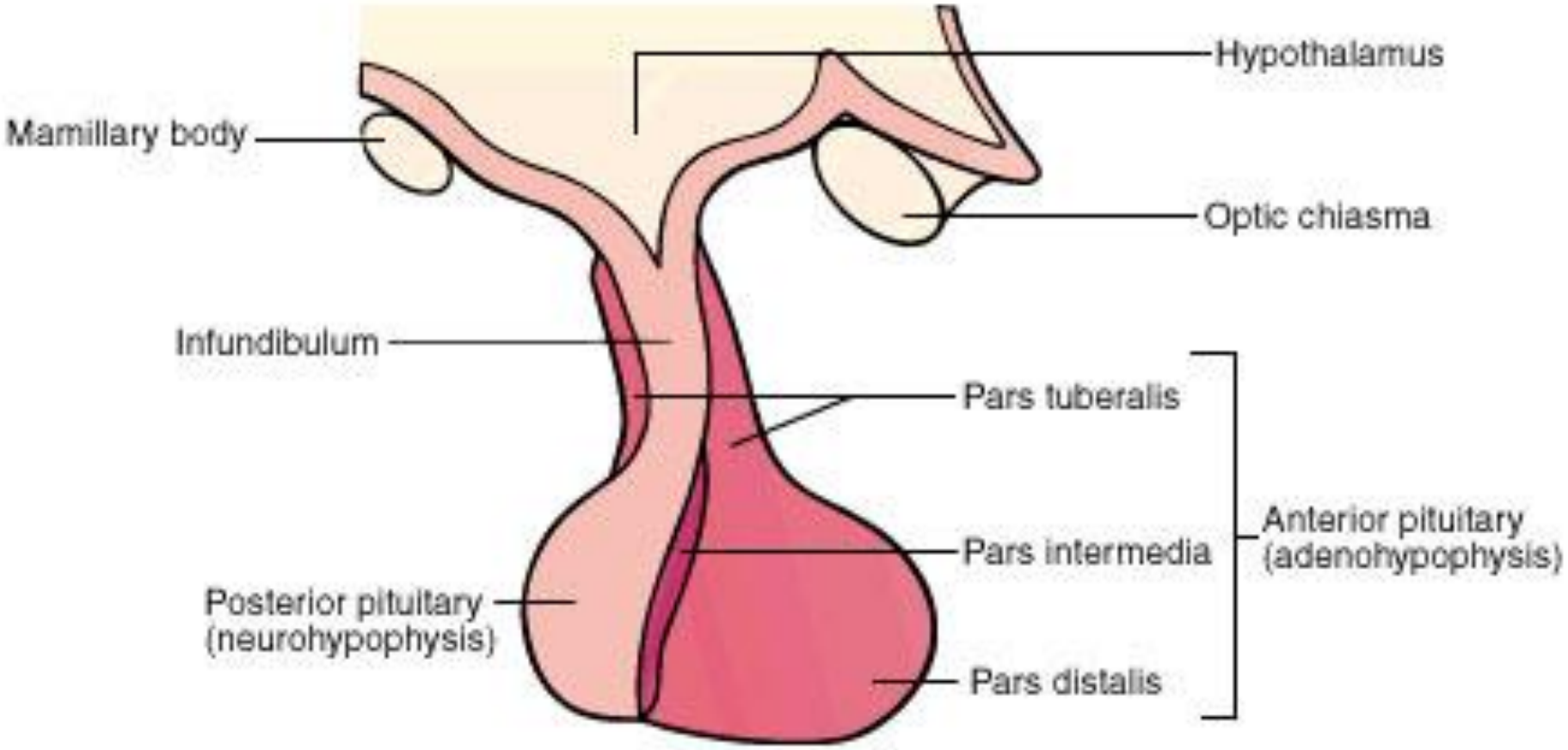
Practical

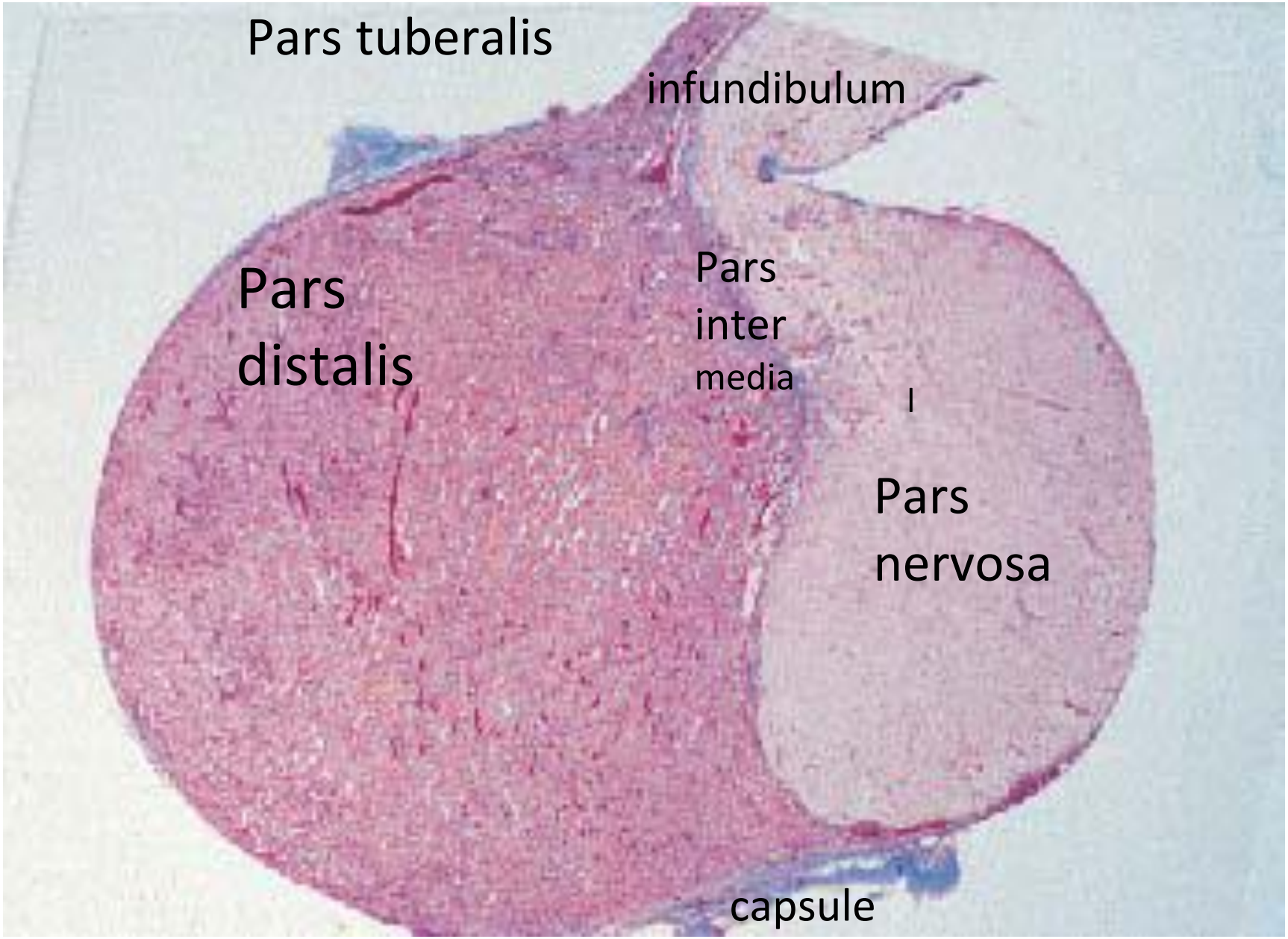
# Practical
# ERS
# Histology

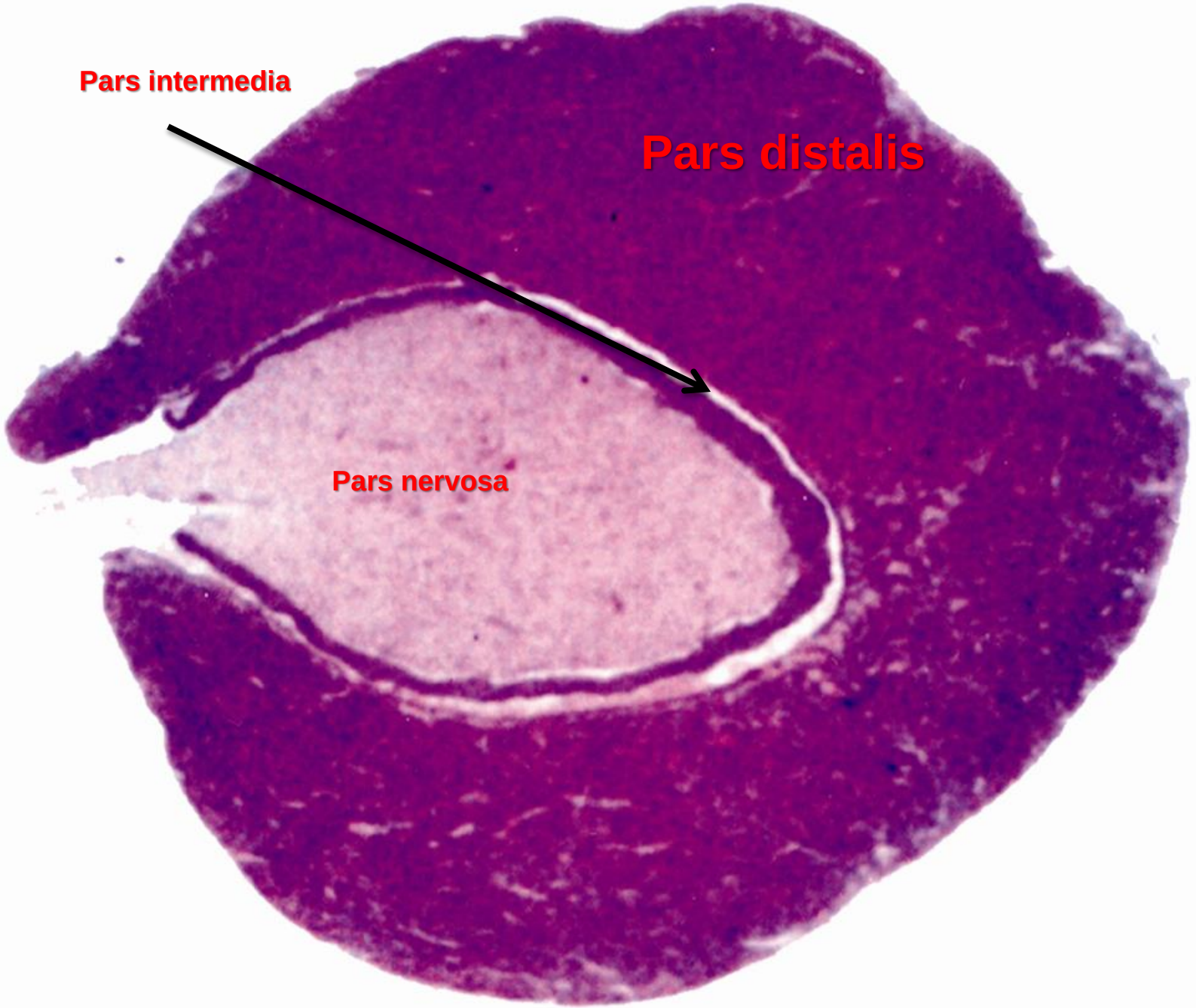
# Pituitary Gland

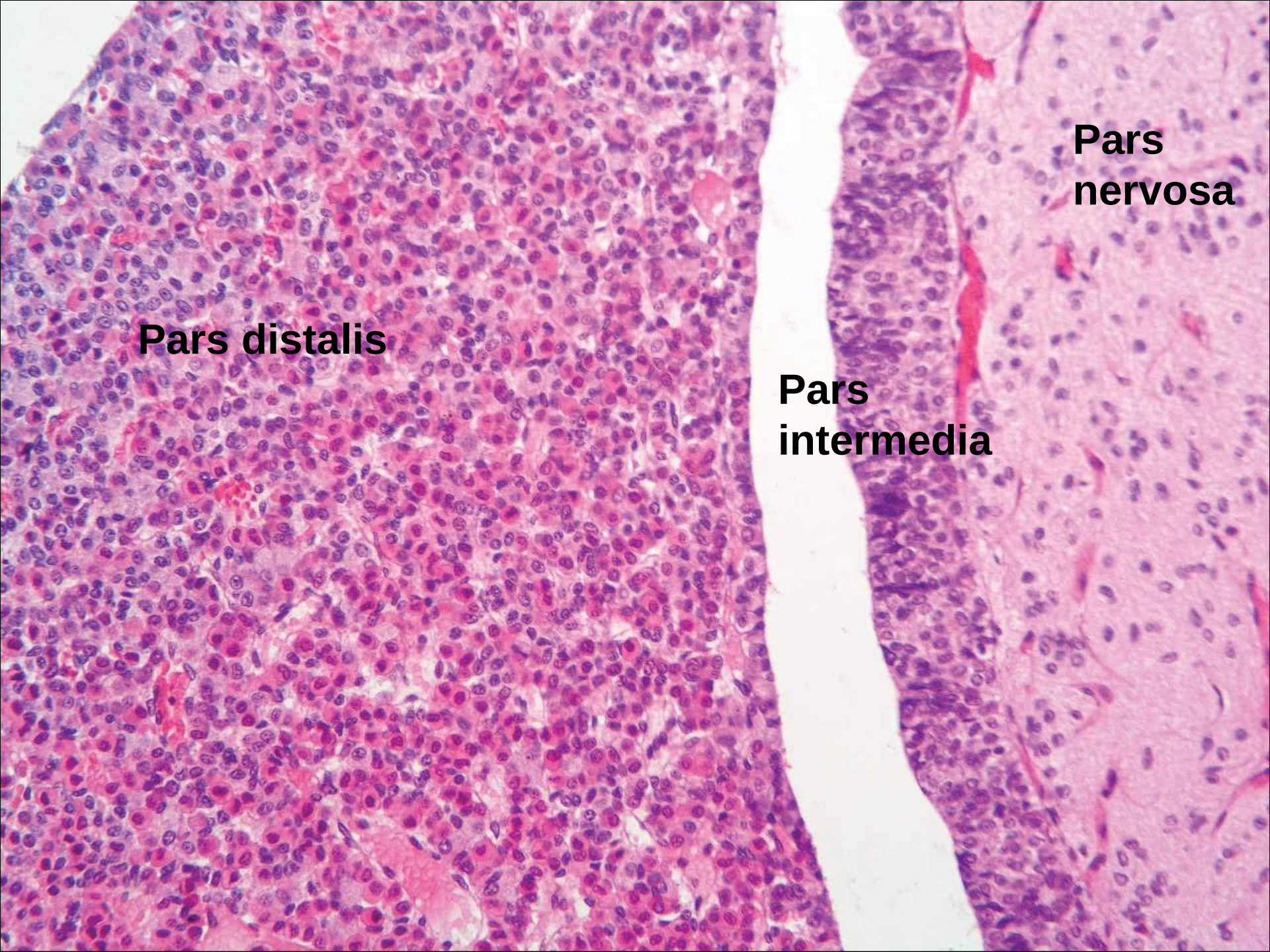


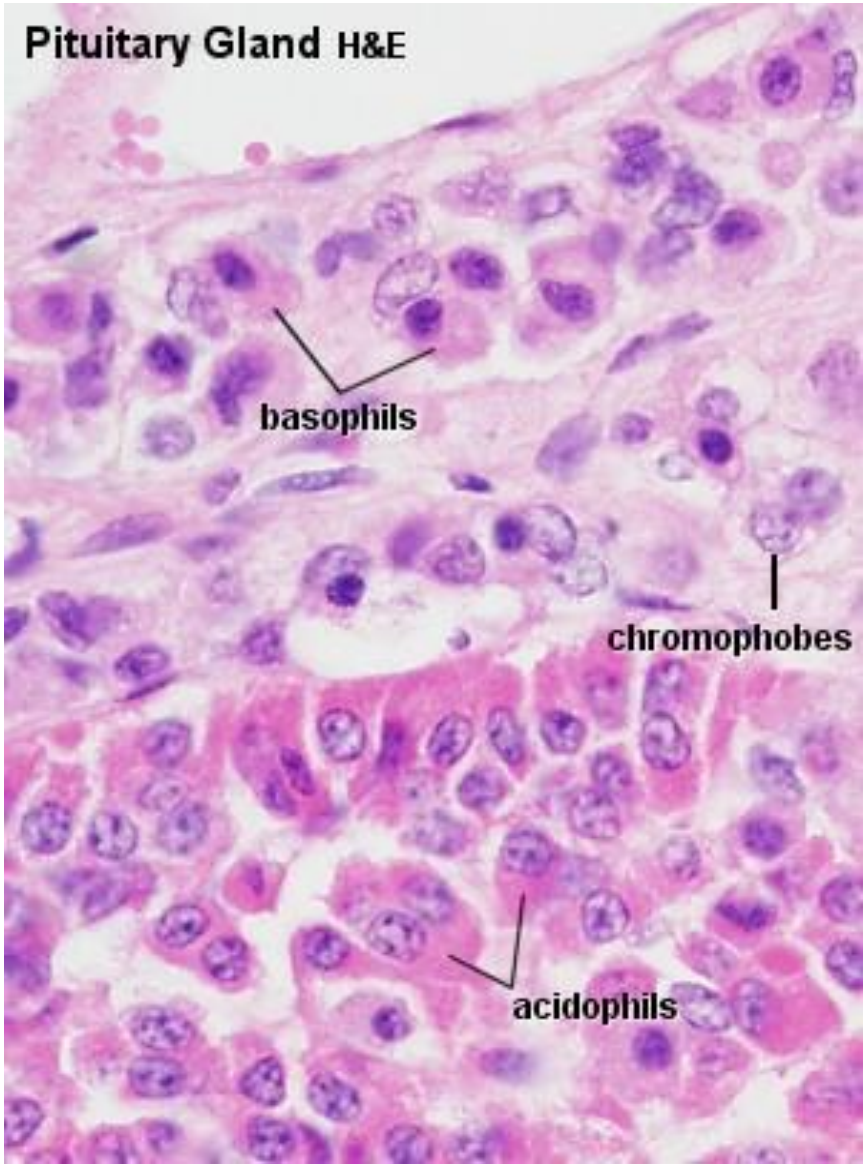
# Parts of Pituitary gland

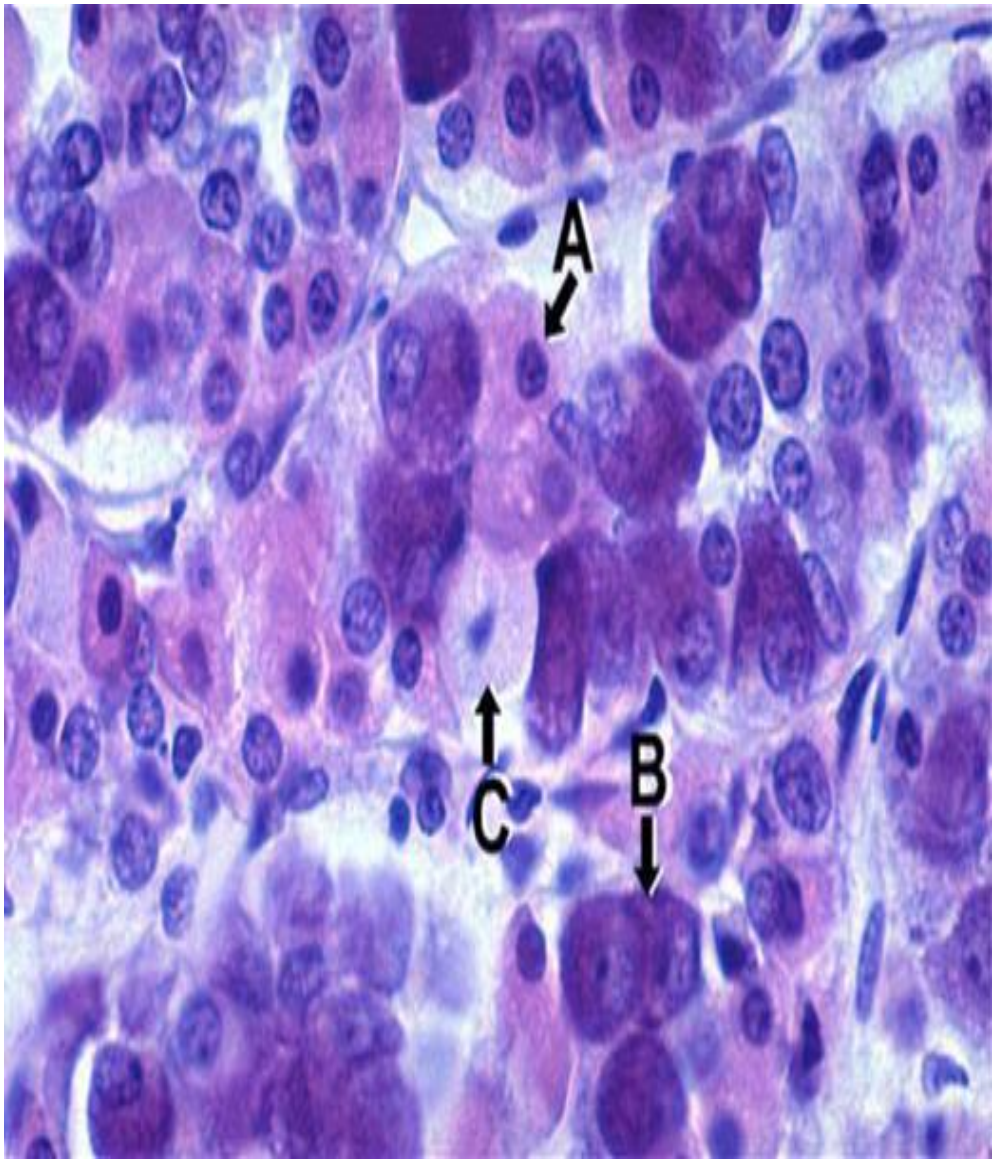



Pars tuberalis
infundibulum
Pars distalis
Pars inter media
Pars nervosa
capsule


Pars intermedia
Pars distalis
Pars nervosa


Pars distalis
Pars intermedia
Pars nervosa

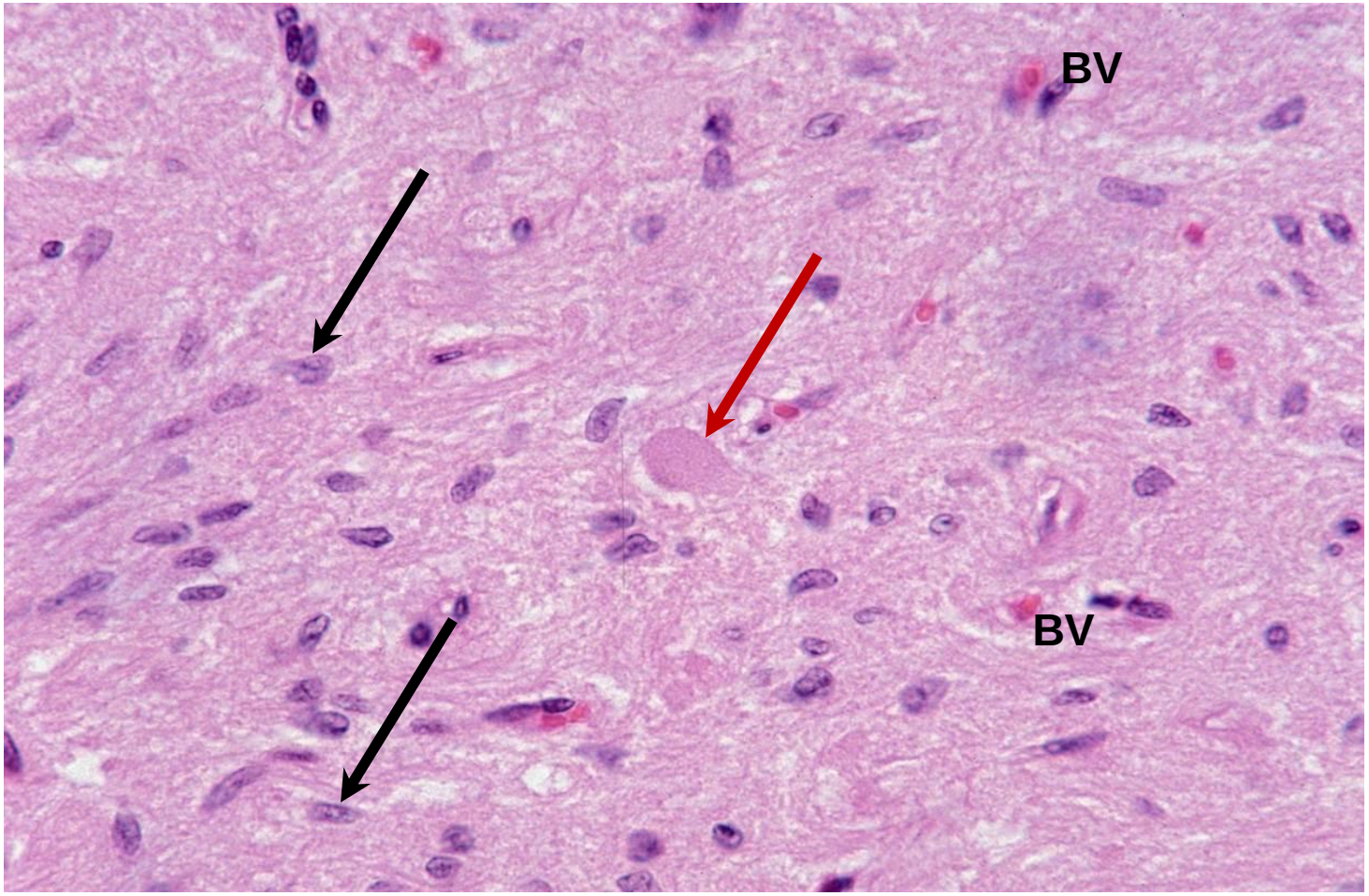



# Pars Distalis

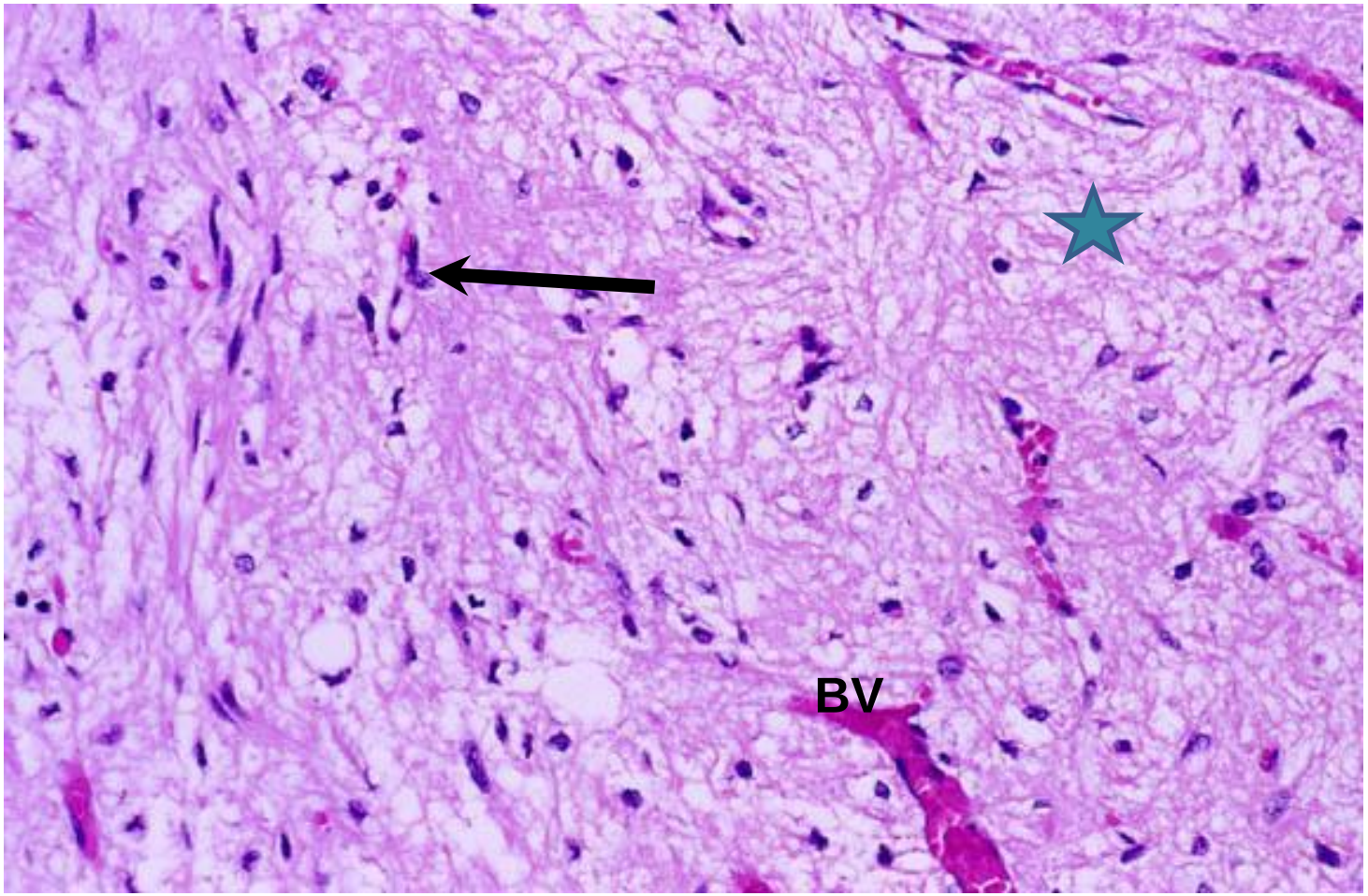
**A:** acidophils **B:** basophils **C:** chromophobes

# Pars Nervosa (posterior pituitary)



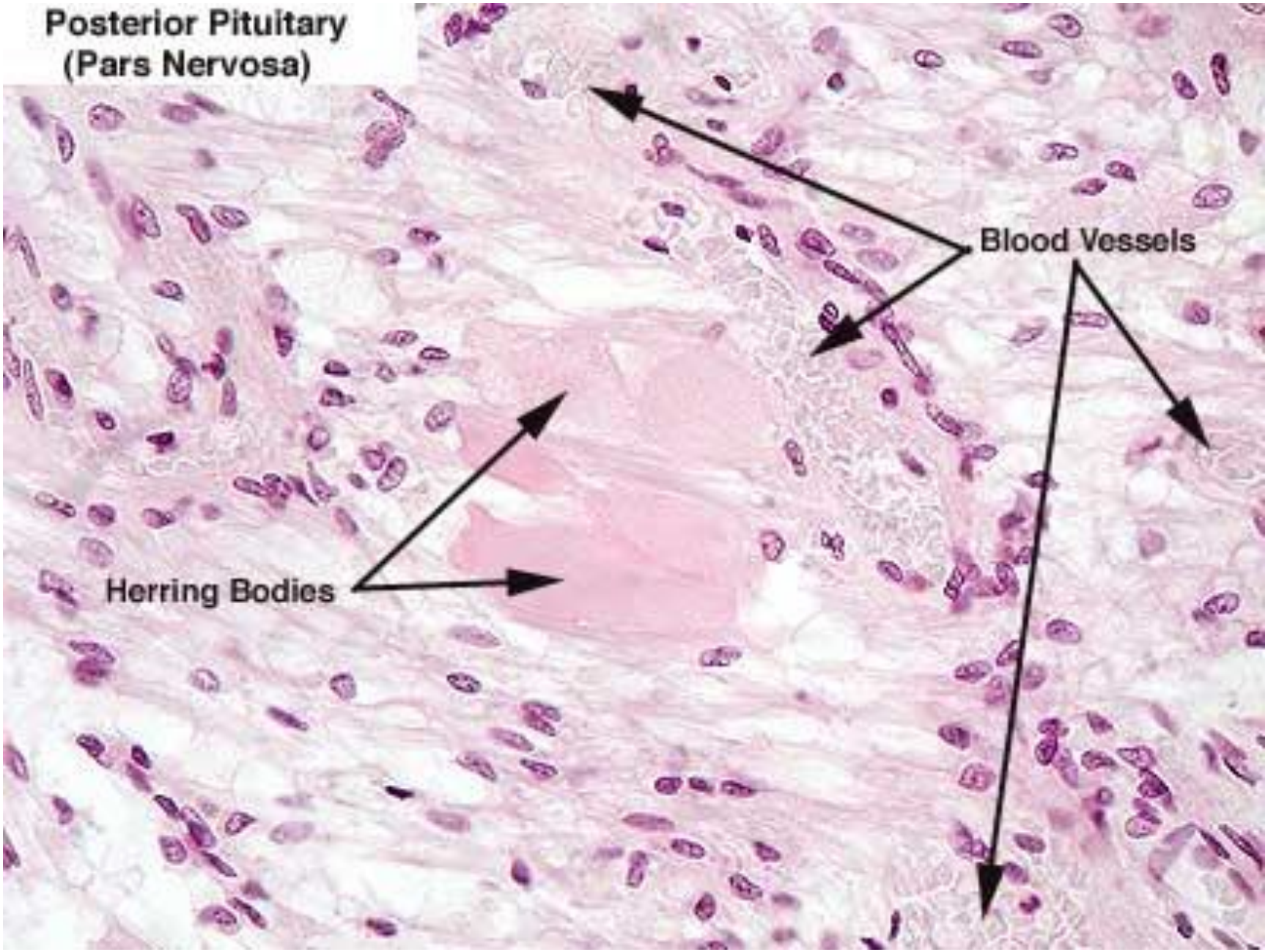

**Black arrows: Pituicytes** **Red arrow: Herring body** **BV: blood vessel (fenestrated capillaries)**

# Pars nervosa

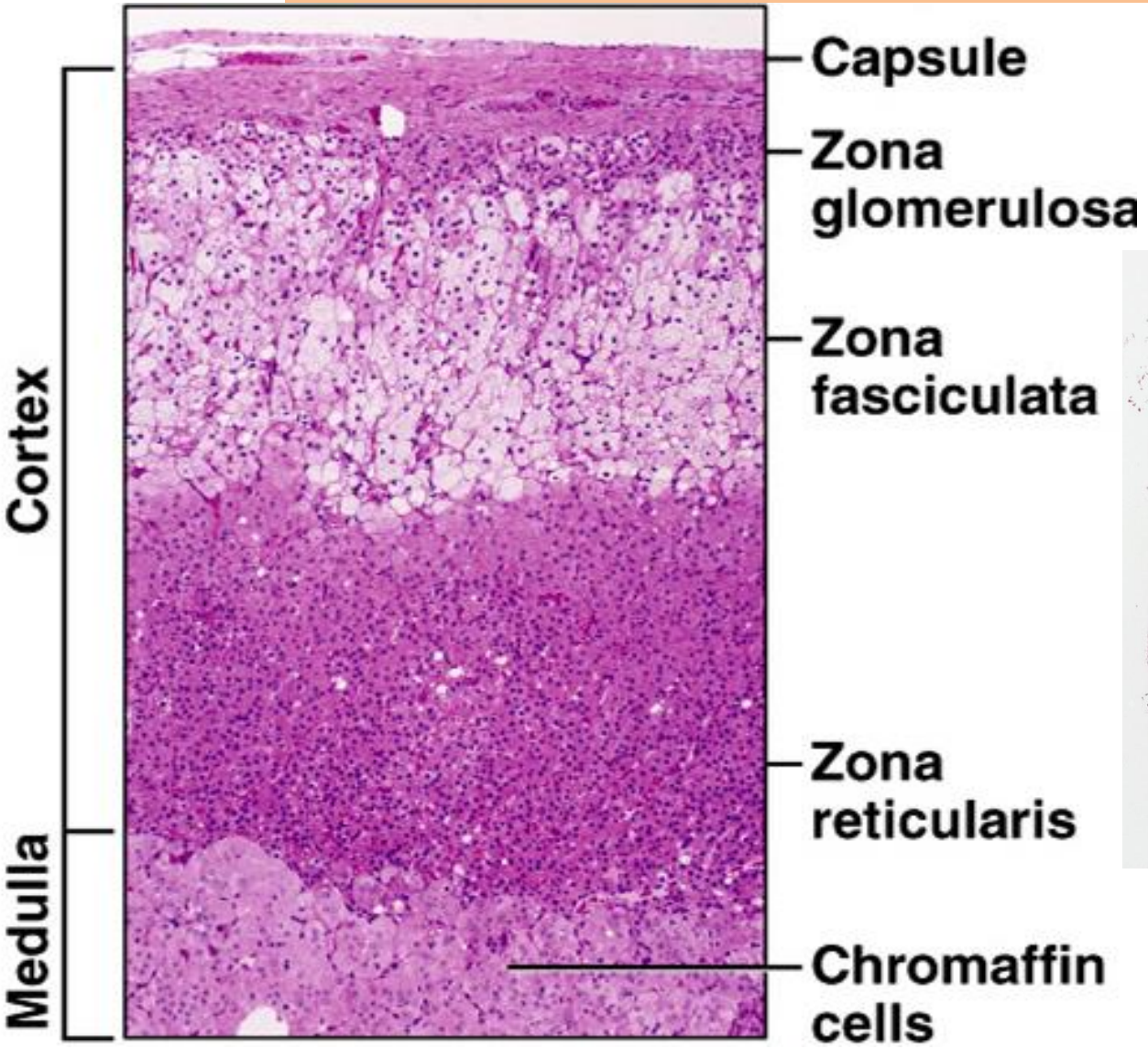


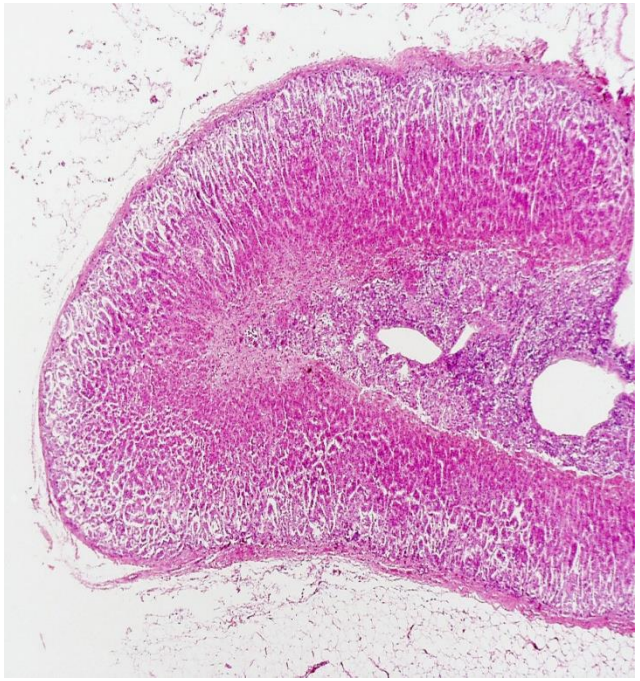

**Arrow:** pituicytes

**star:** axons of neurosecretory cells

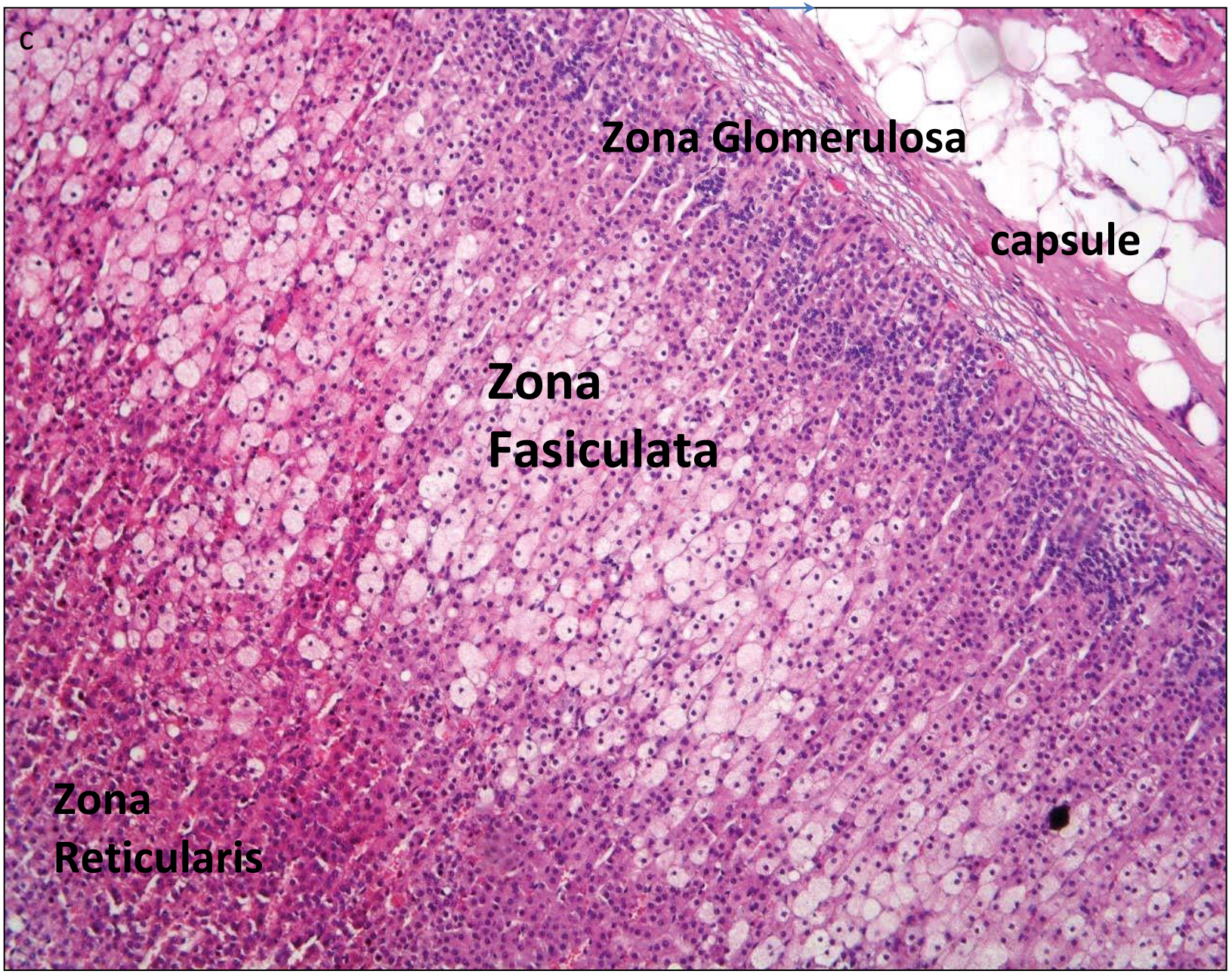

Posterior Pituitary
(Pars Nervosa)
Blood Vessels
Herring Bodies

# Supra renal Gland



# Suprarenal Gland

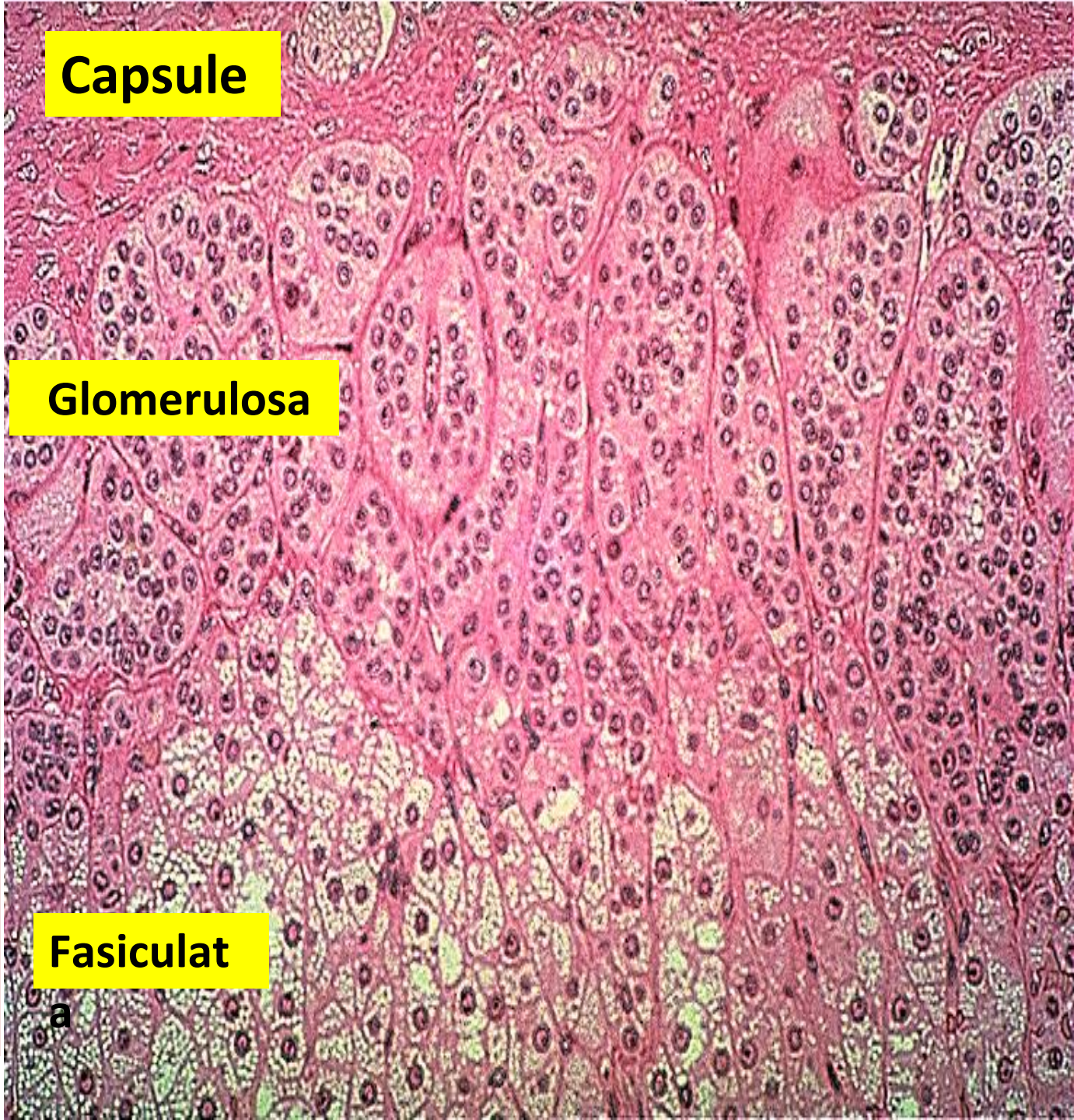


## Zona glomerulosa:

Narrow zone under the capsule.
Columner cells arranged
In arched groups.

## Zona fasiculata:

Wide zone formed of Polyhedral cells
Arranged in narrow Straight cords.
They have vacuolated cytoplasm (spongiocytes)

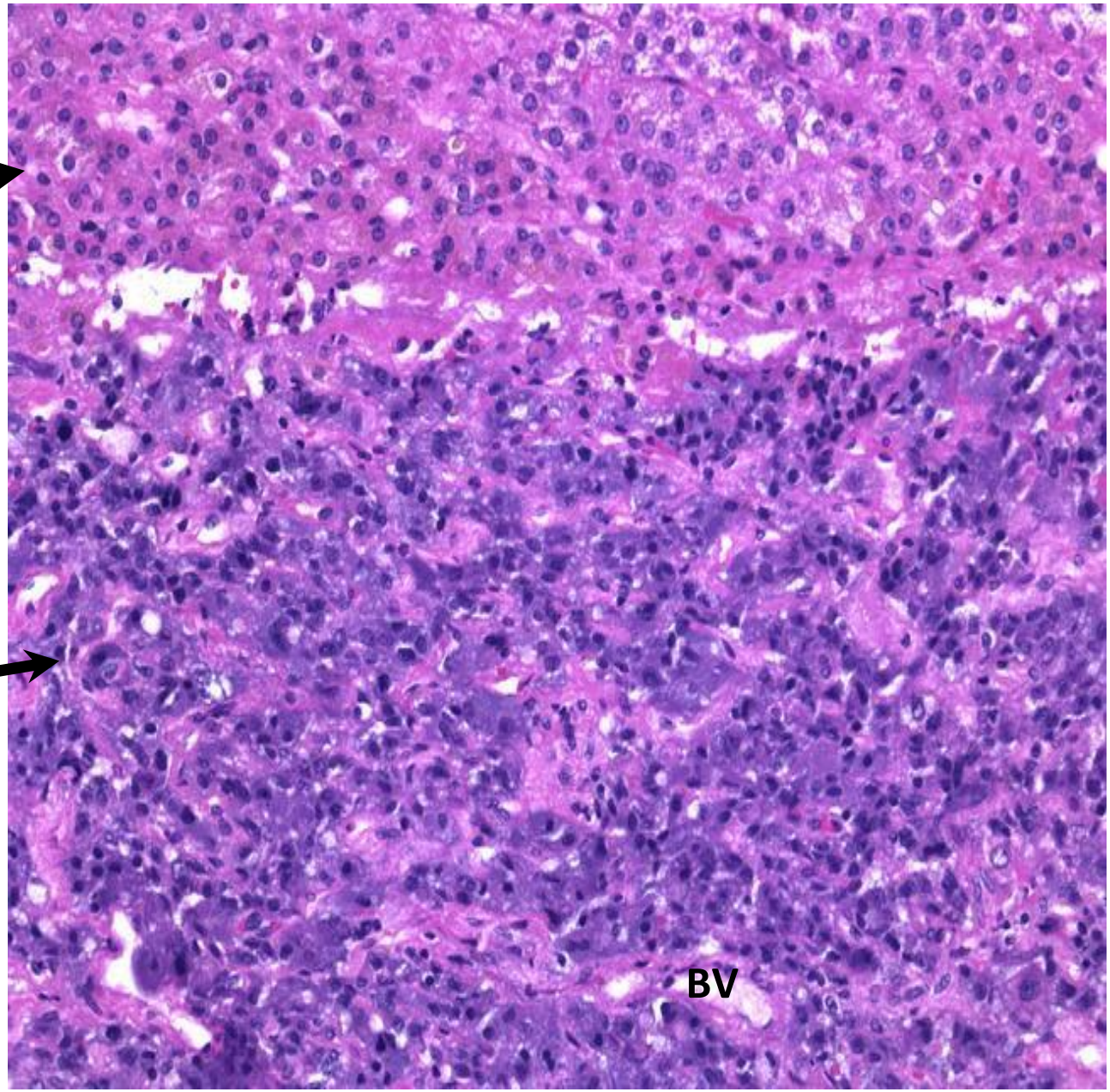


## Zona Reticularis

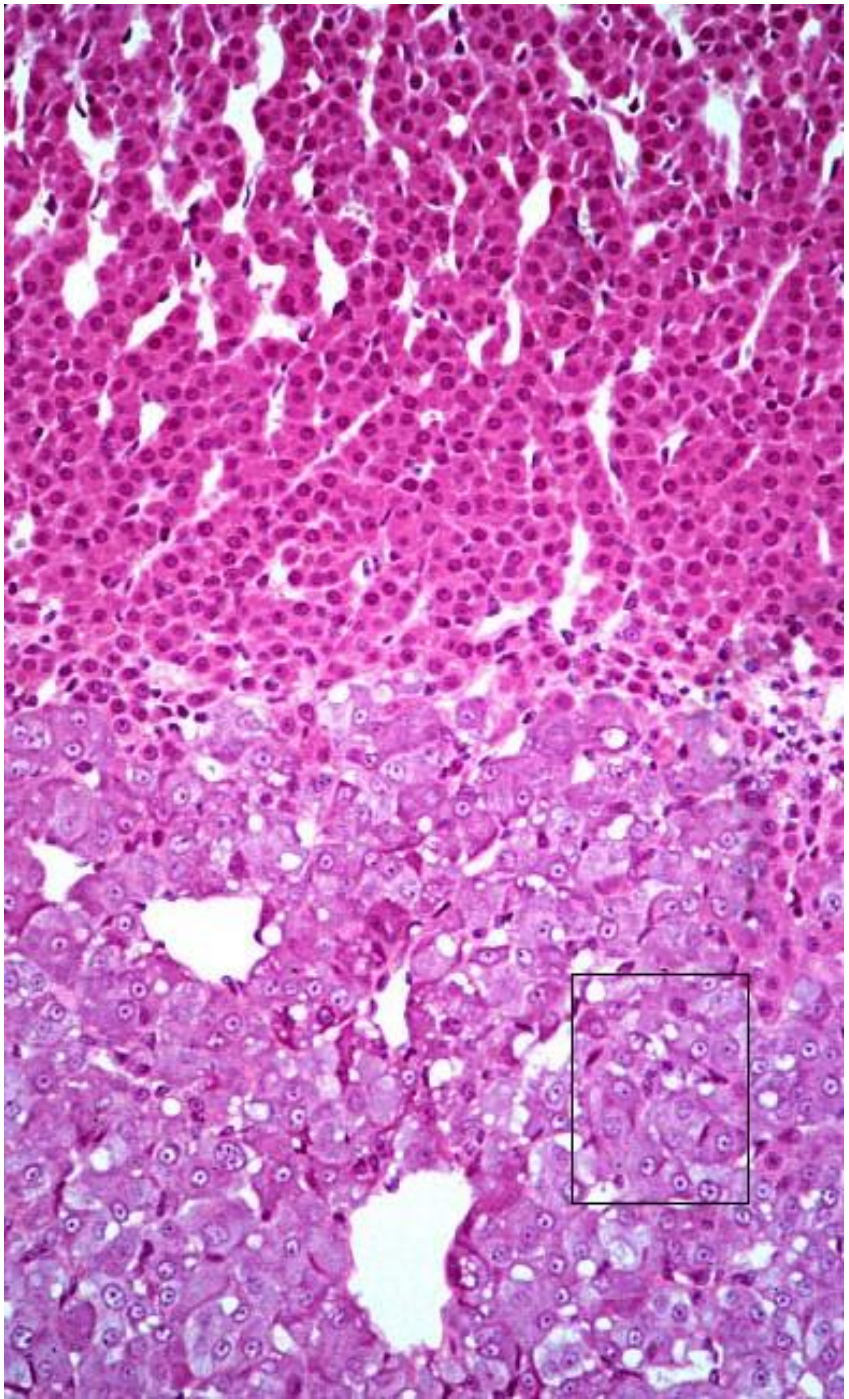
Polyhedral cells
Arranged in branching anastomosing cords.
Cytoplasm is **acidophilic**

## Medulla

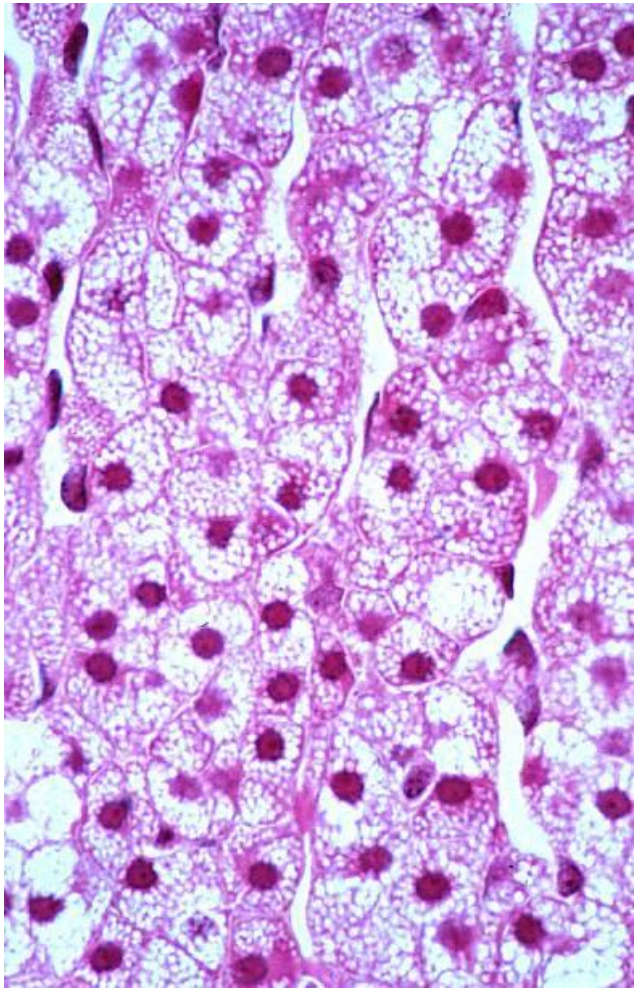
Polyhedral cells
Arranged in branching anastomosing cords.
Cytoplasm is **basophilic**



Zona Reticularis

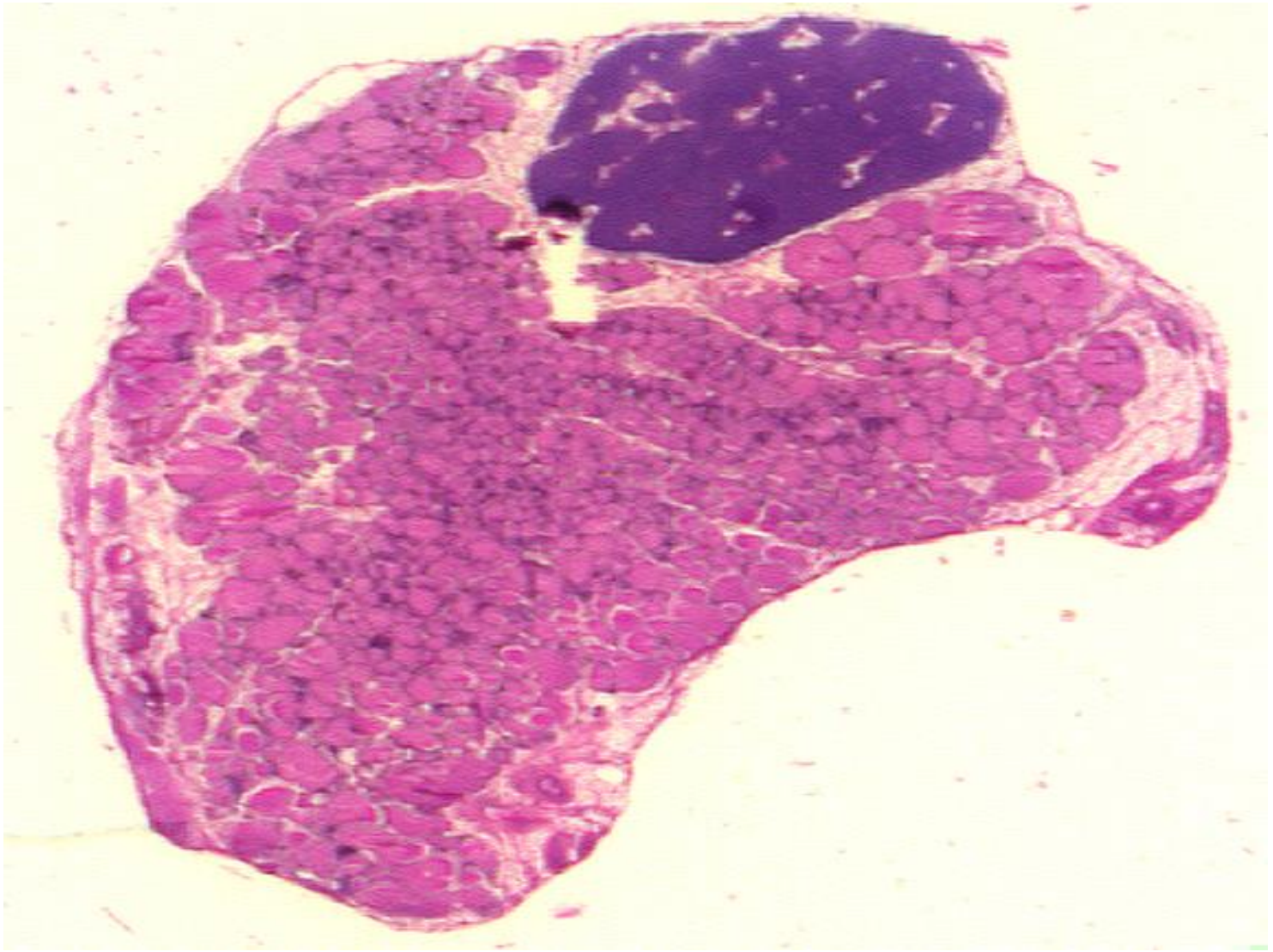


Medulla

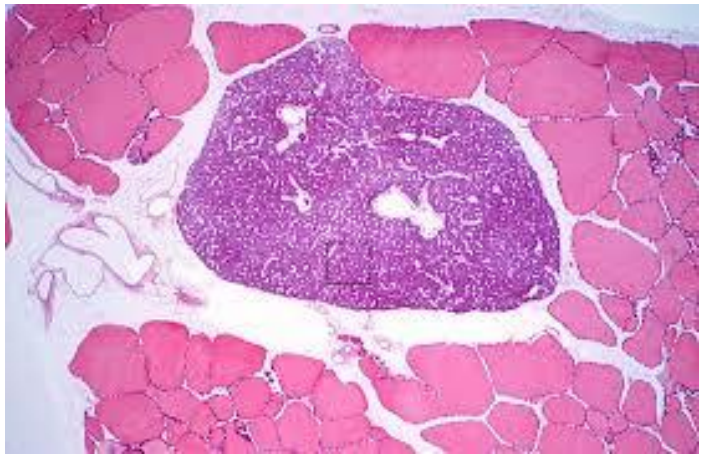


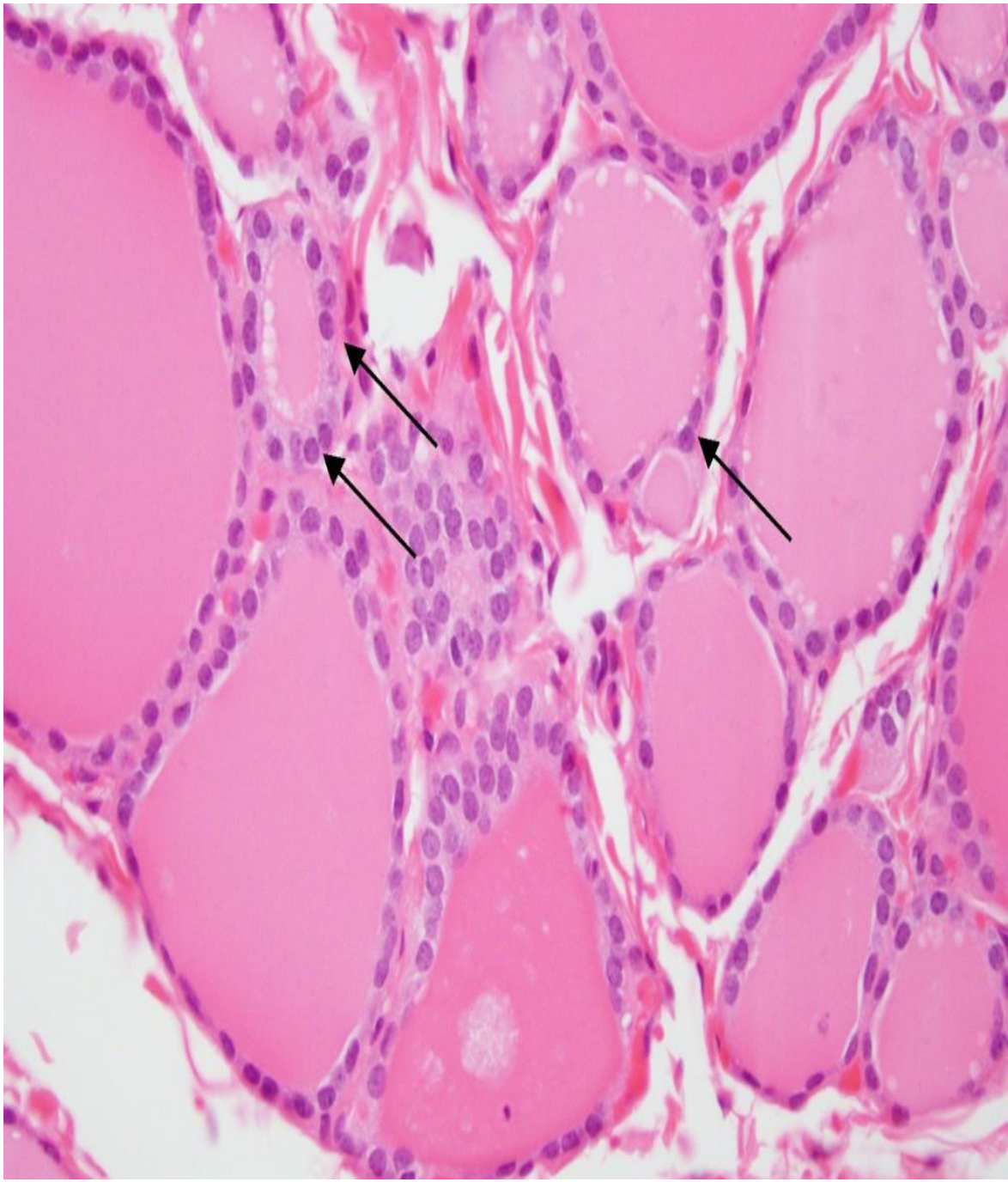
Zona Fasiculata

# Thyroid & Parathyroid



# Thyroid & Parathyroid Gland





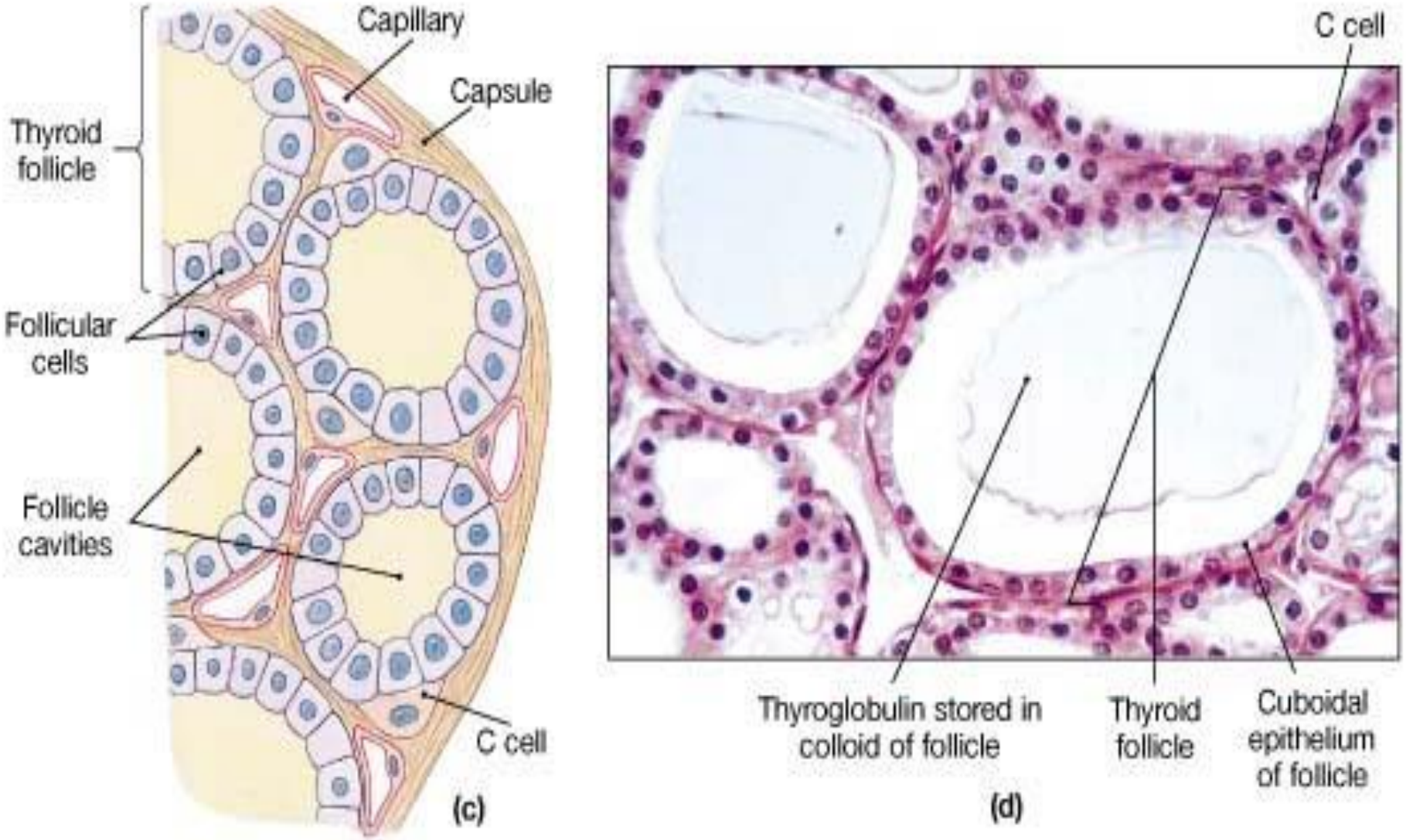
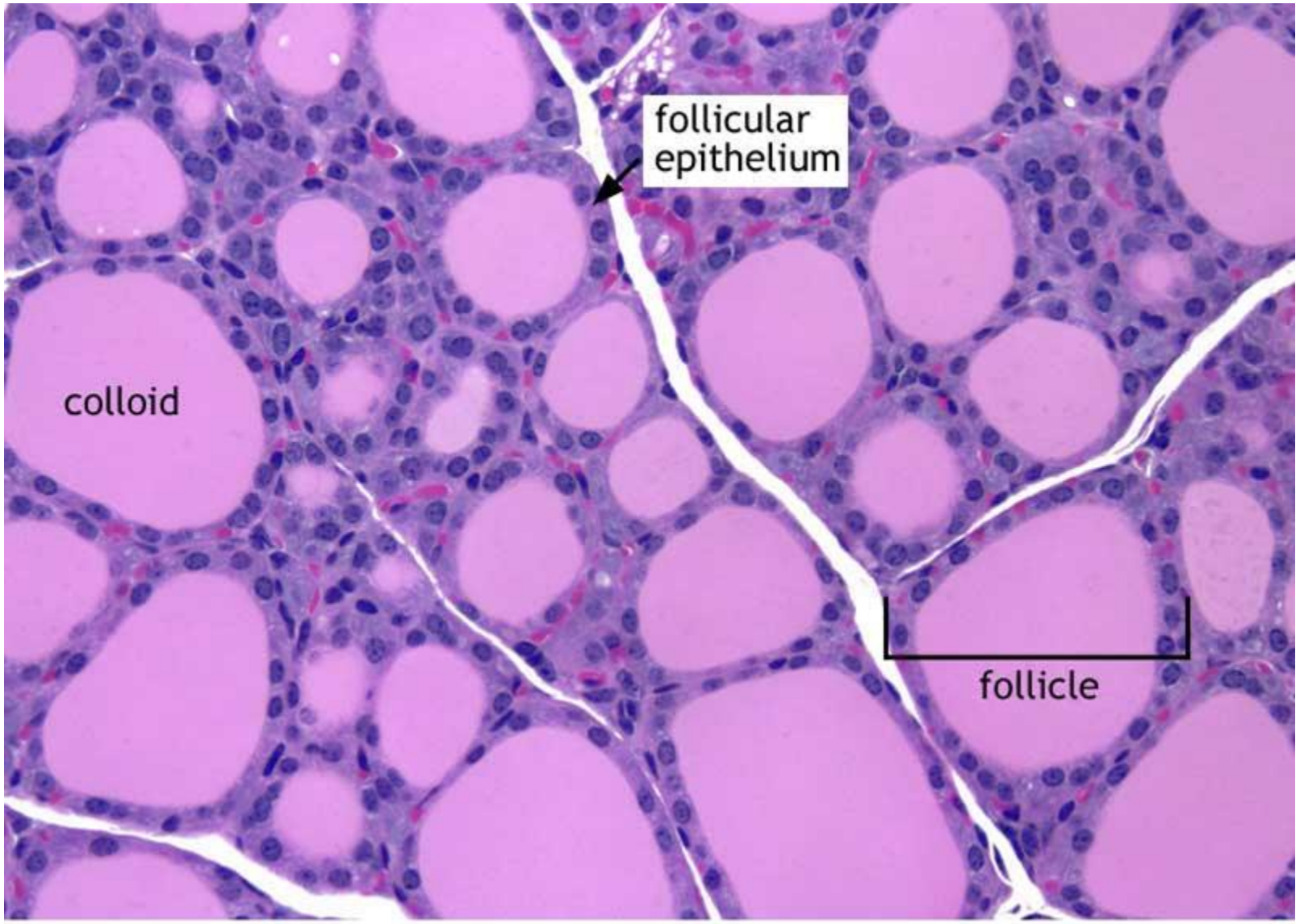
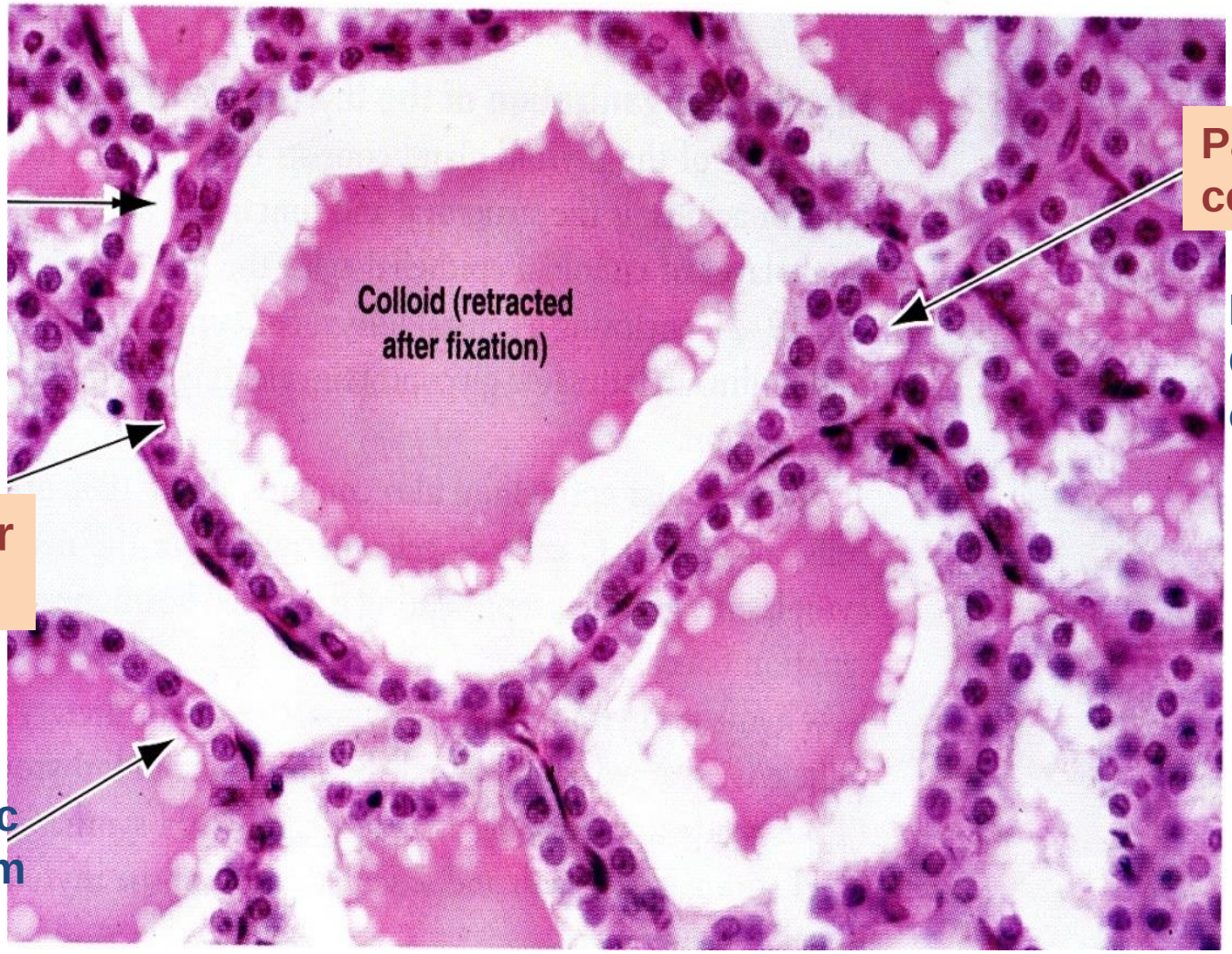



**FIGURE 18-12 The Thyroid Gland.** **(c)** Diagrammatic view of a section through the wall of the thyroid gland. **(d)** Histological details, showing thyroid follicles. (LM × 211)

# Thyroid gland



# Thyroid Gland




BV

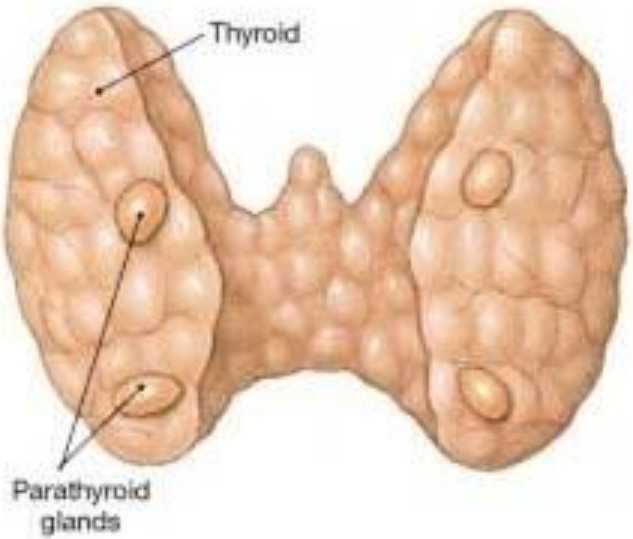
Parafollicular cell

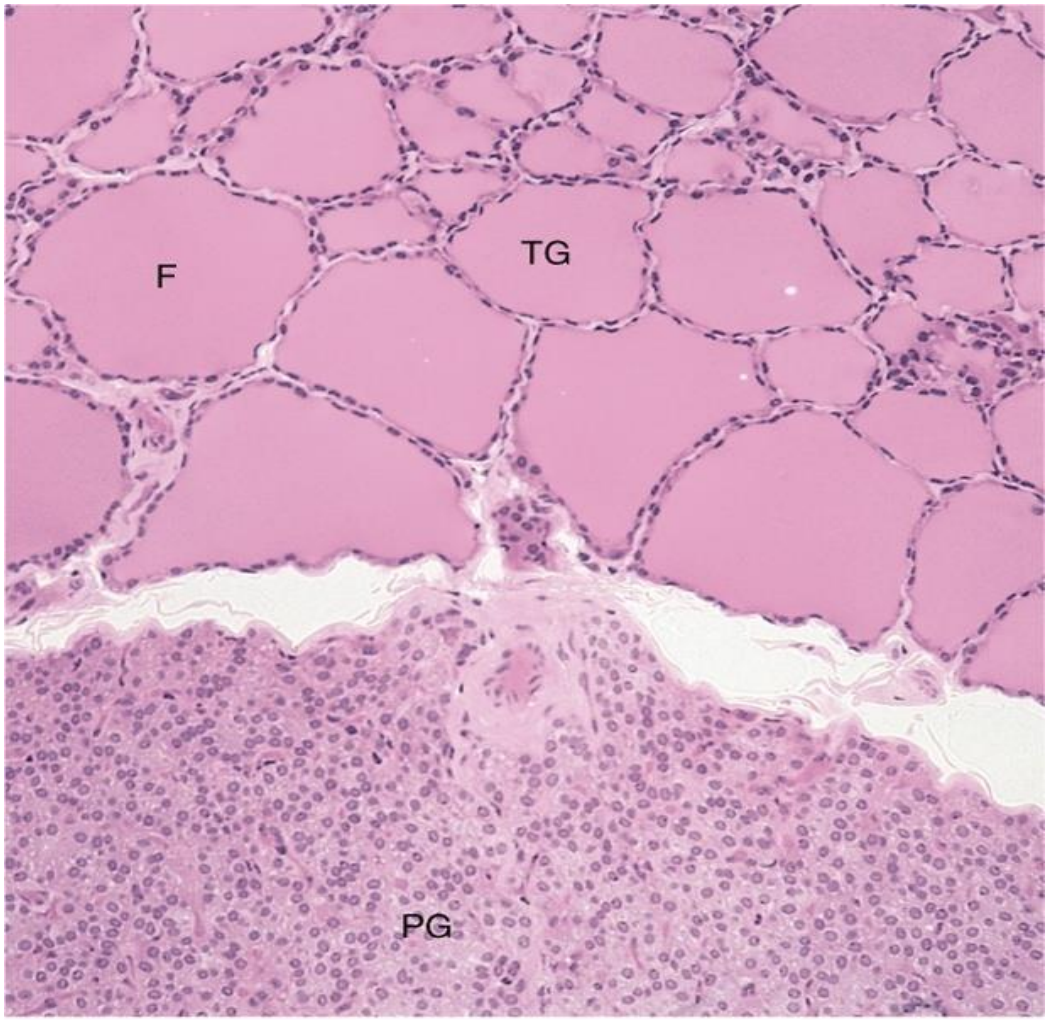
Large cells
Clear cytoplasm

Follicular cells

Cuboidal cells
Basophilic cytoplasm

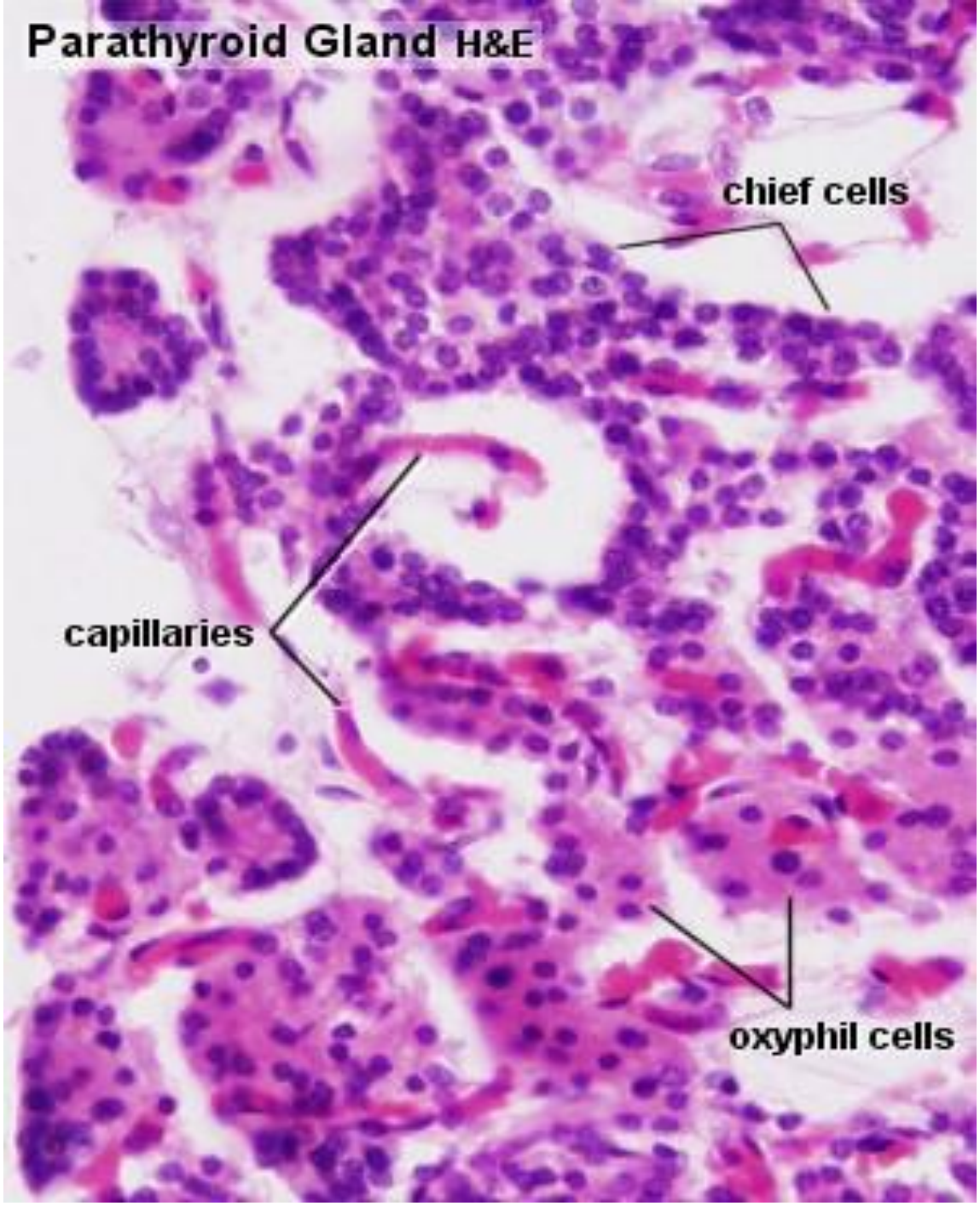
# The Parathyroid Glands



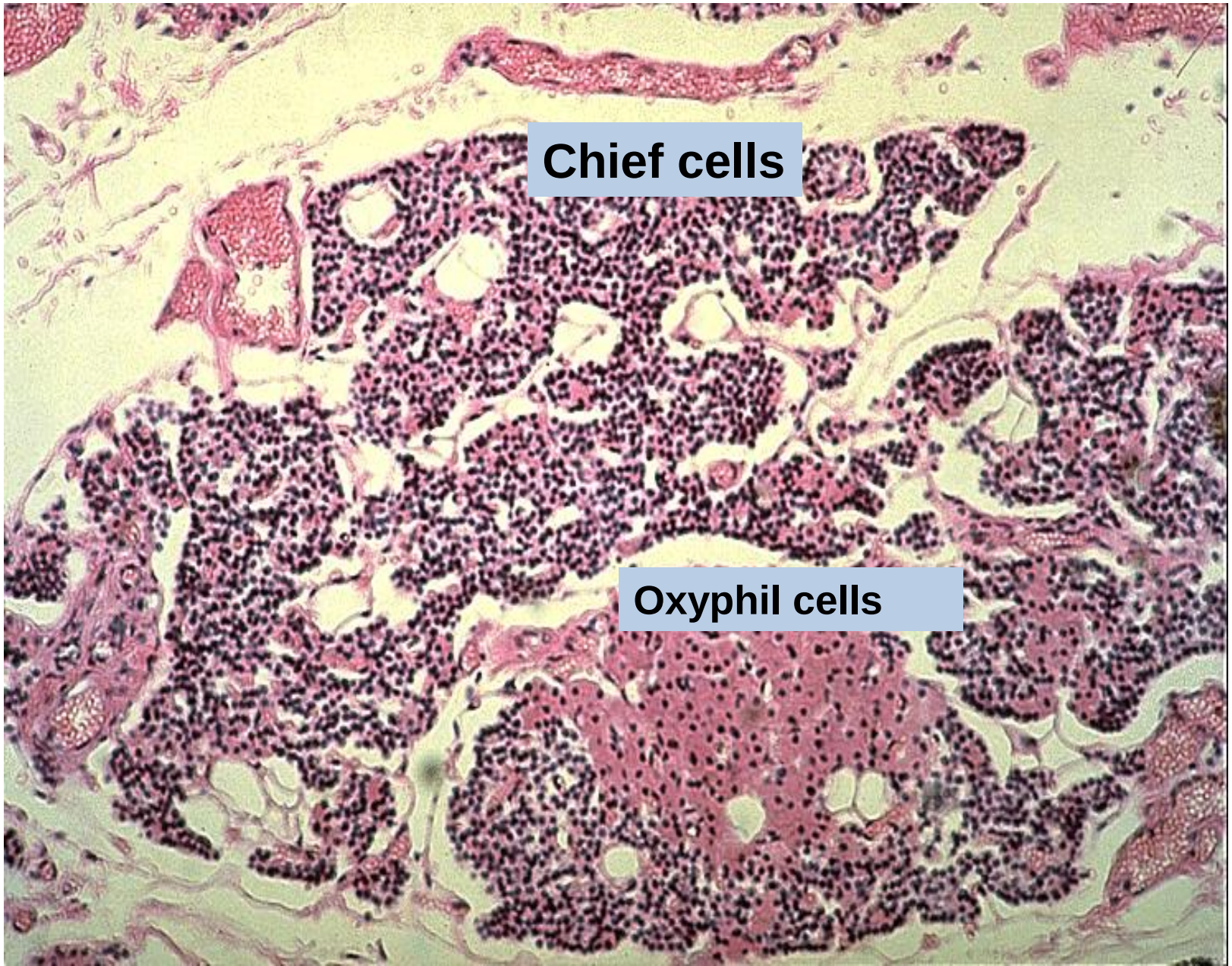



**Chief cells:**
Numerous
Small
polyhedral
basophilic

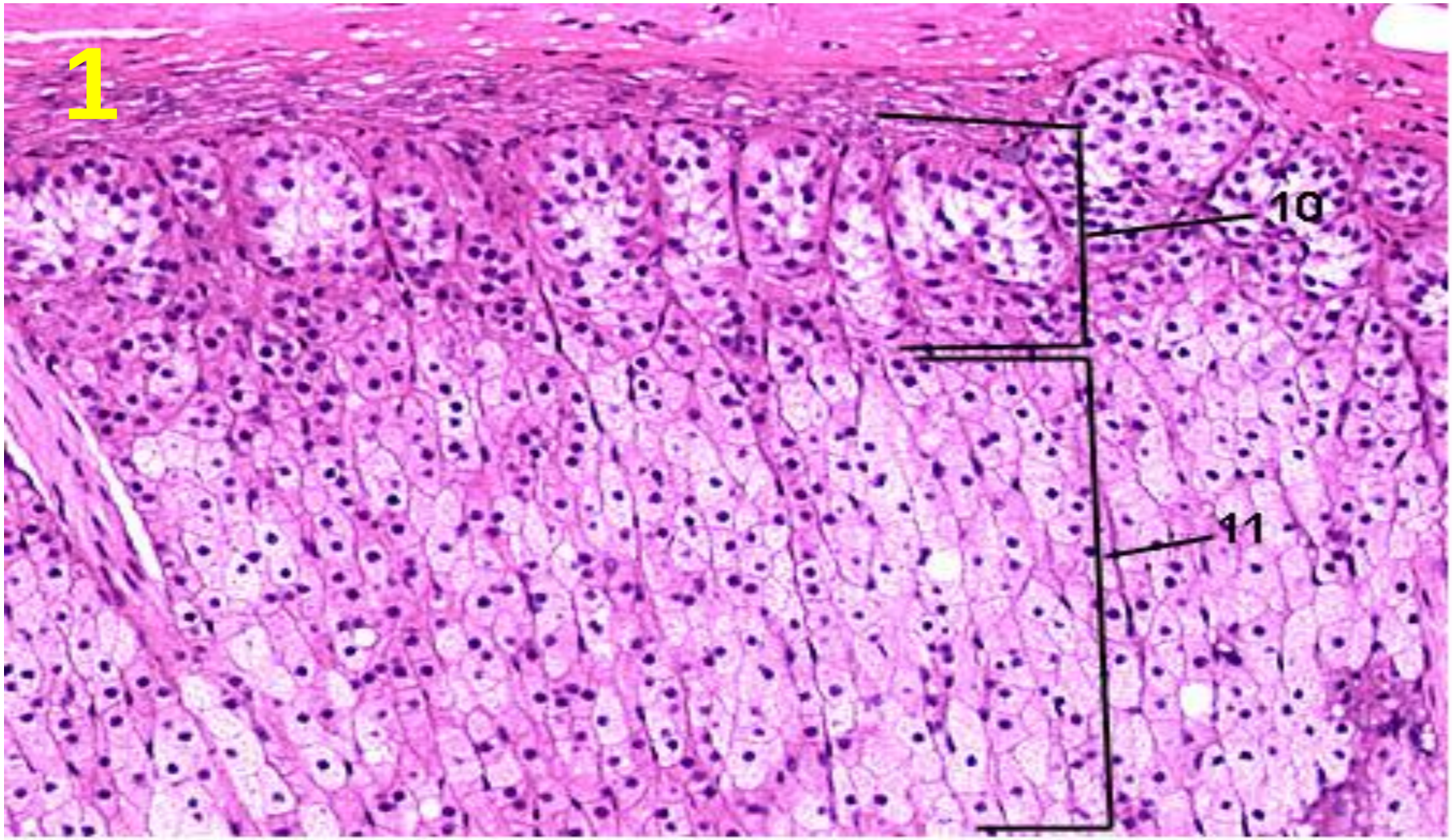
**Oxyphil cells:**
Less
numerous
Large
polygonal
Acidophilic
Form clumps



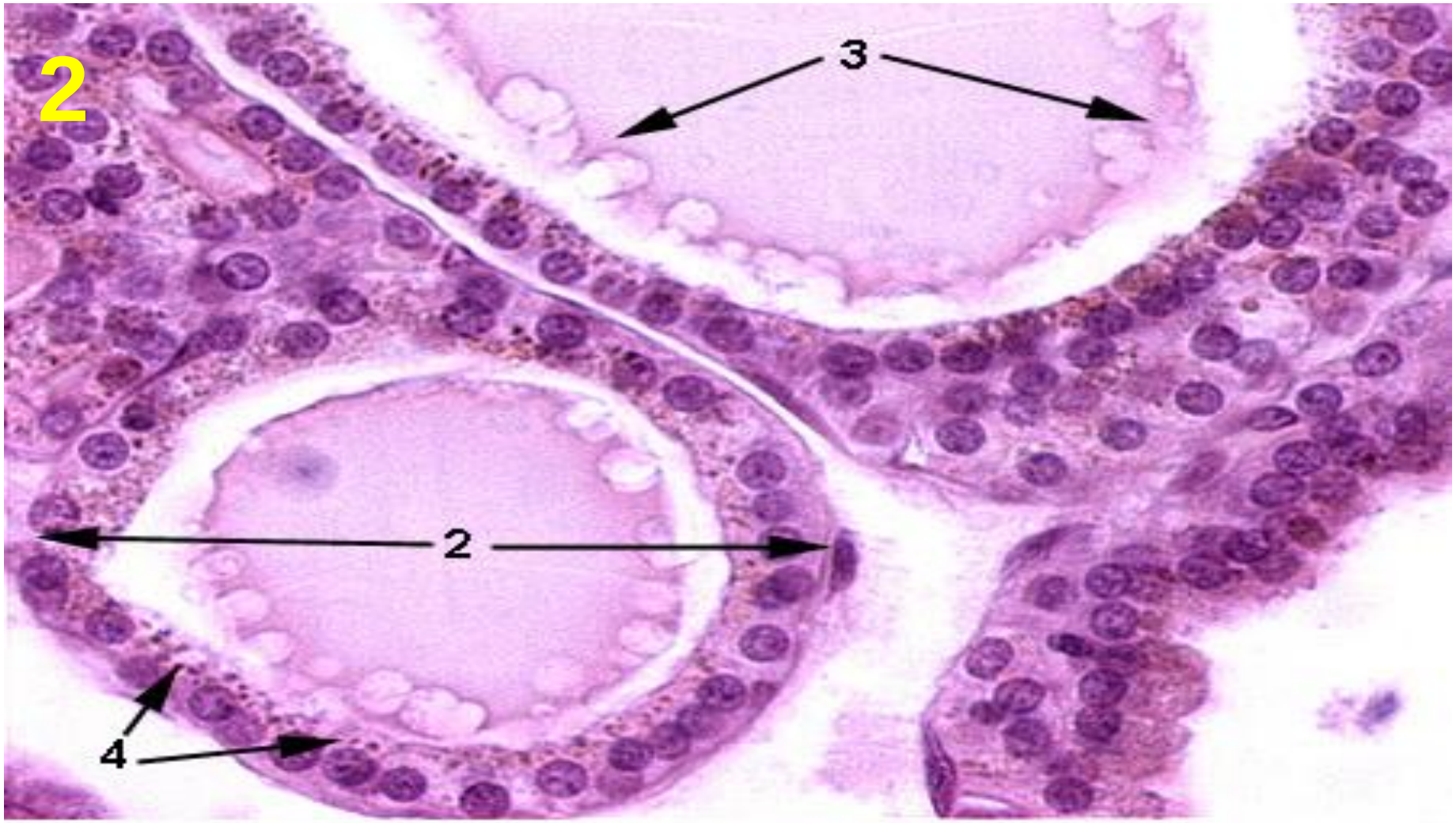
# Parathyroid Gland



# Trial Exam

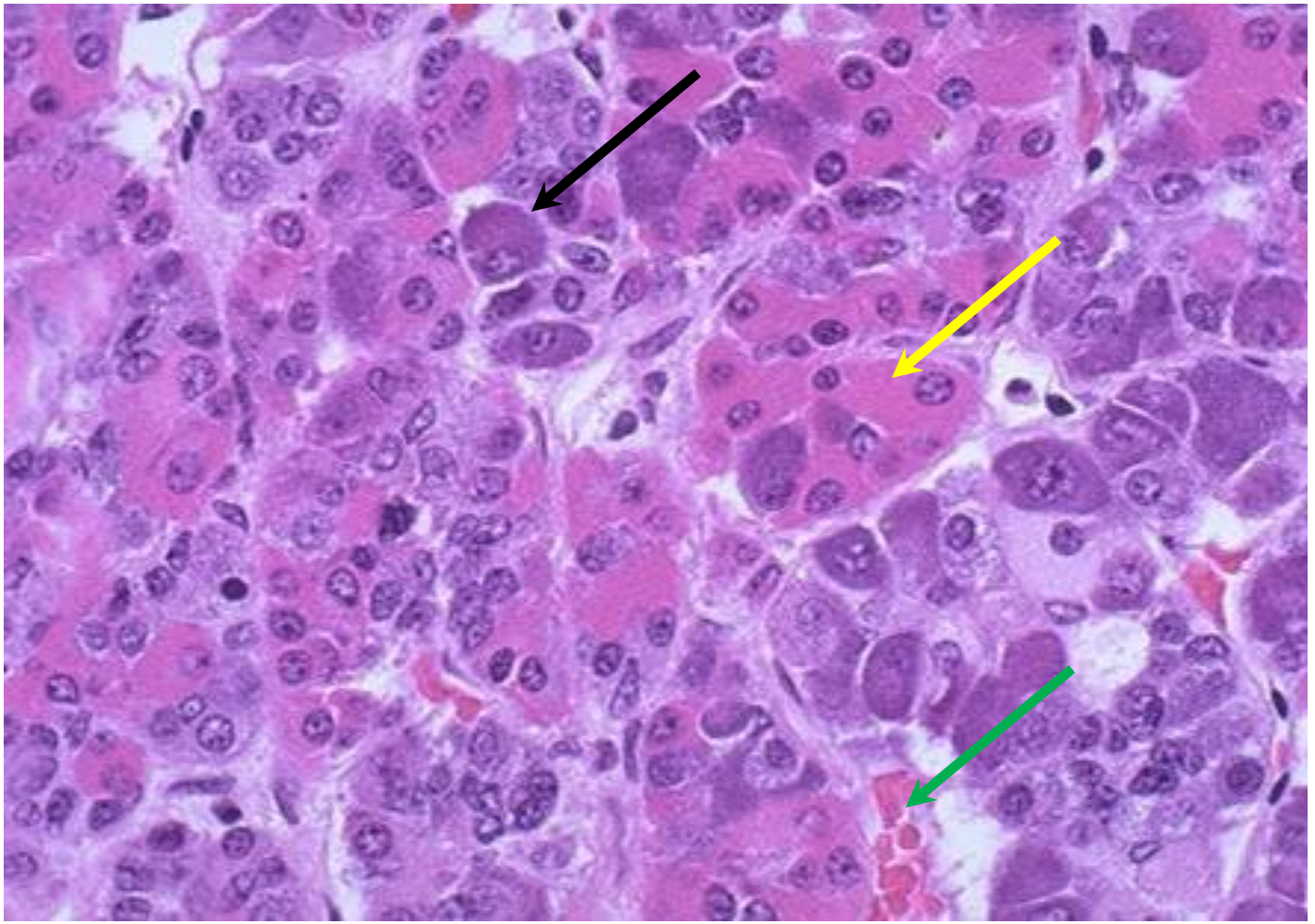



9. Identify this organ
10. Identify the region indicated by the arrow
11. Identify the region indicated by the arrow
12. What does this region (#11) produce?




1. Identify this organ
2. Identify the entire structure indicated by the arrow
3. Identify the material indicated by the arrows
4. Identify the granules indicated by the pointer

3



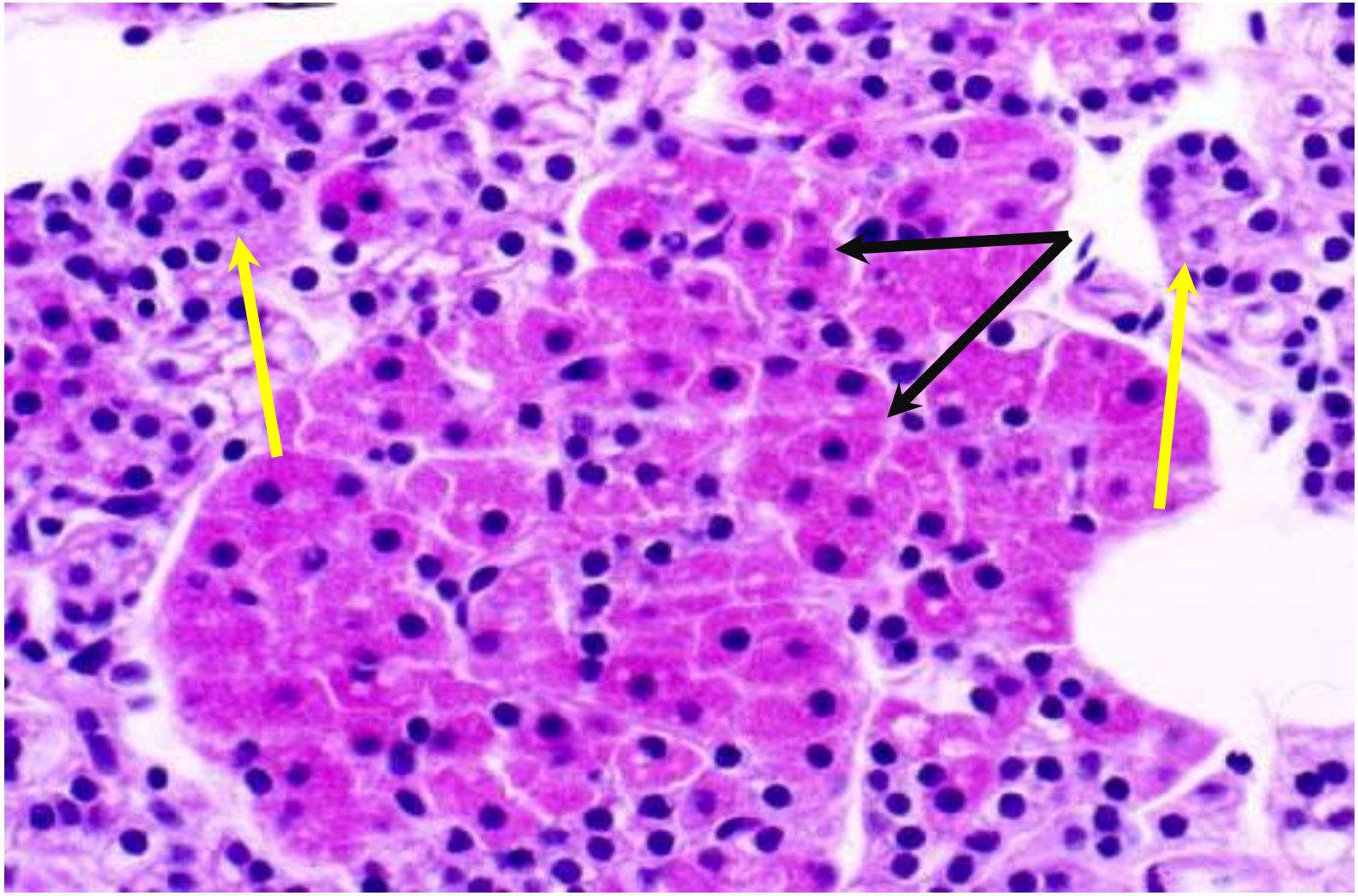
1- Identify this organ.

2-The black arrow points to.....cells, their percentage is....

3-The yellow arrow points to.... cells, their percentage is.....

4- The green arrow points to.....

4

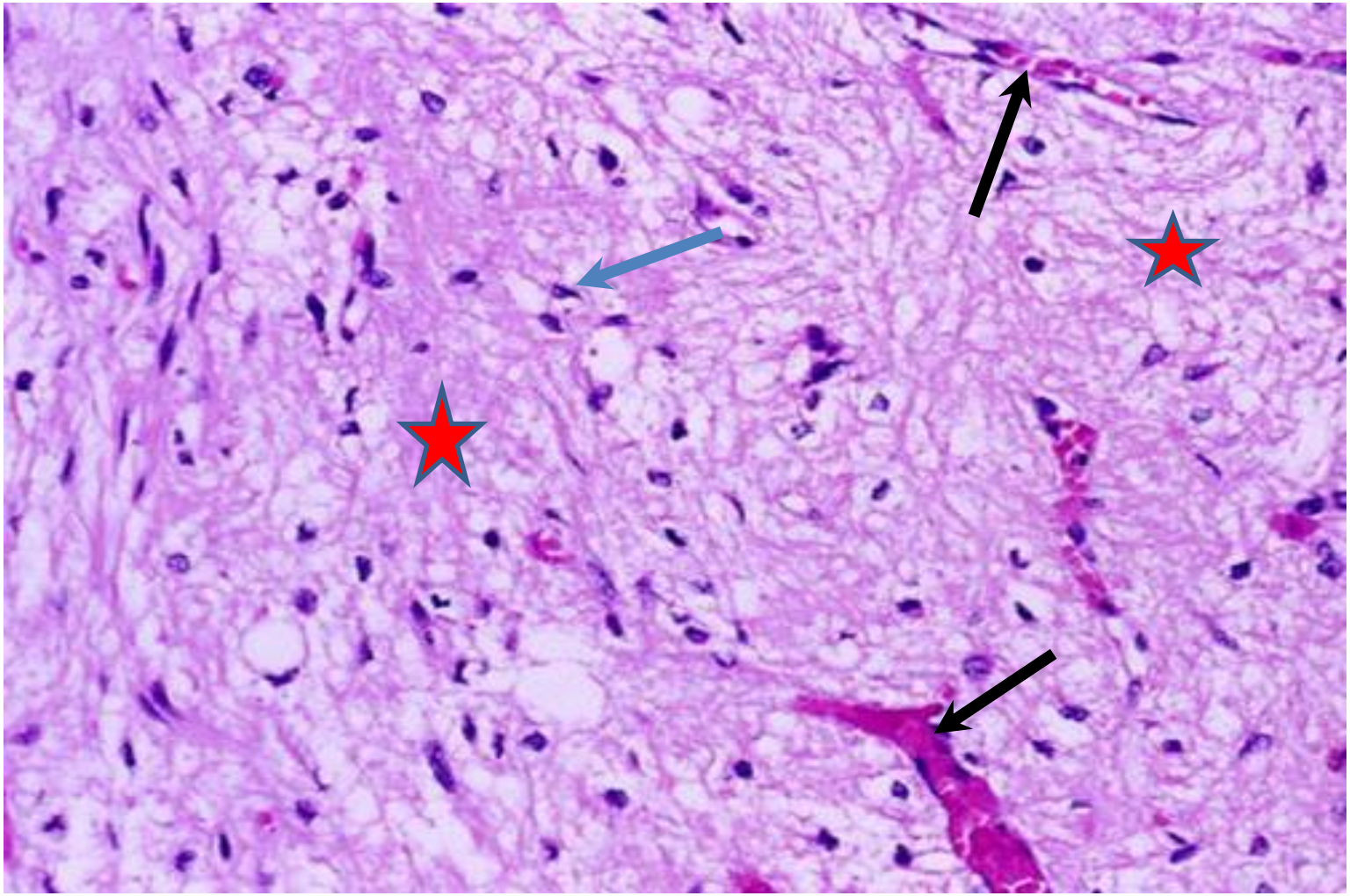


This is a section in the parathyroid gland .

1- Identify the cells indicated by the black arrows.

2- Identify the cells indicated by the yellow arrows.

5



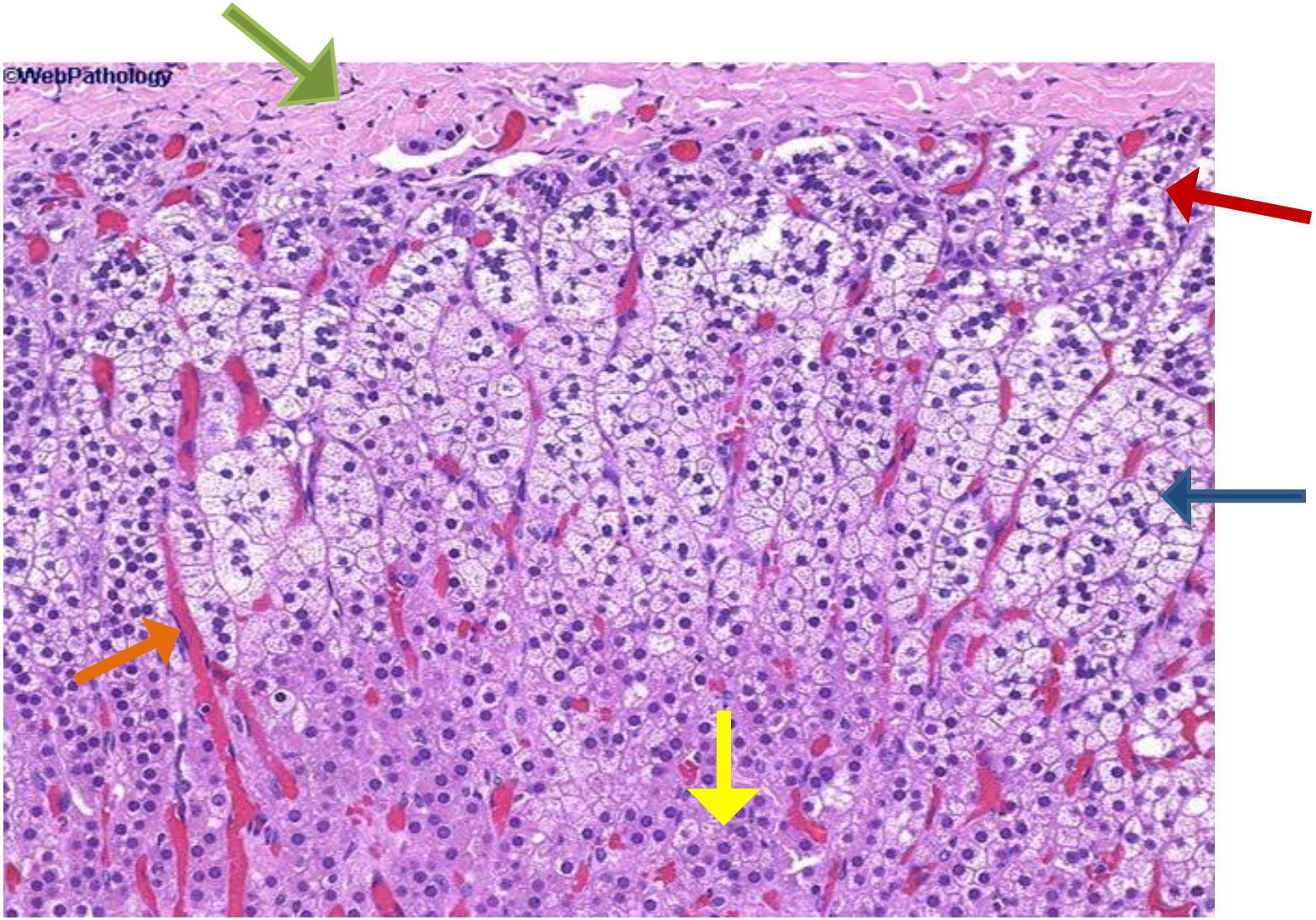
1- This section is in the .....of the pituitary gland.

2- The black arrows point to.....

3- The blue arrow points to.....

4- The astrix points to.....

(6)

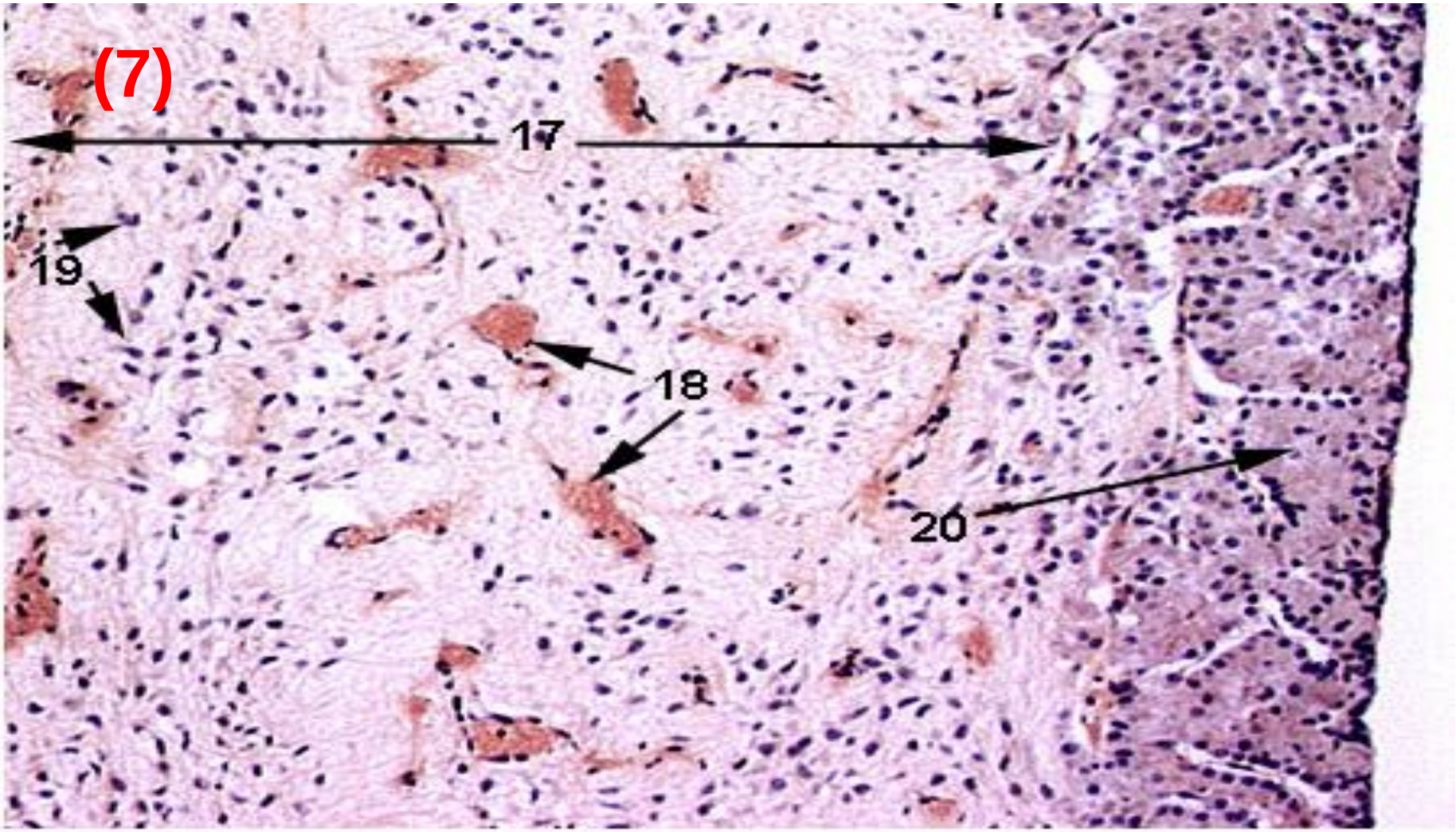



**Identify the organ.**

**The red arrow points to....while the green one points to.....**

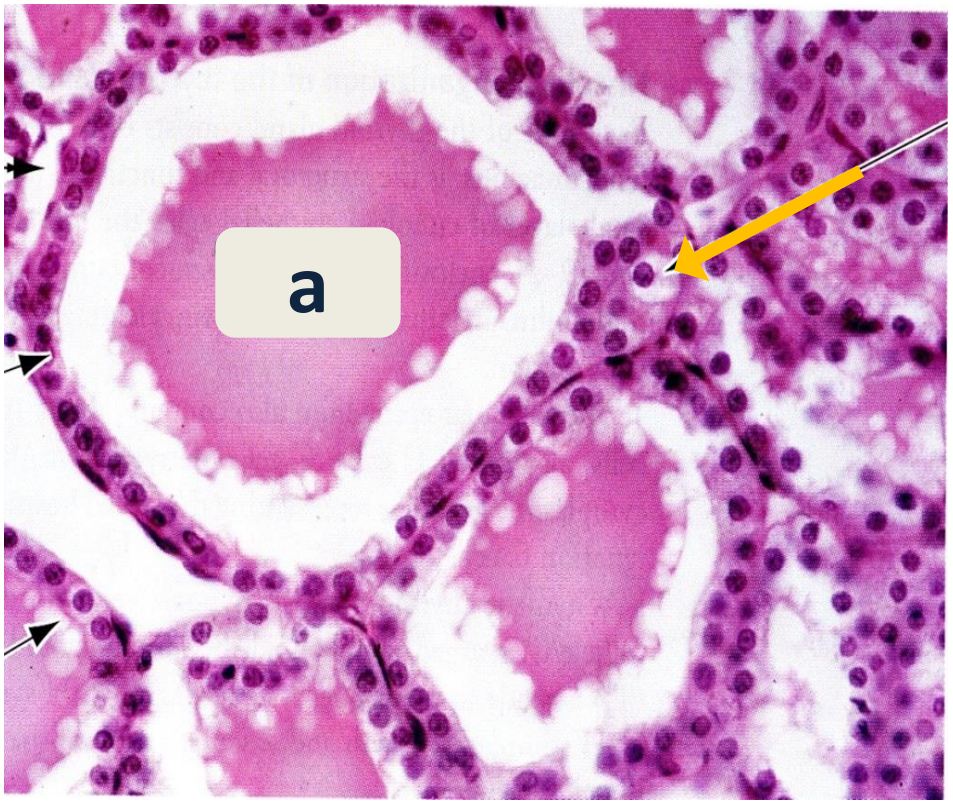
**The blue arrow points to .....which secrete ....**

**The yellow arrow points to .....while the orange arrow points to....**




17. Identify the region of the organ
18. Identify the structures indicated by the arrow
19. Identify the cells indicated by the arrows
20. Identify the region of the organ

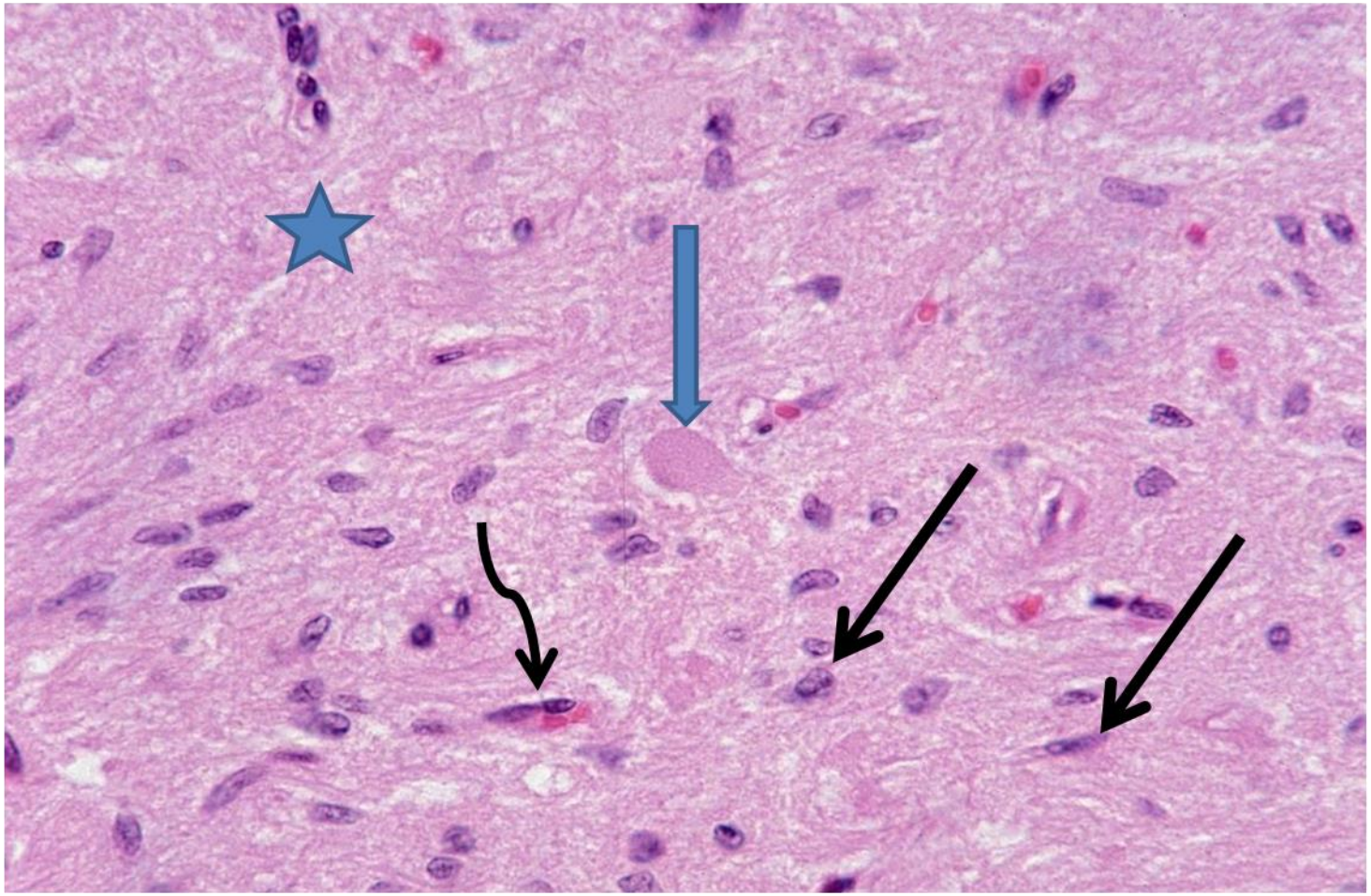
**(8)**





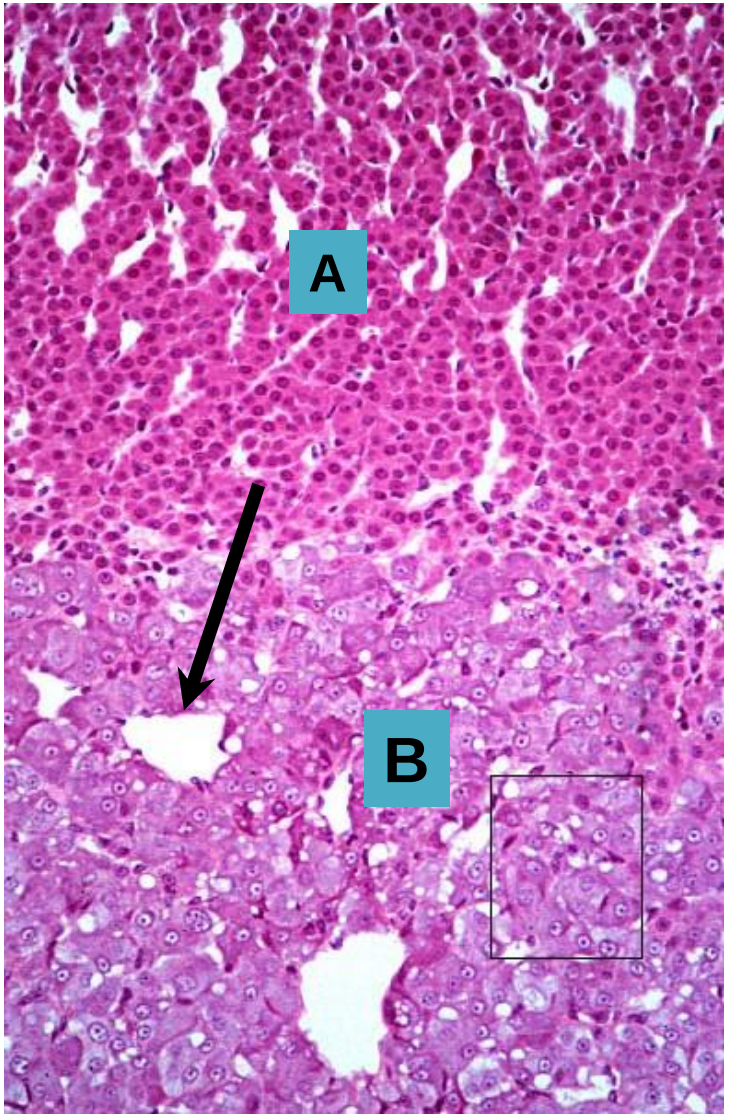
**1- Identify the organ.**
**2- The material indicated by letter a is……**
**3- The yellow arrow points to ……..and the blue arrow points to……**

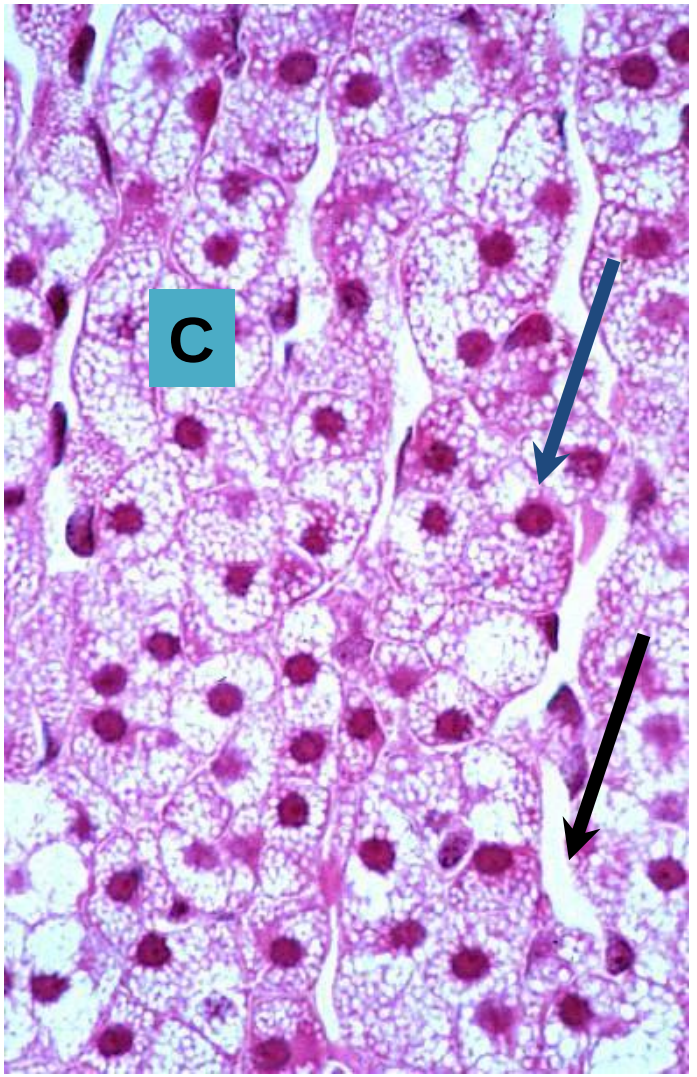
(9)



1- Identify this part of the pituitary gland.
2- Black arrows point to……while curved arrow points to…..
3-Blue arrow points to……..and the star indicates……..

(10)



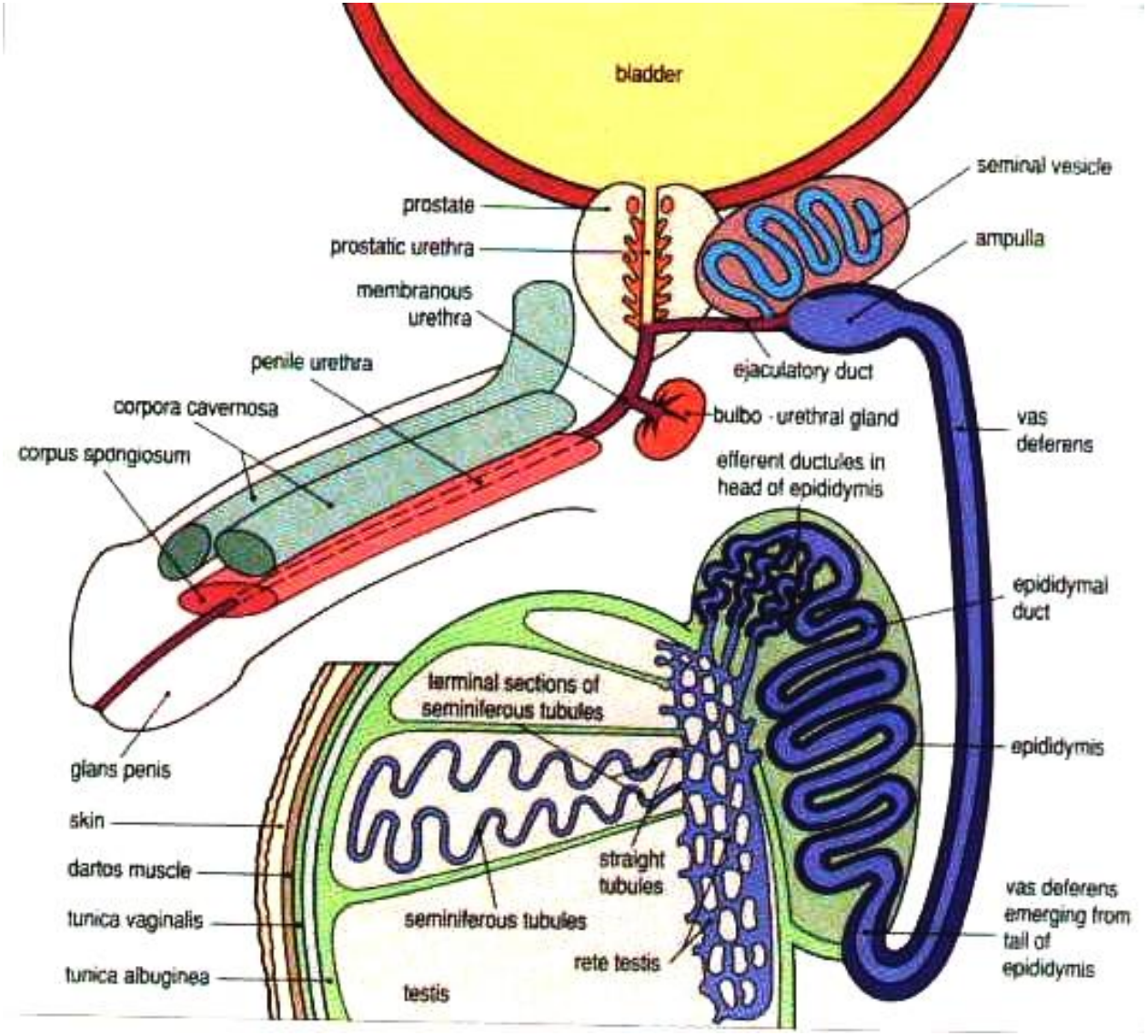

**1- Identify the gland.**
**2- Identify different regions A, B & C.**
**3- The blue arrow point to…….The black arrows points to…..**

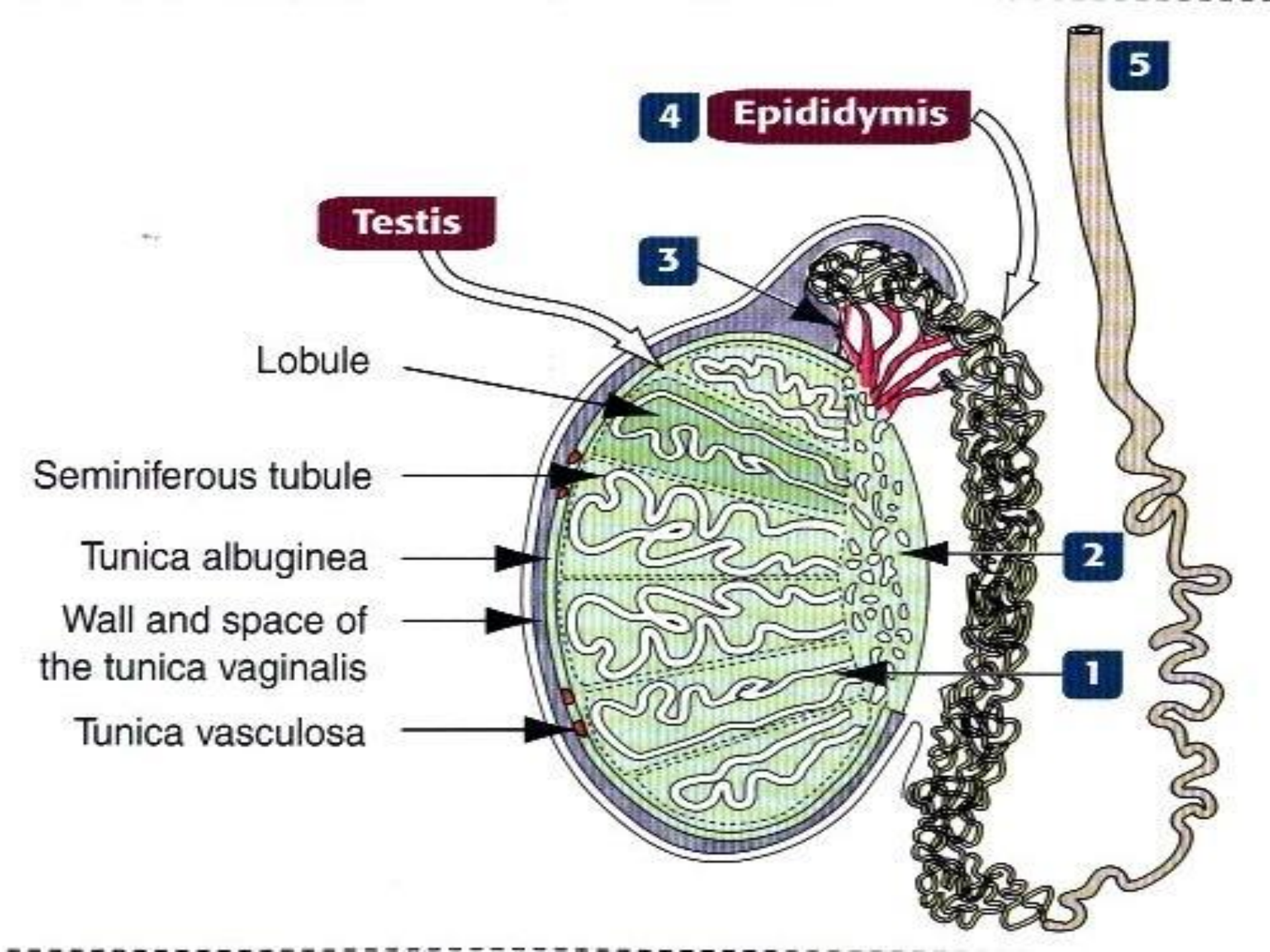


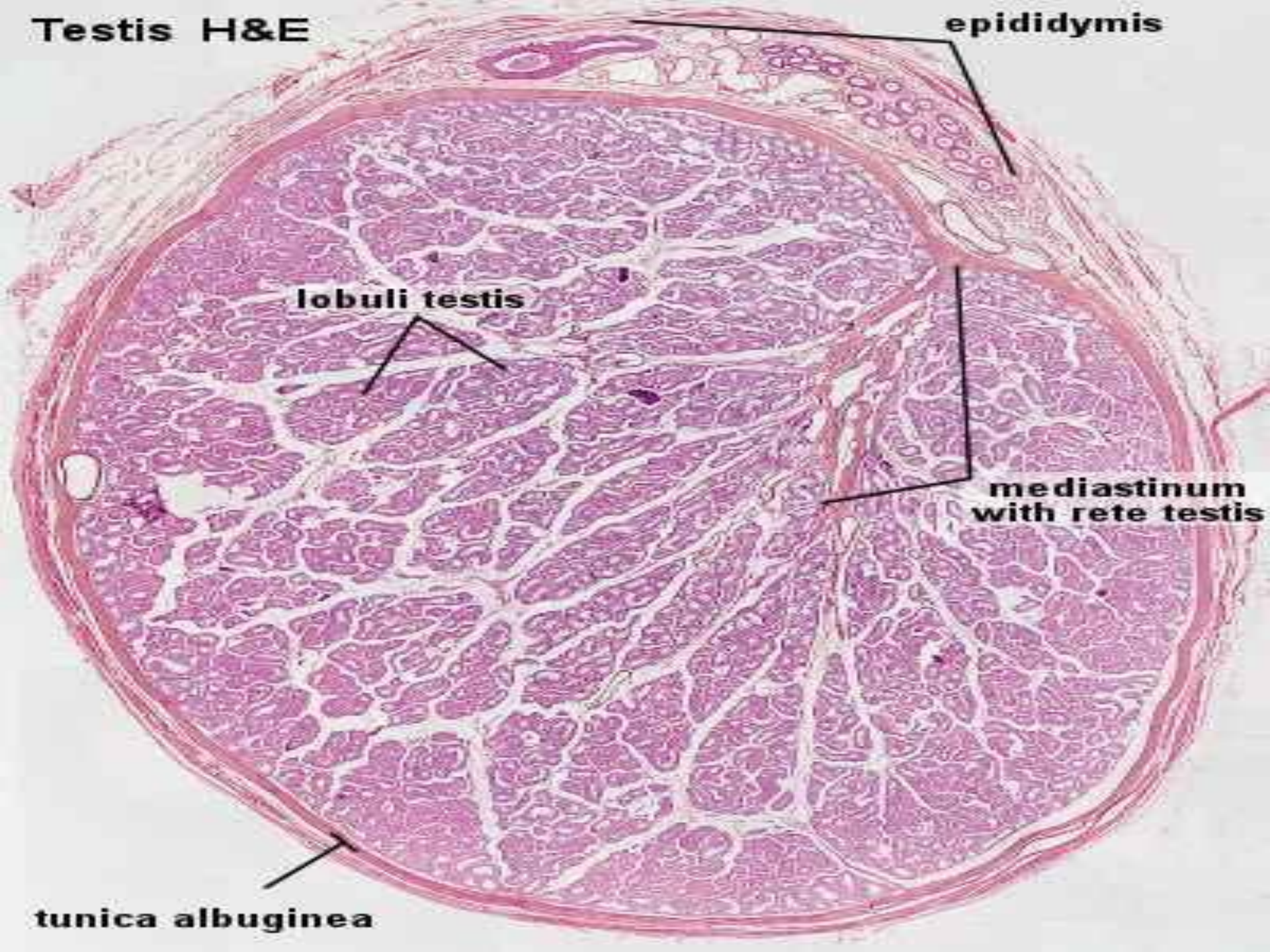
# Male Genital system

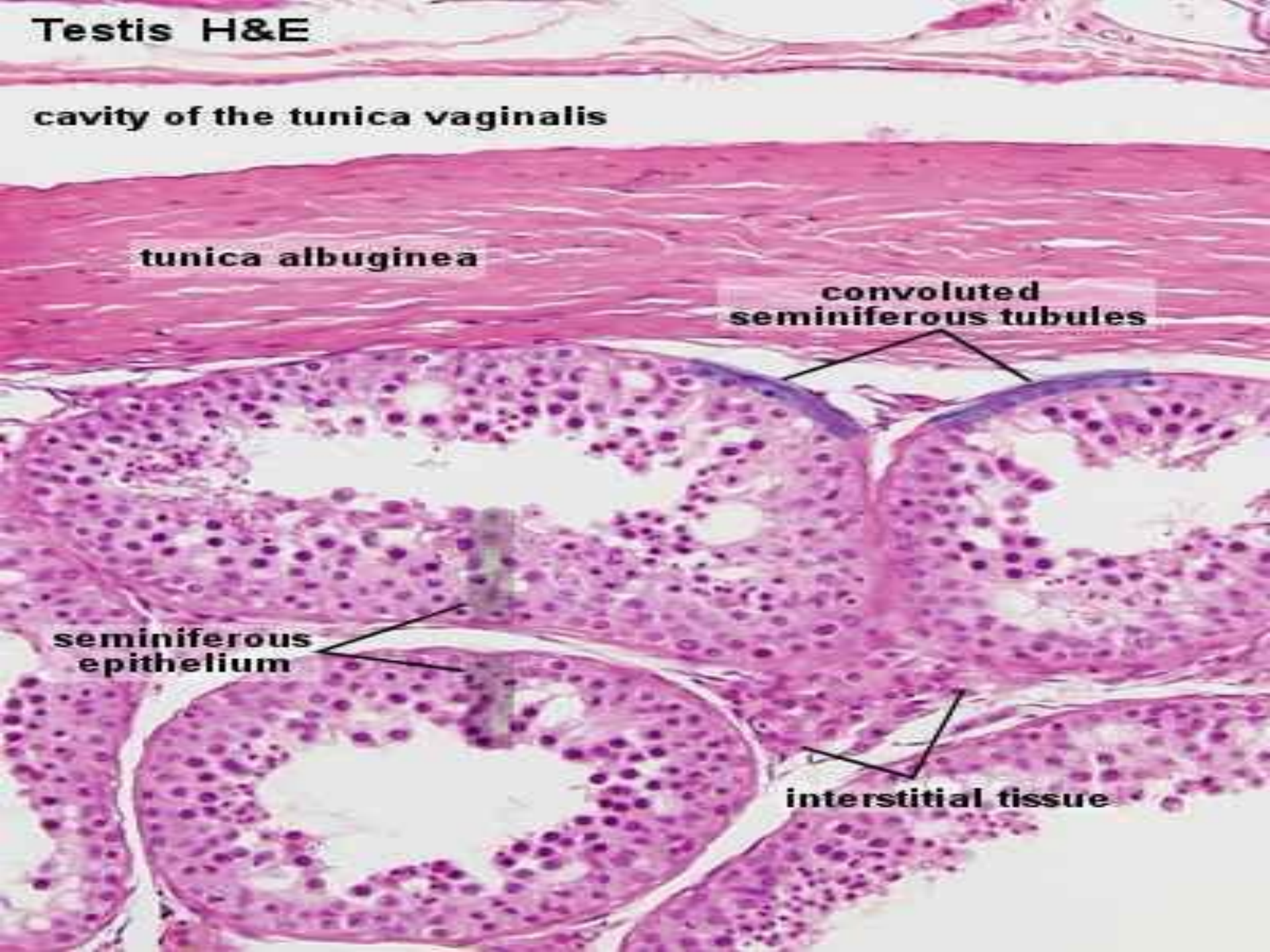
Practical

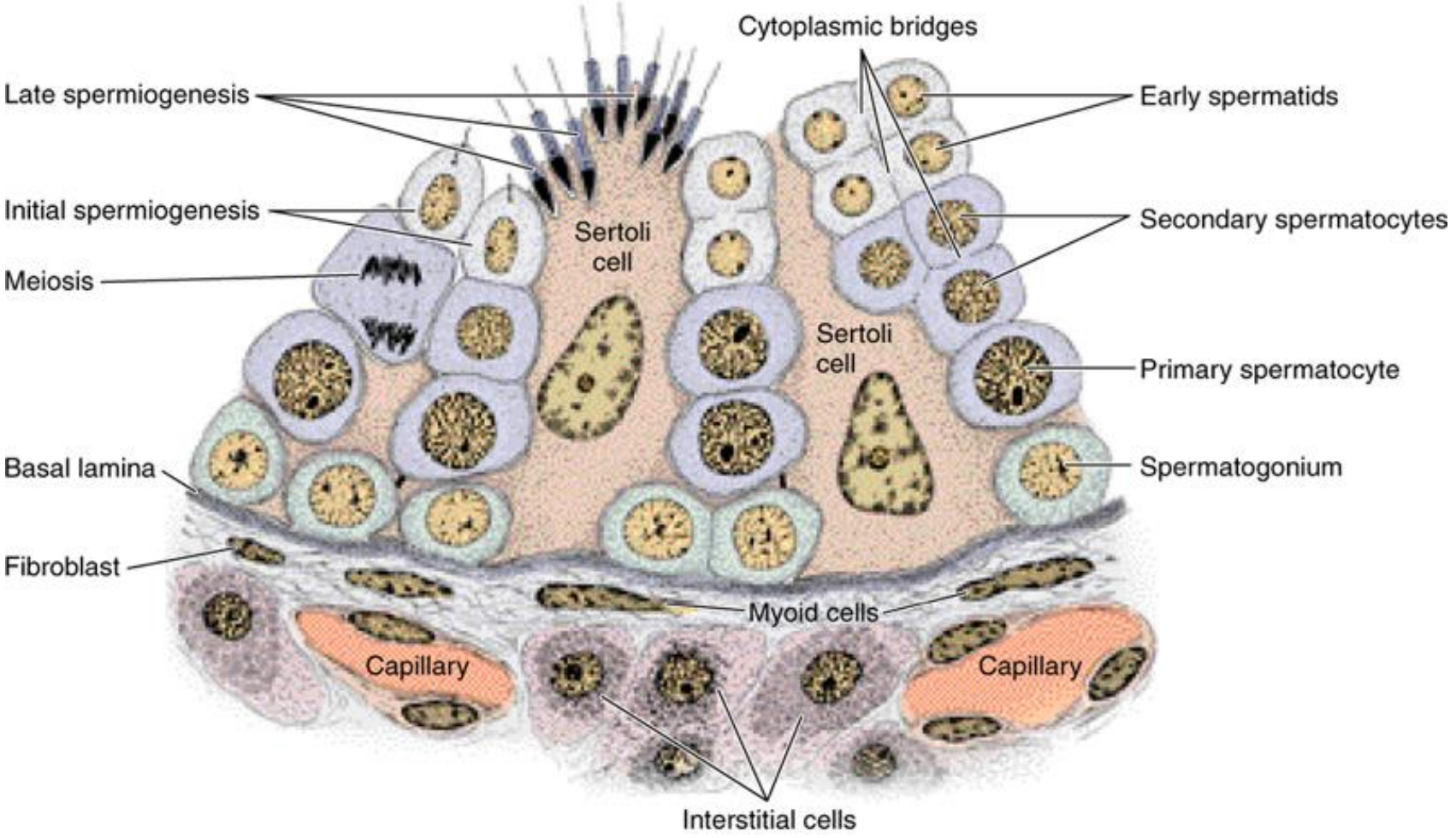
# The Male Reproductive System

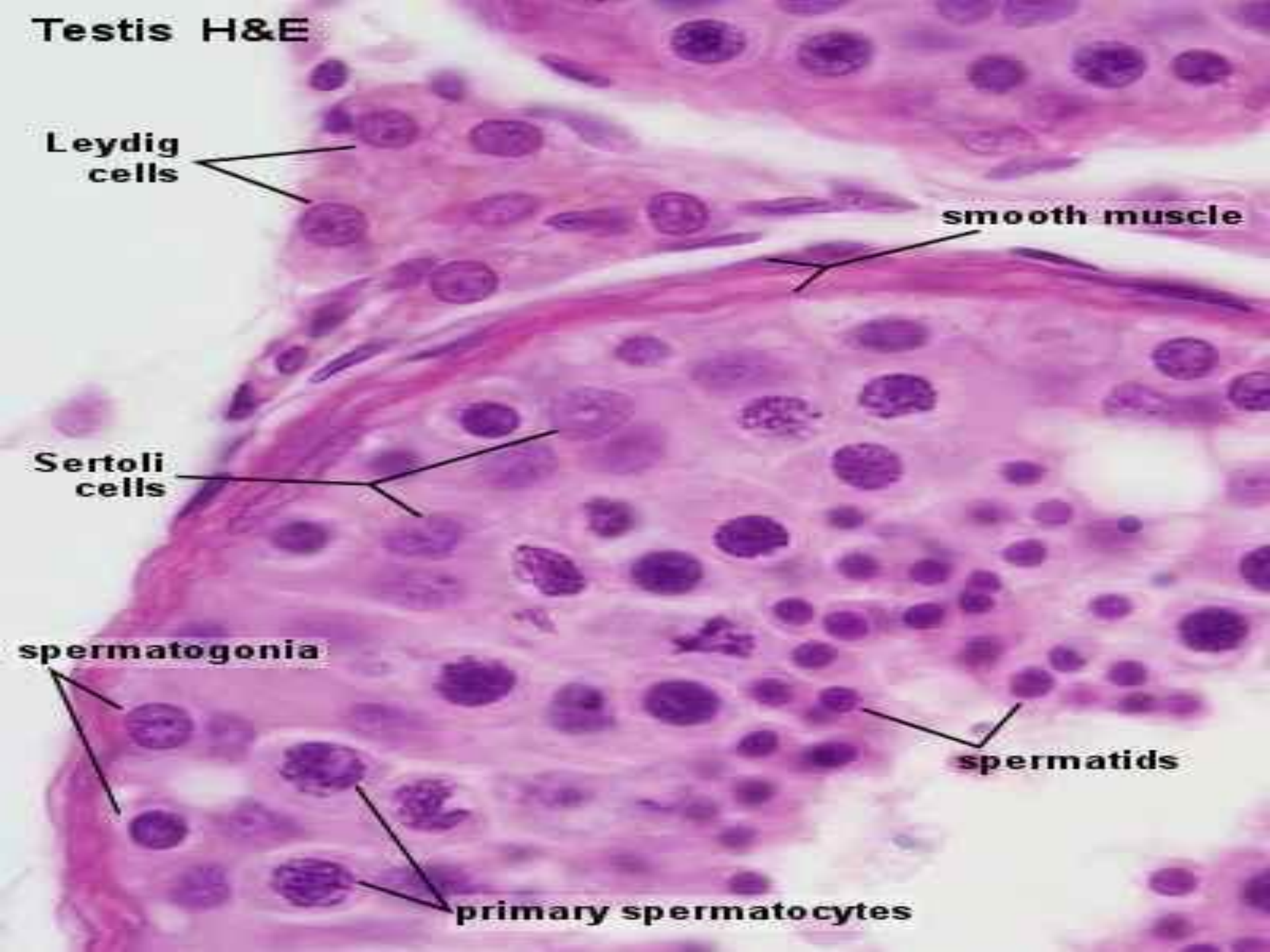


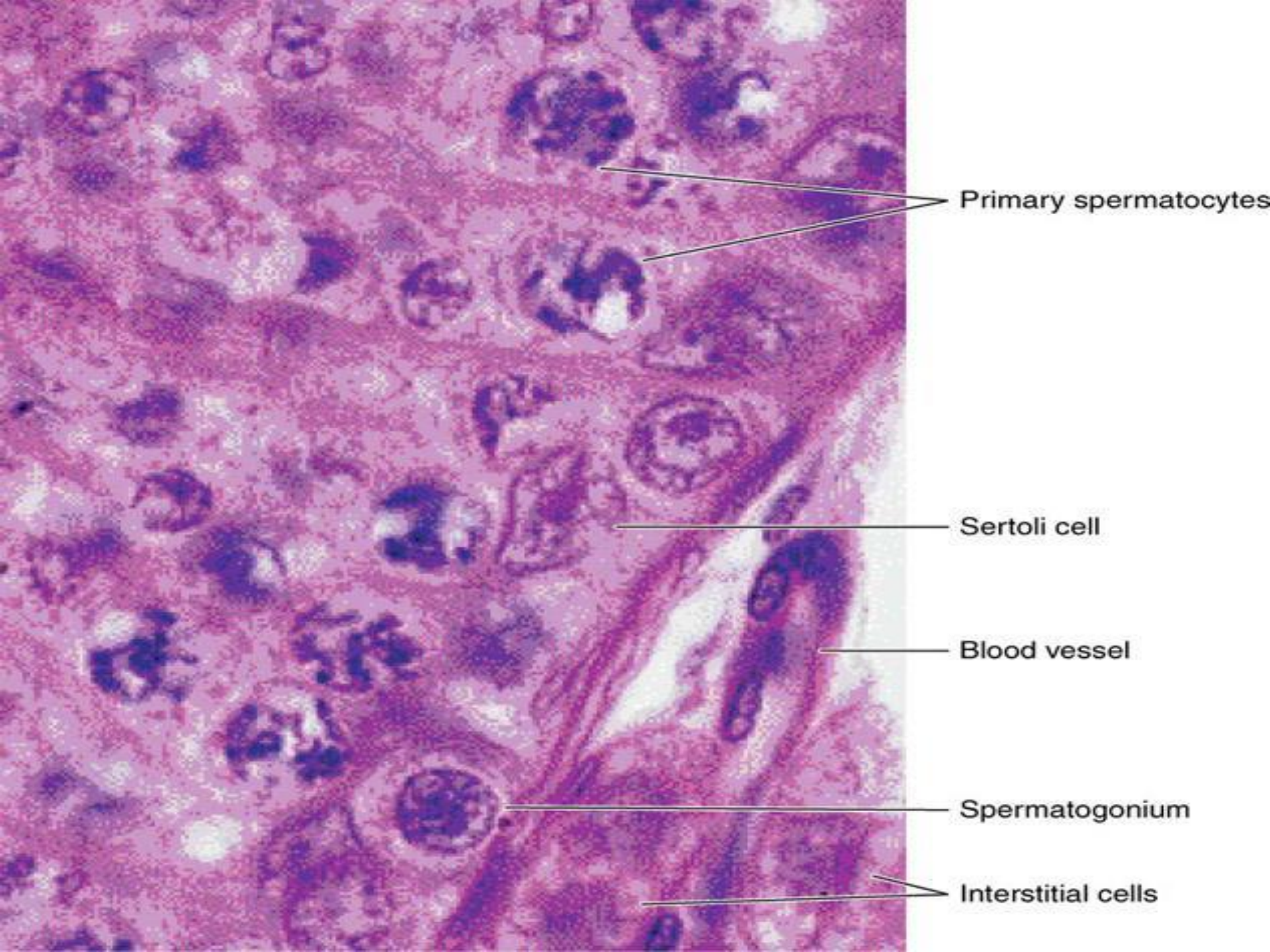

Testis
4
Epididymis
5
3
Lobule
Seminiferous tubule
Tunica albuginea
Wall and space of the tunica vaginalis
Tunica vasculosa
2
1

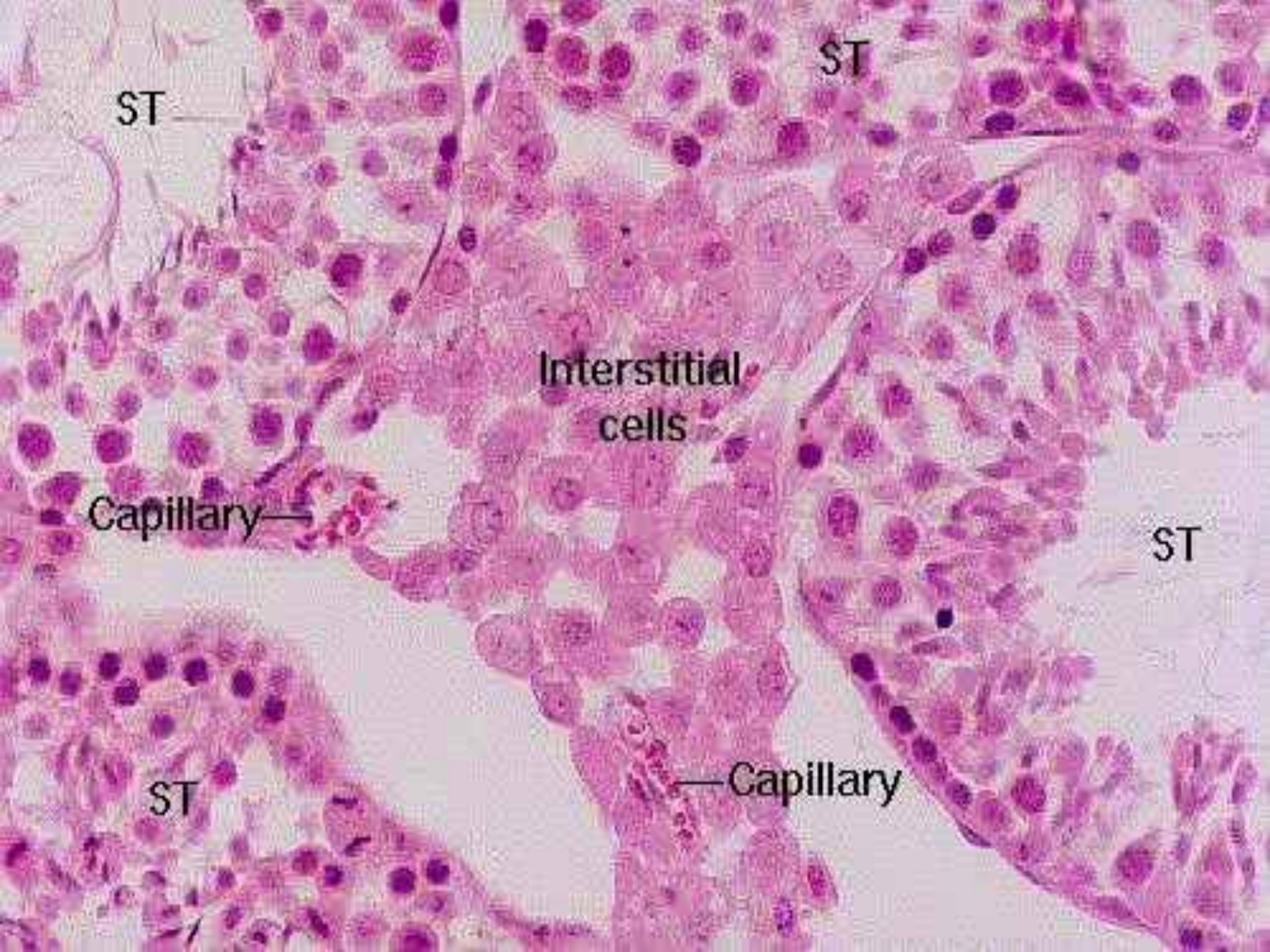

Testis H&E
epididymis
lobuli testis
mediastinum
with rete testis
tunica albuginea


Testis H&E
cavity of the tunica vaginalis
tunica albuginea
convoluted
seminiferous tubules
seminiferous
epithelium
interstitial tissue

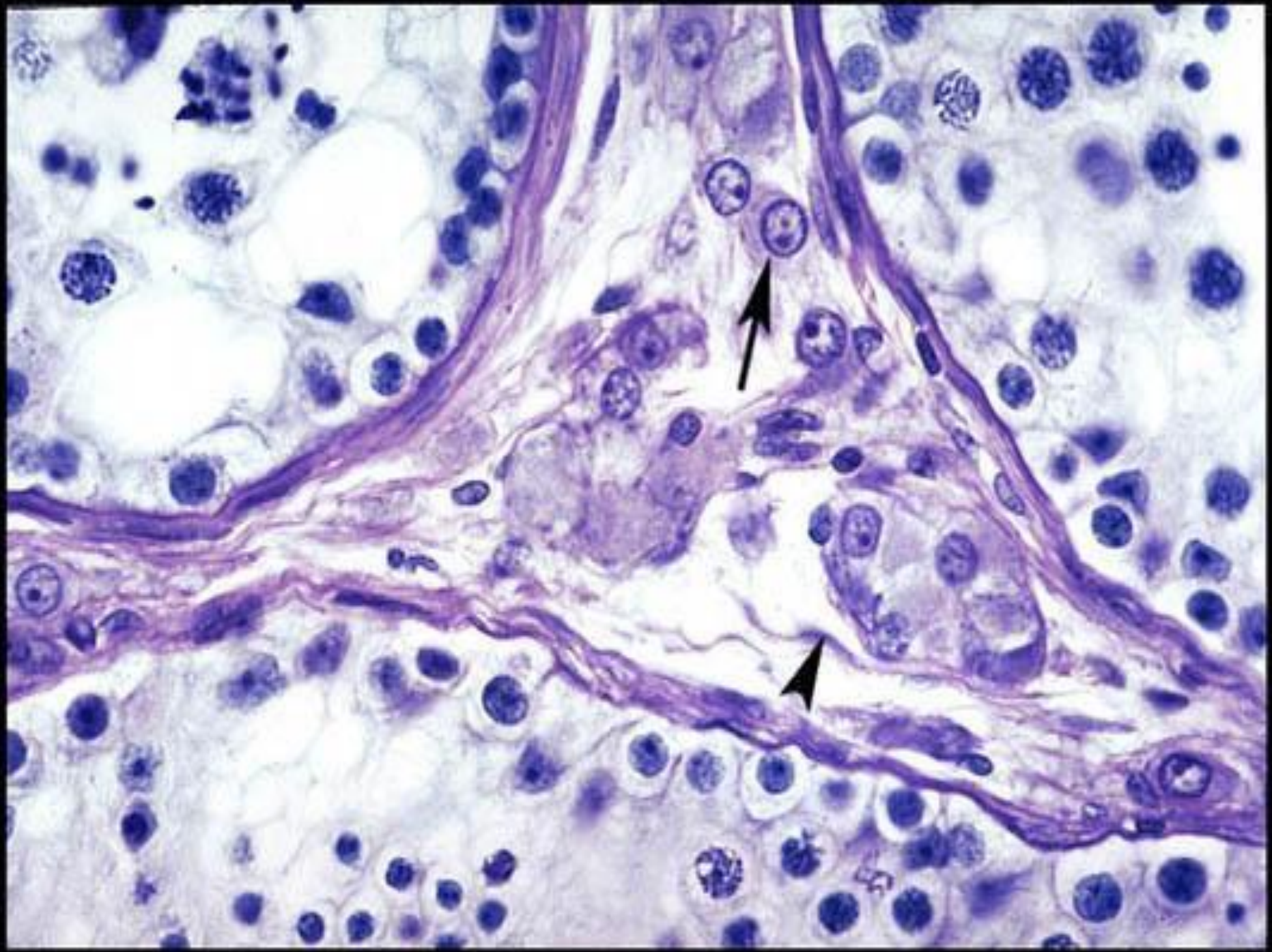

Cytoplasmic bridges
Late spermiogenesis
Early spermatids
Initial spermiogenesis
Secondary spermatocytes
Sertoli cell
Meiosis
Sertoli cell
Primary spermatocyte
Basal lamina
Spermatogonium
Fibroblast
Myoid cells
Capillary
Capillary
Interstitial cells

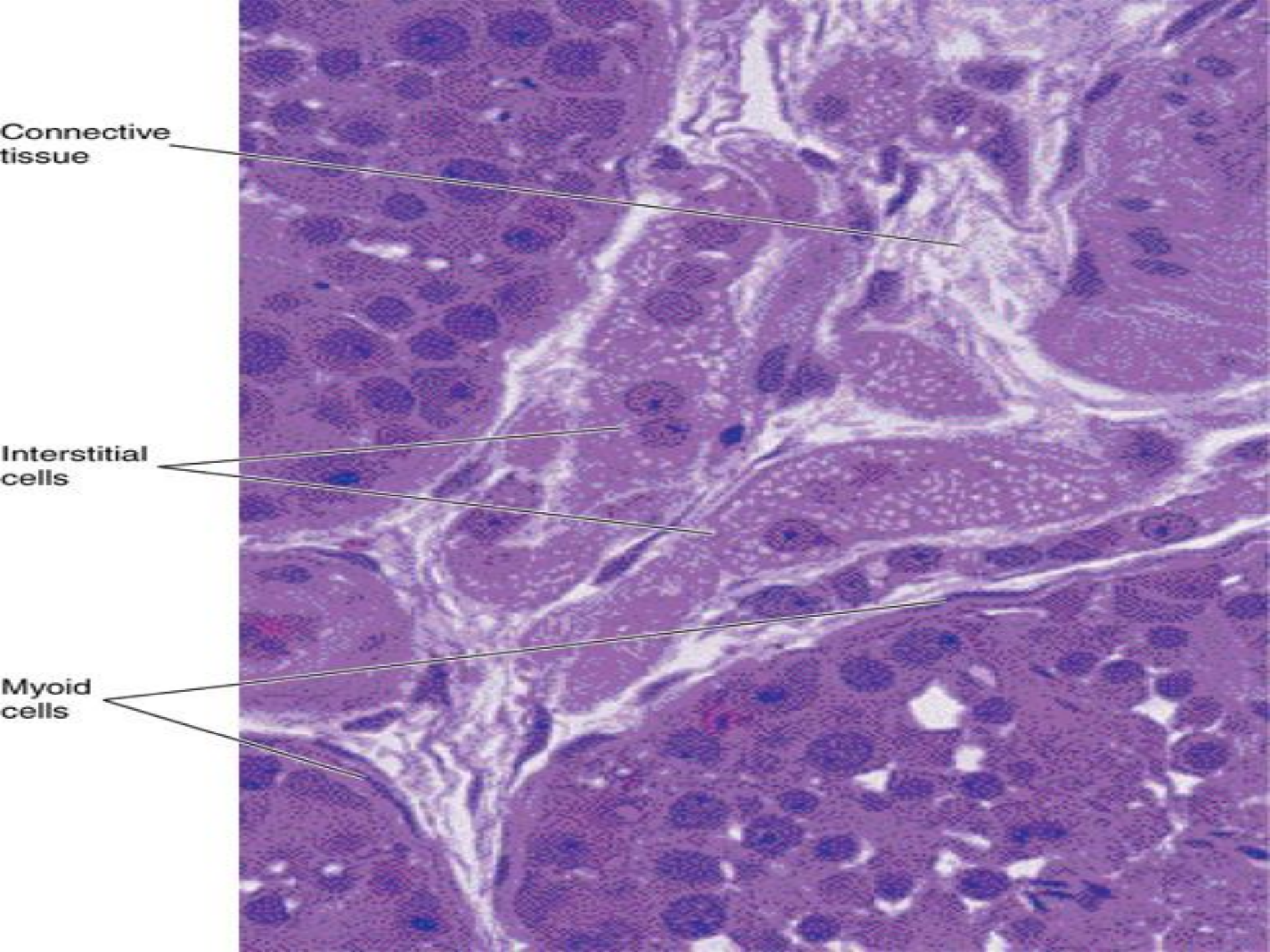

Testis H&E
Leydig cells
smooth muscle
Sertoli cells
spermatogonia
spermatids
primary spermatocytes

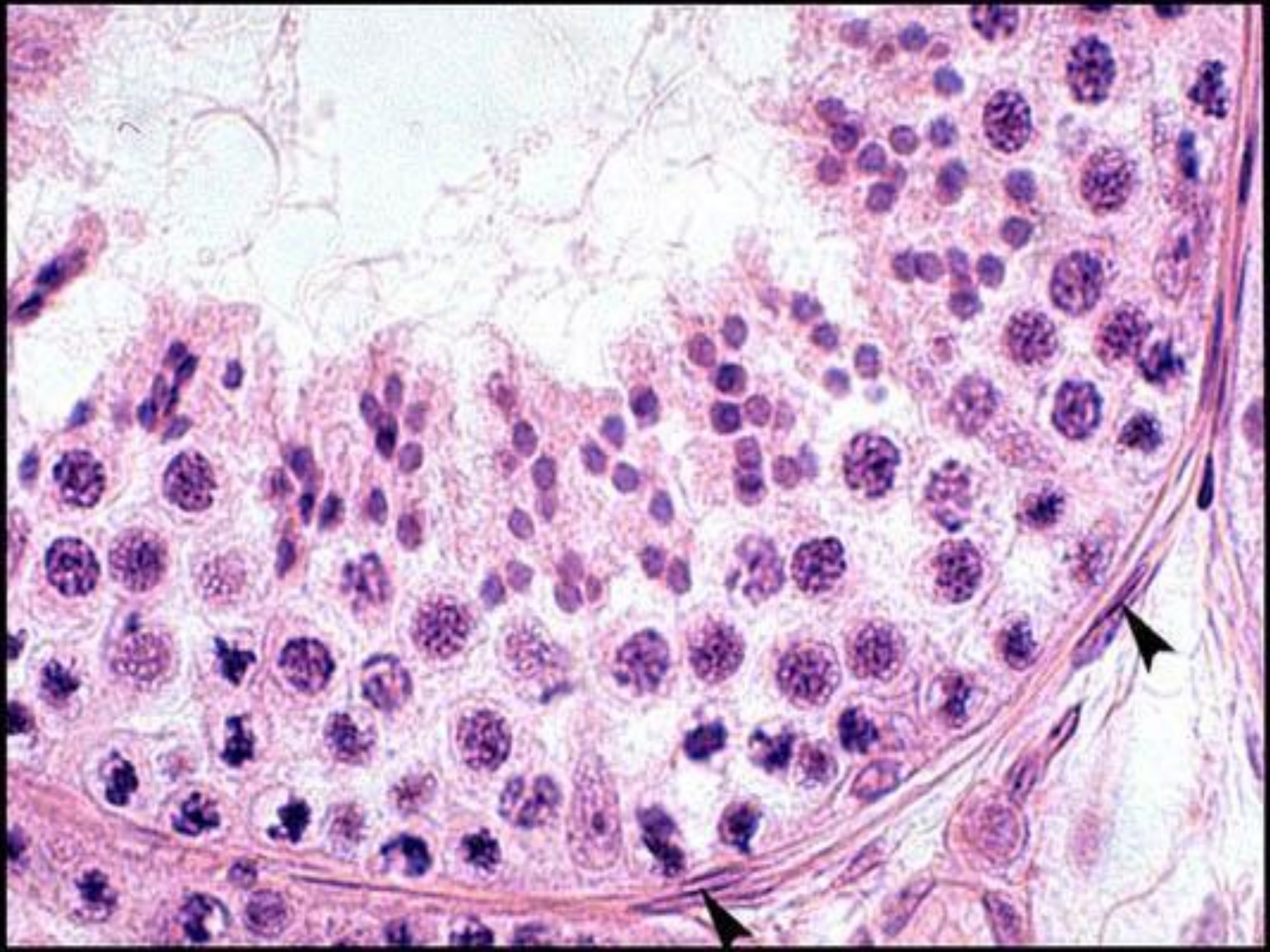

Primary spermatocytes
Sertoli cell
Blood vessel
Spermatogonium
Interstitial cells

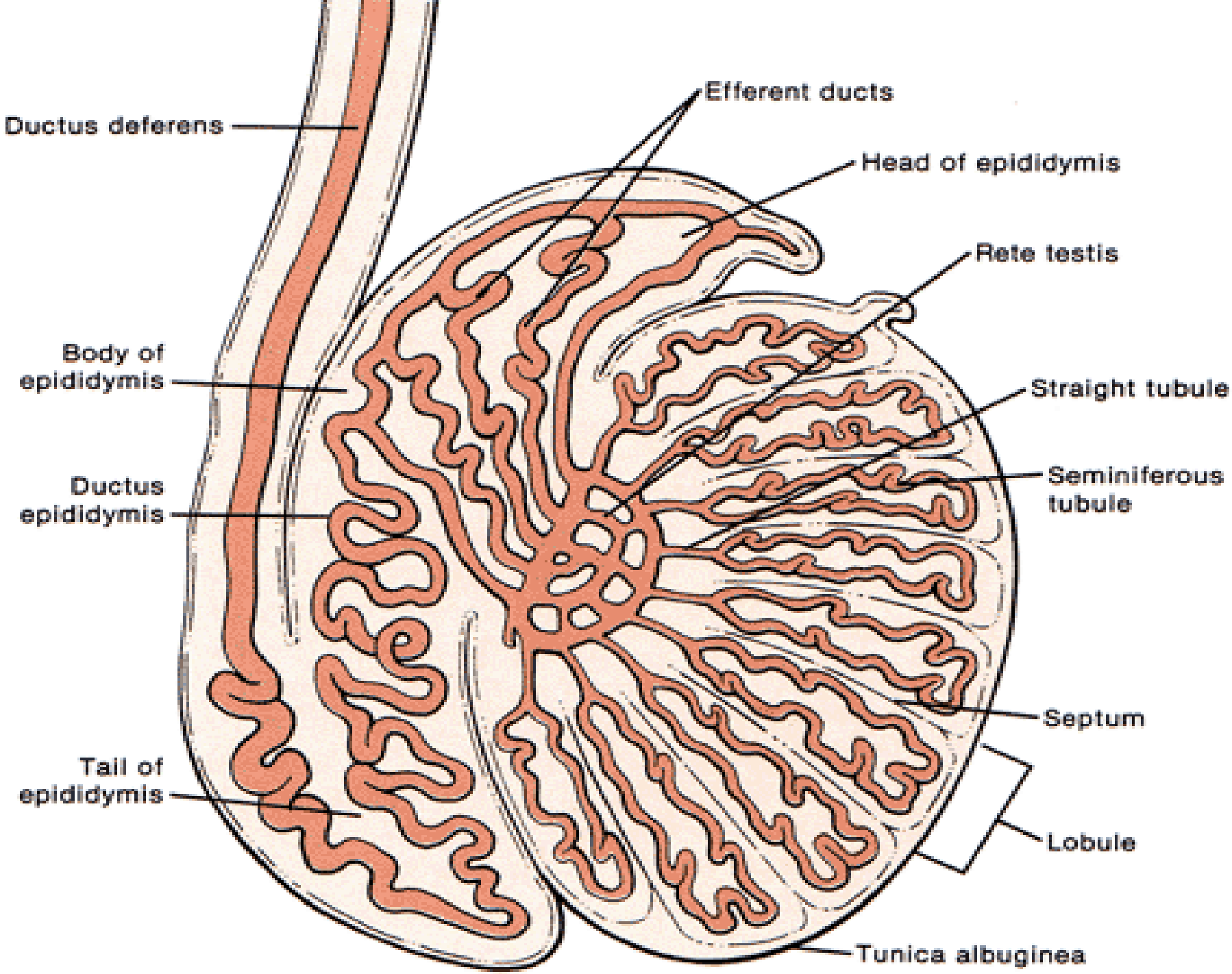

ST
ST
Interstitial cells
Capillary
ST
ST
Capillary


Myoid cell
Sertoli cells
Interstitial cell
spermatogonium
Primary spermatocy
Sertoli cell
spermatid

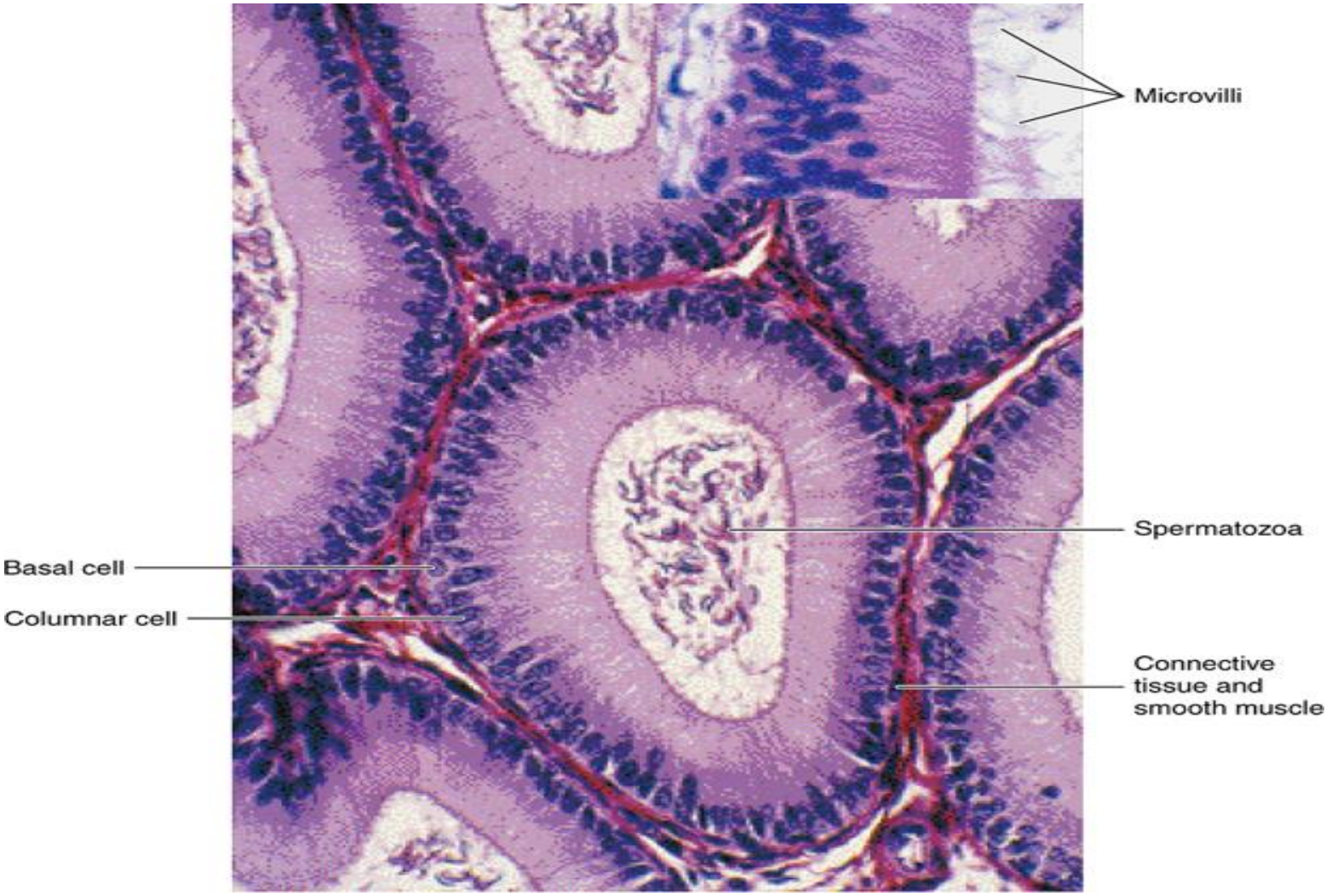



Connective tissue
Interstitial cells
Myoid cells

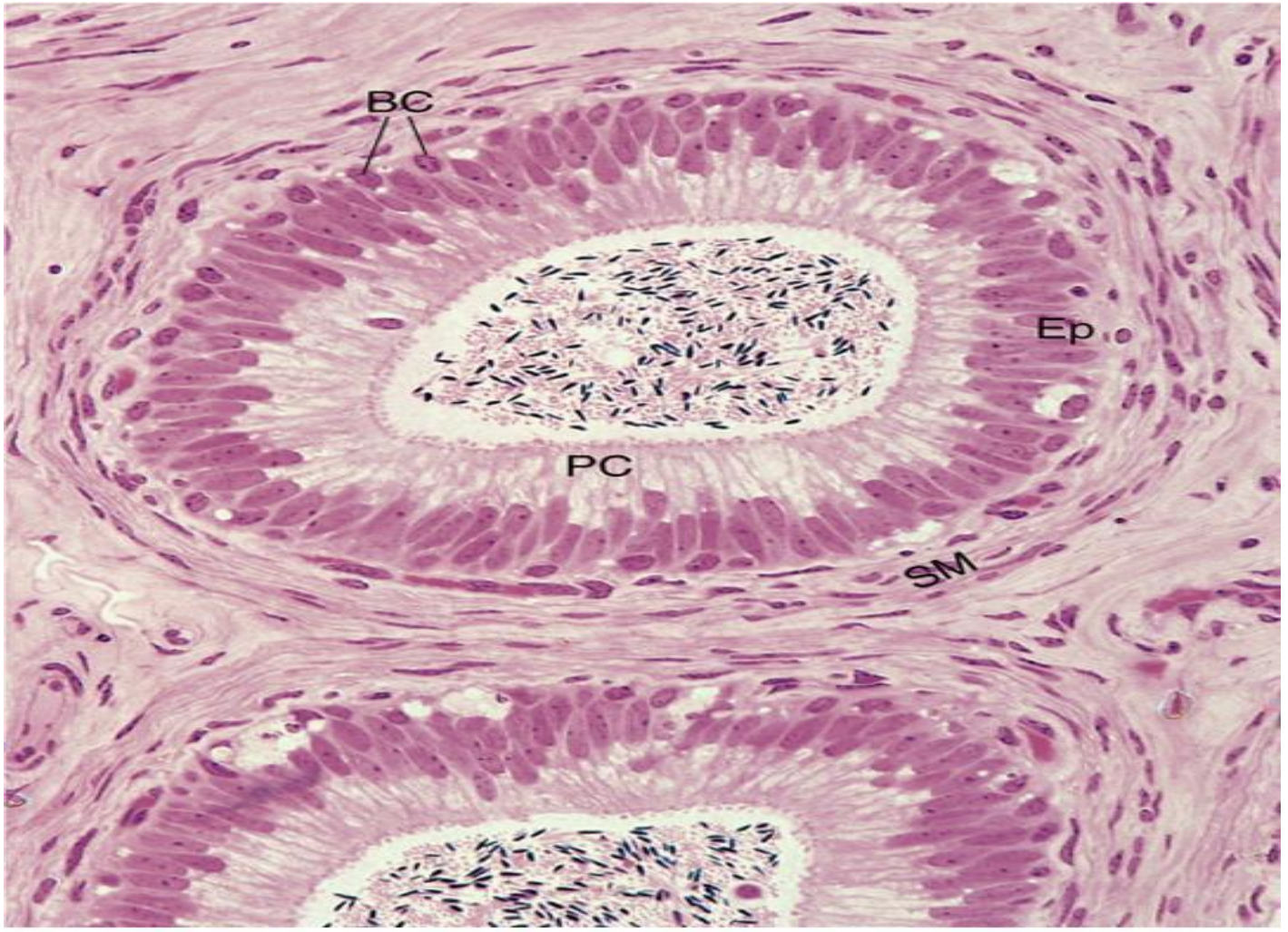


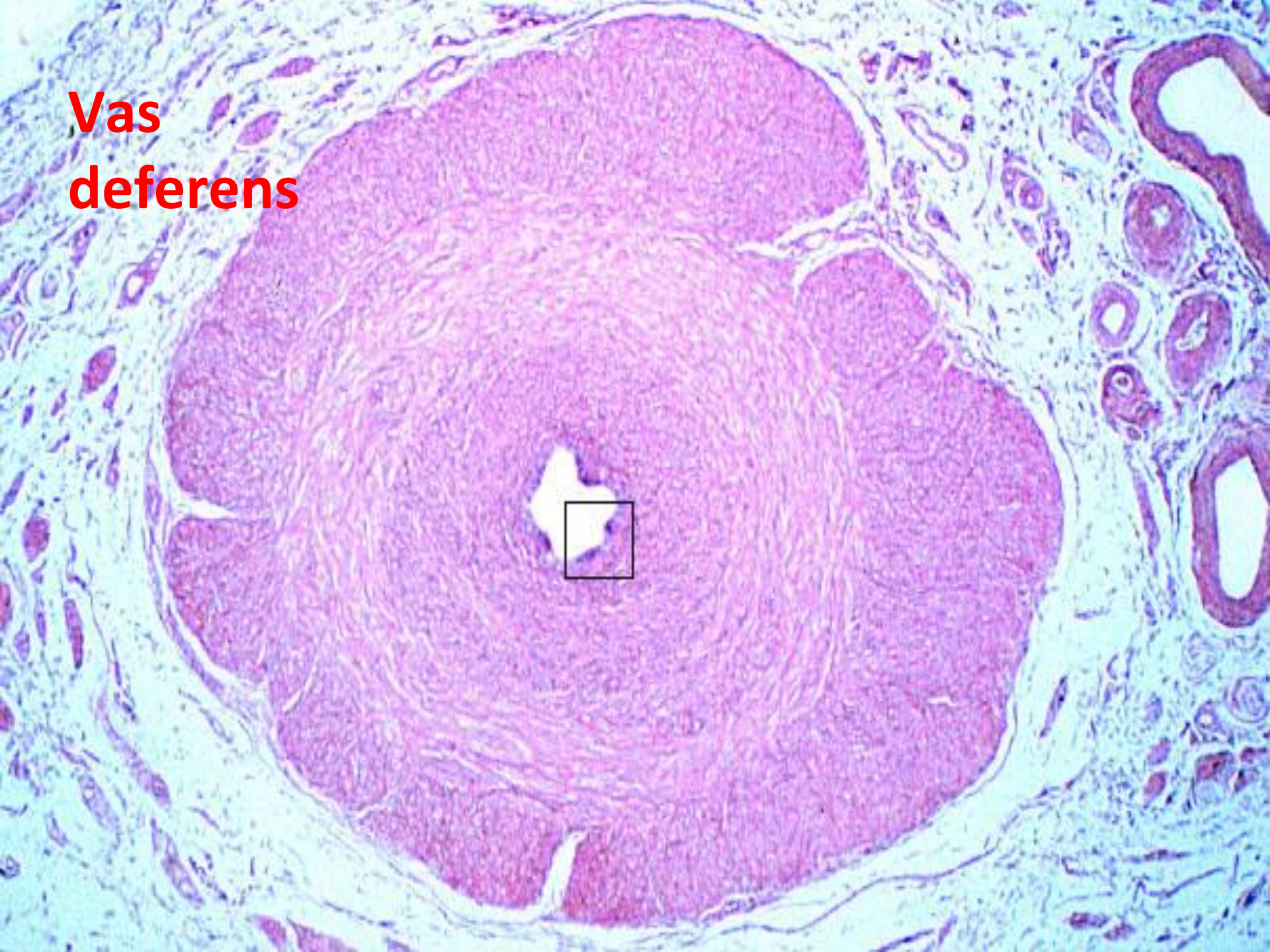

Ductus deferens
Efferent ducts
Head of epididymis
Rete testis
Body of epididymis
Straight tubule
Ductus epididymis
Seminiferous tubule
Septum
Tail of epididymis
Lobule
Tunica albuginea

# epididymis

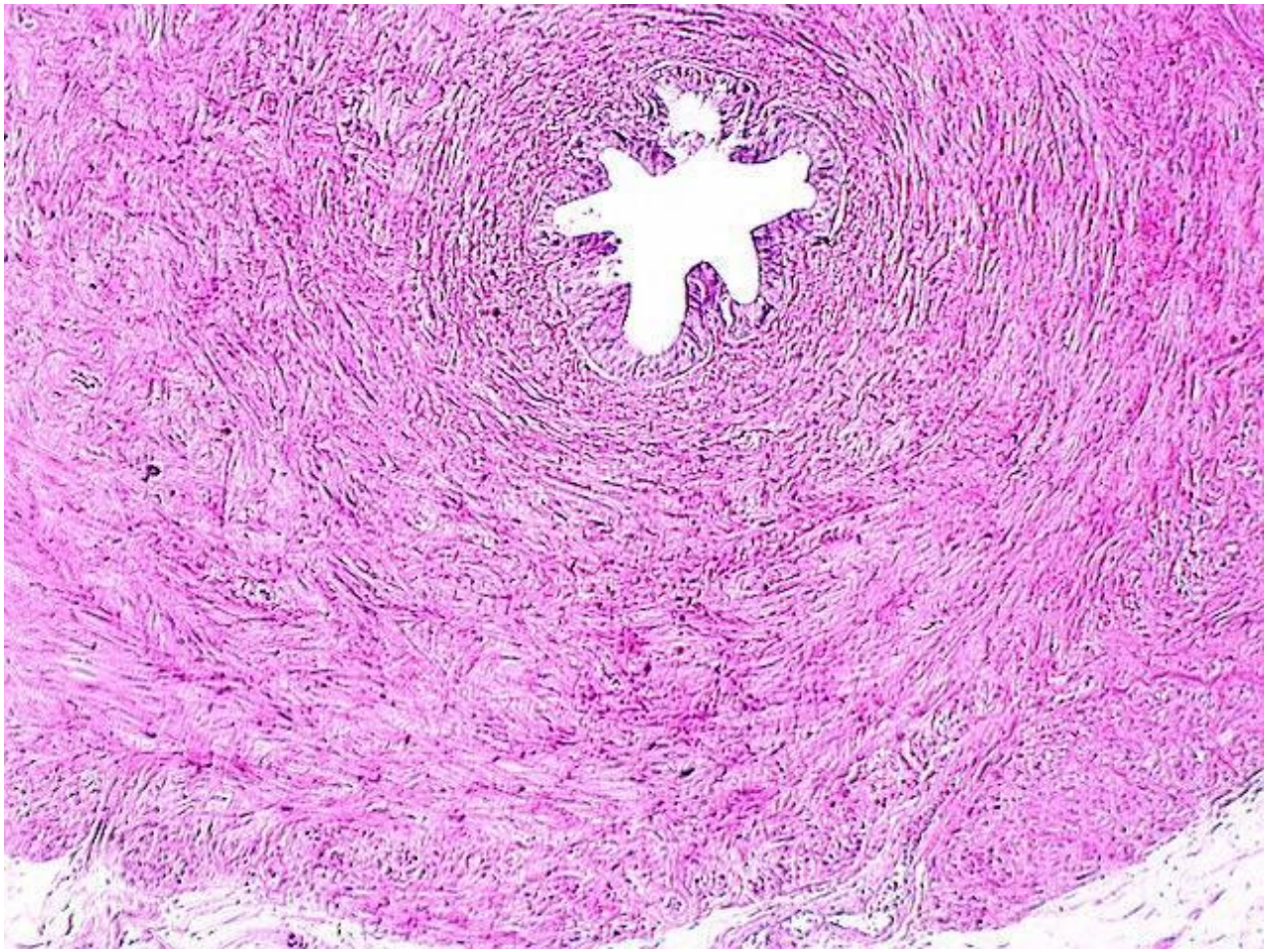

Microvilli
Spermatozoa
Basal cell
Columnar cell
Connective tissue and smooth muscle

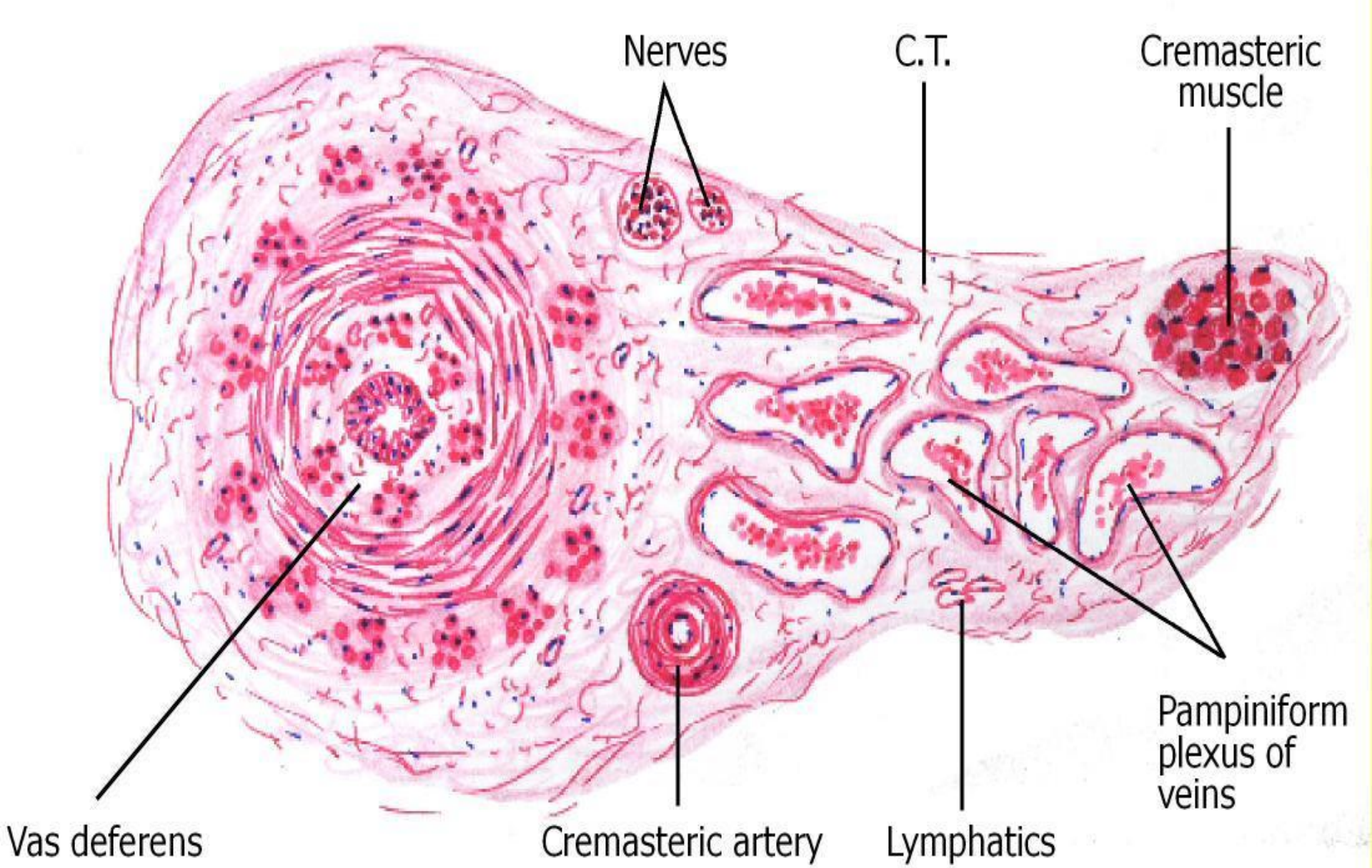
# epididymis




Vas
deferens

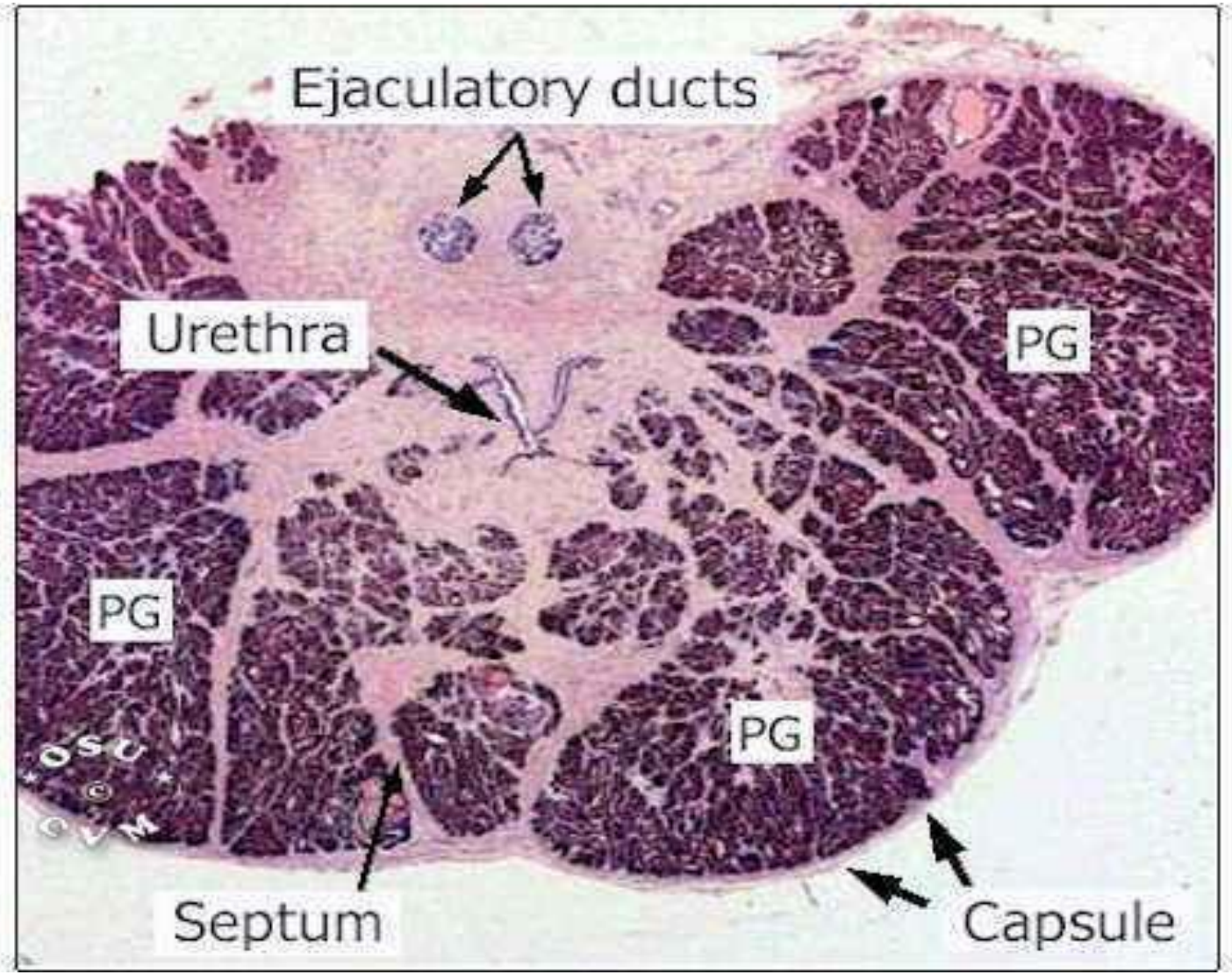
# Vas deferens

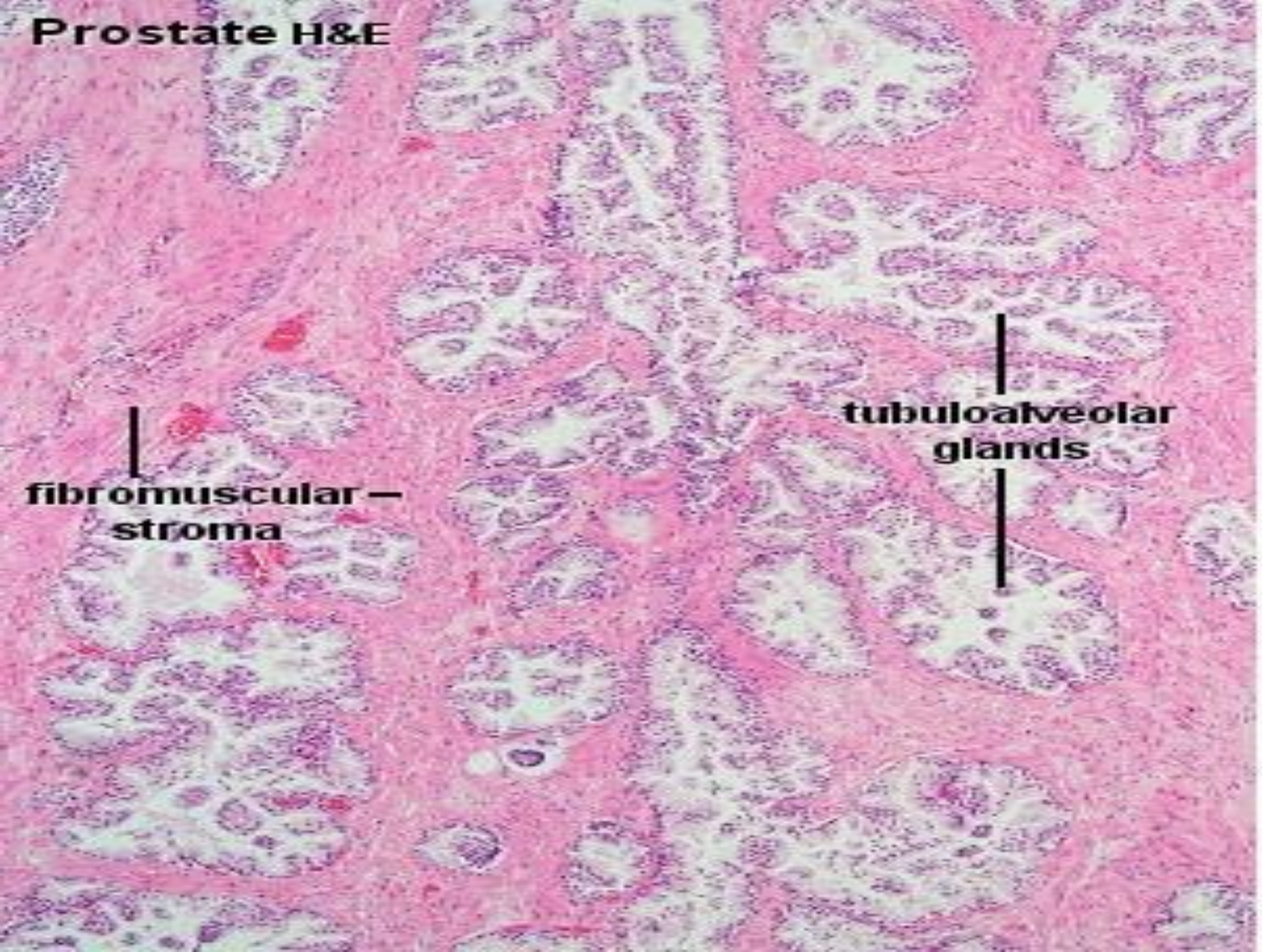


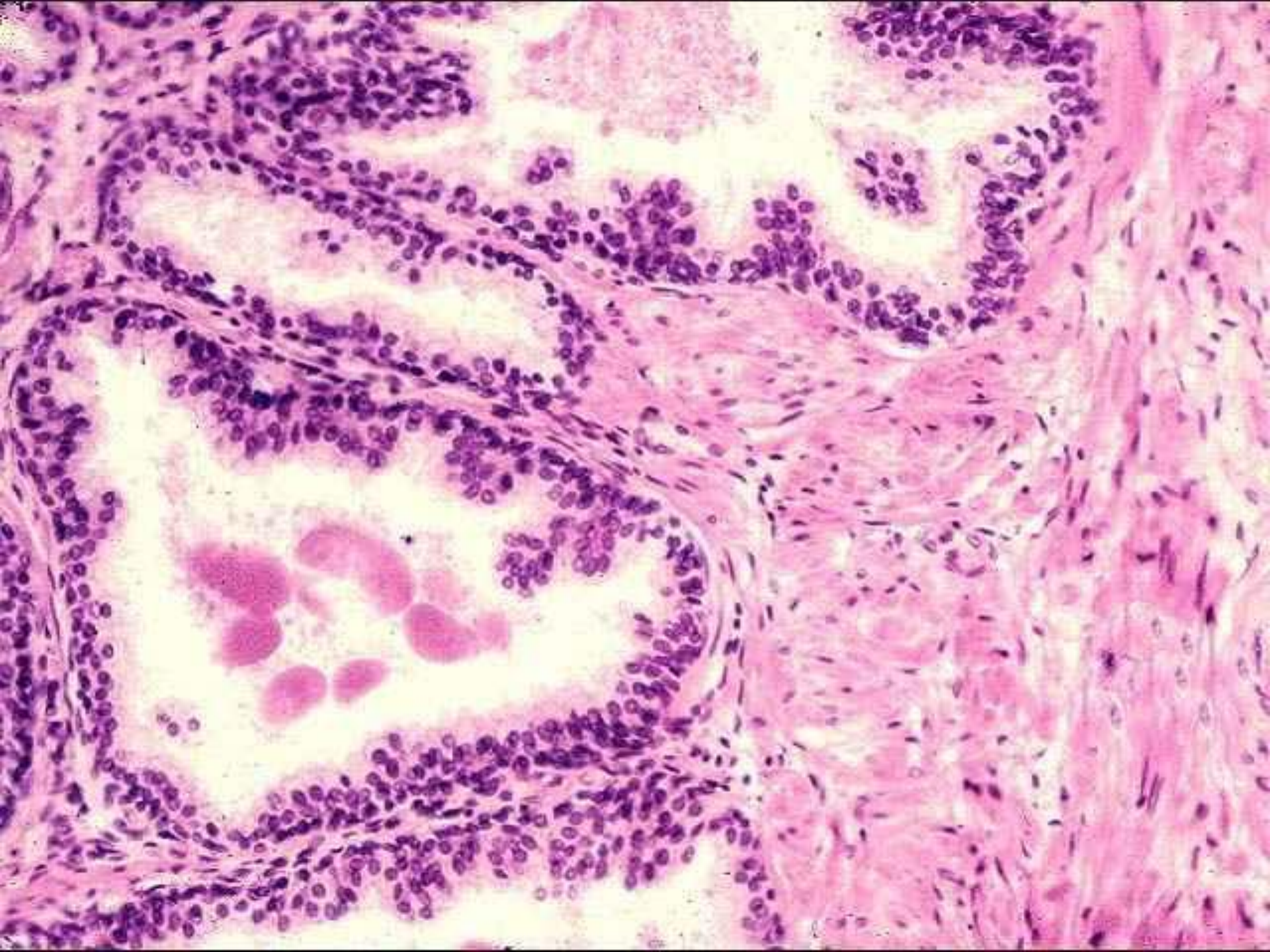


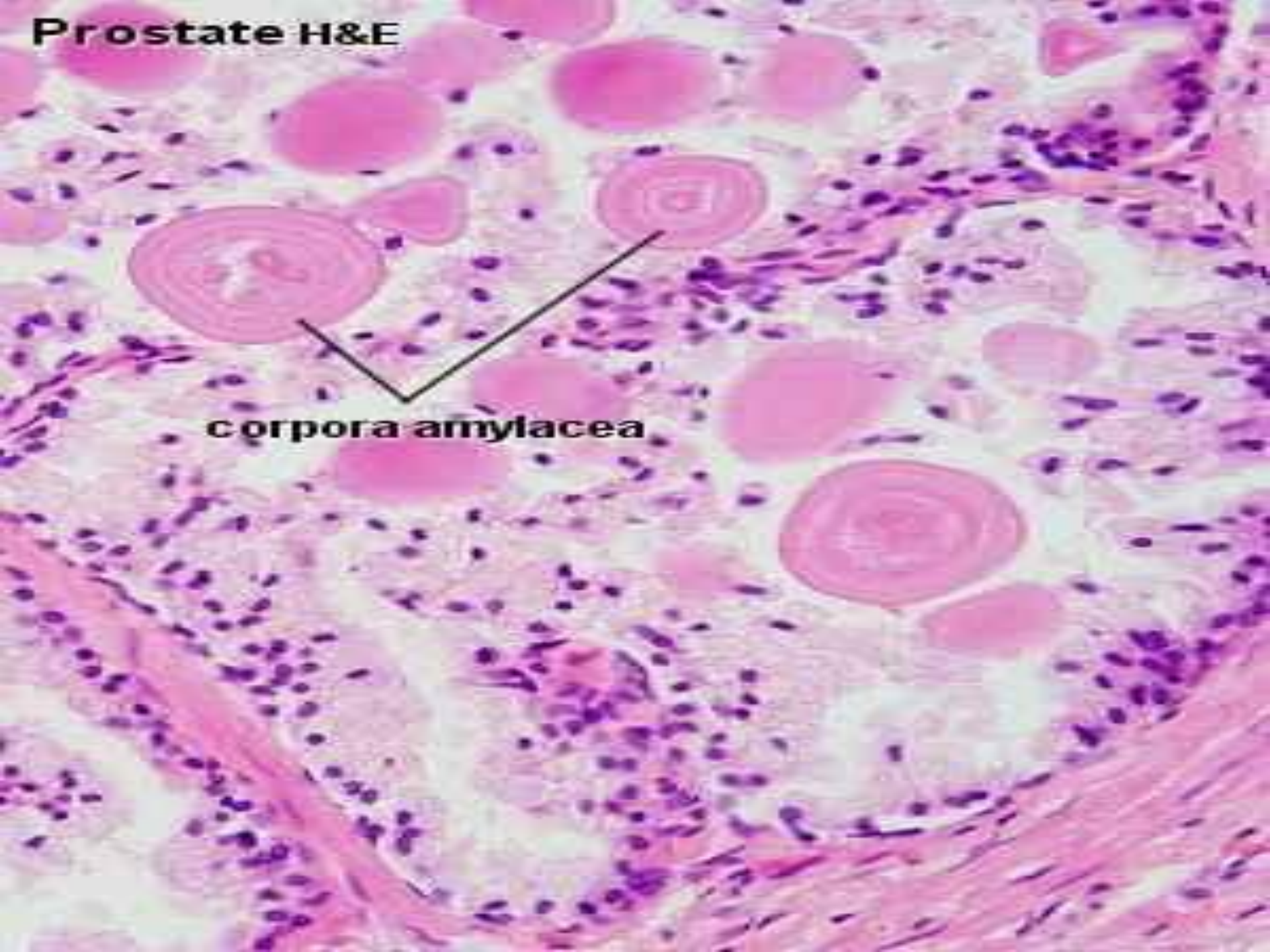

# Spermatic cord

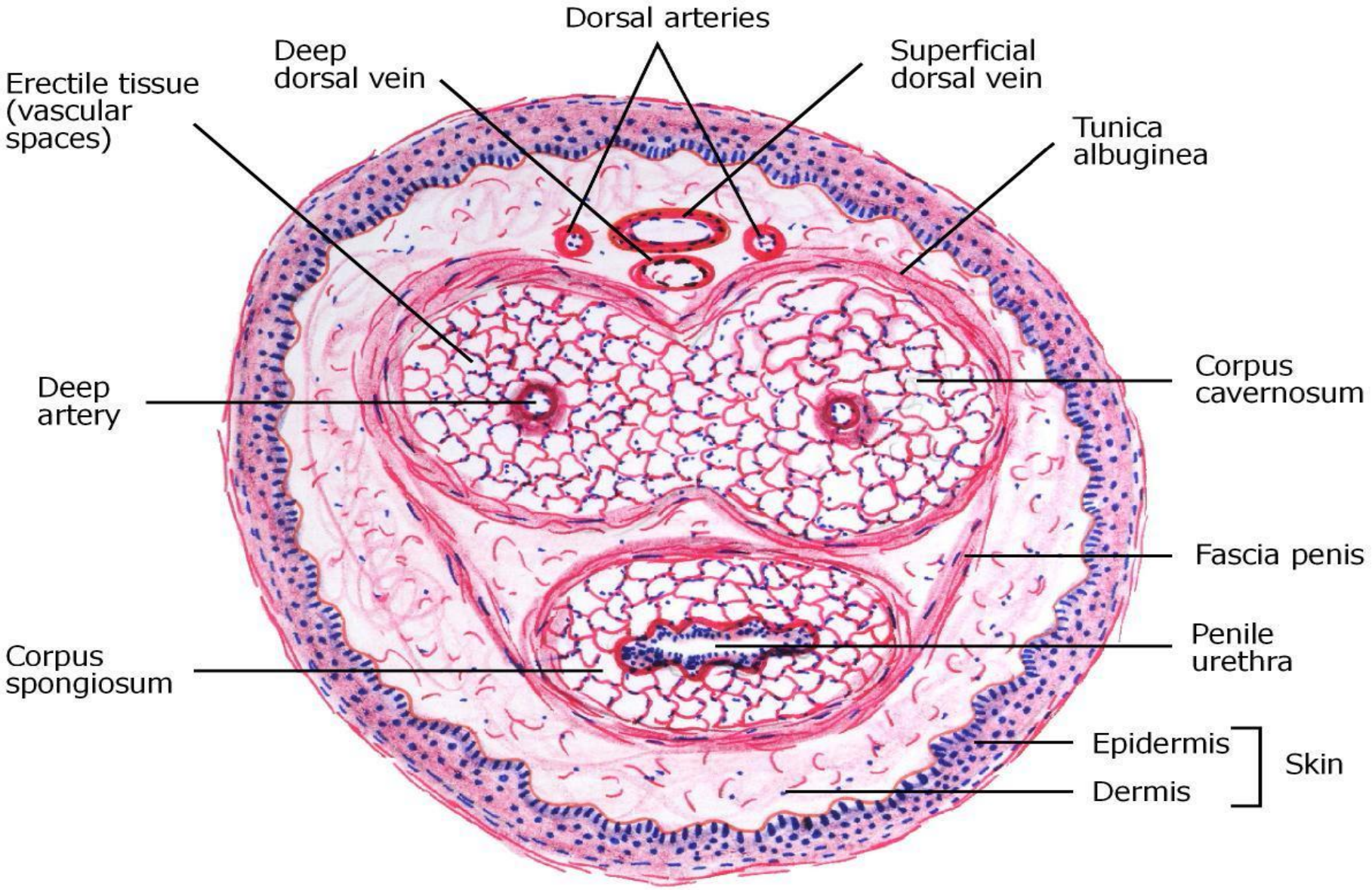
# prostate



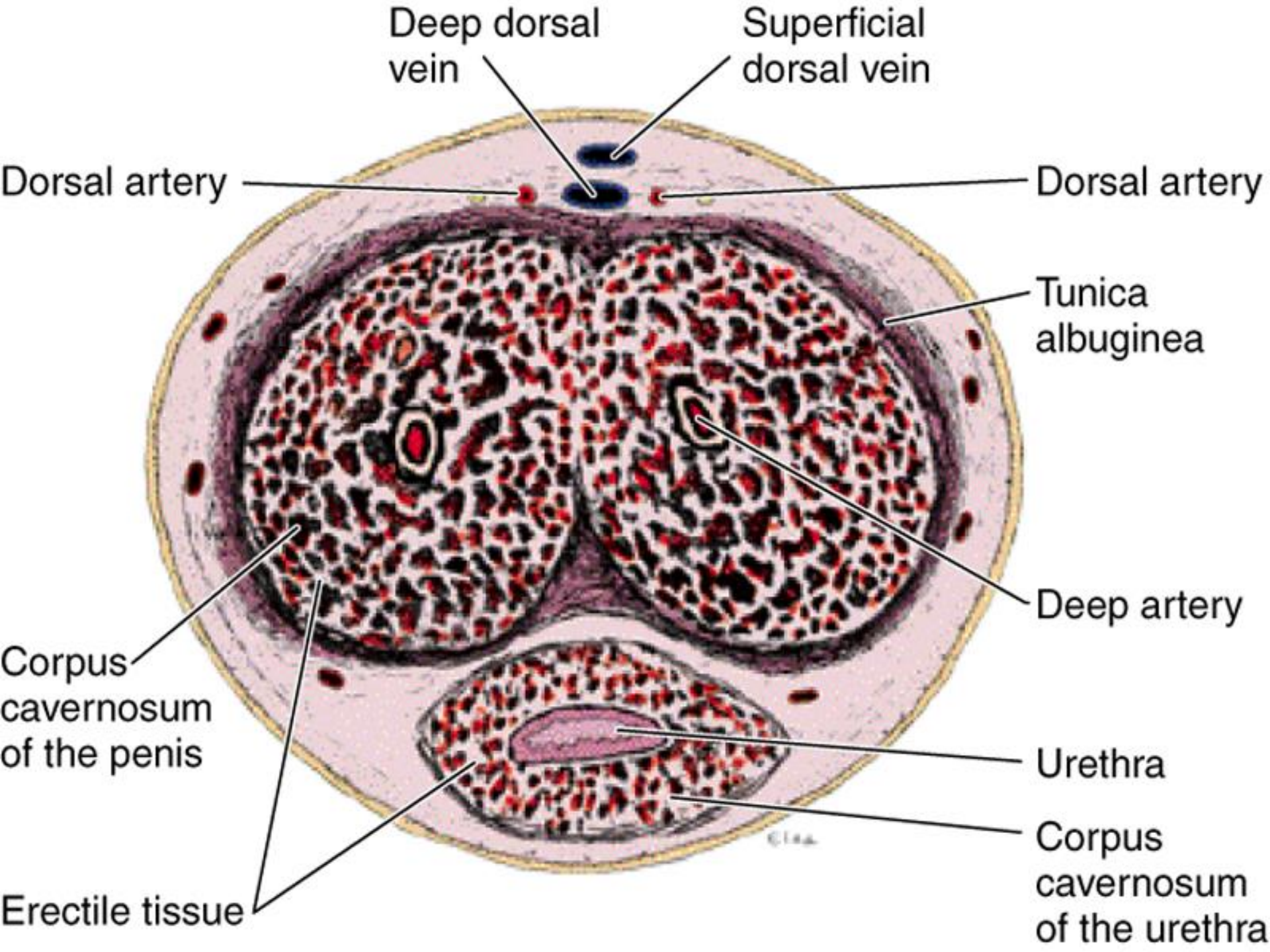

Prostate H&E
fibromuscular stroma
tubuloalveolar glands

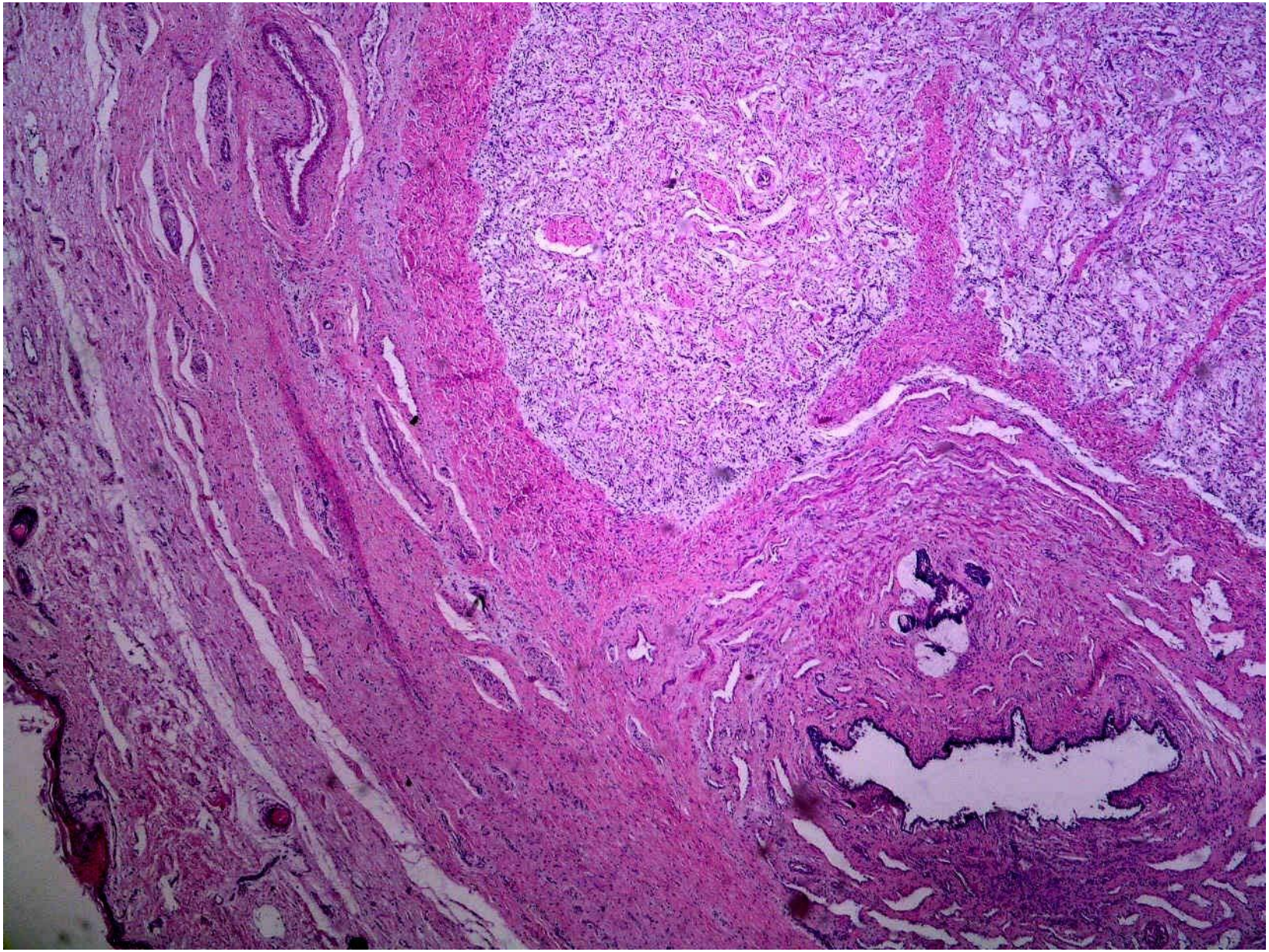



Prostate H&E
corpora amylacea

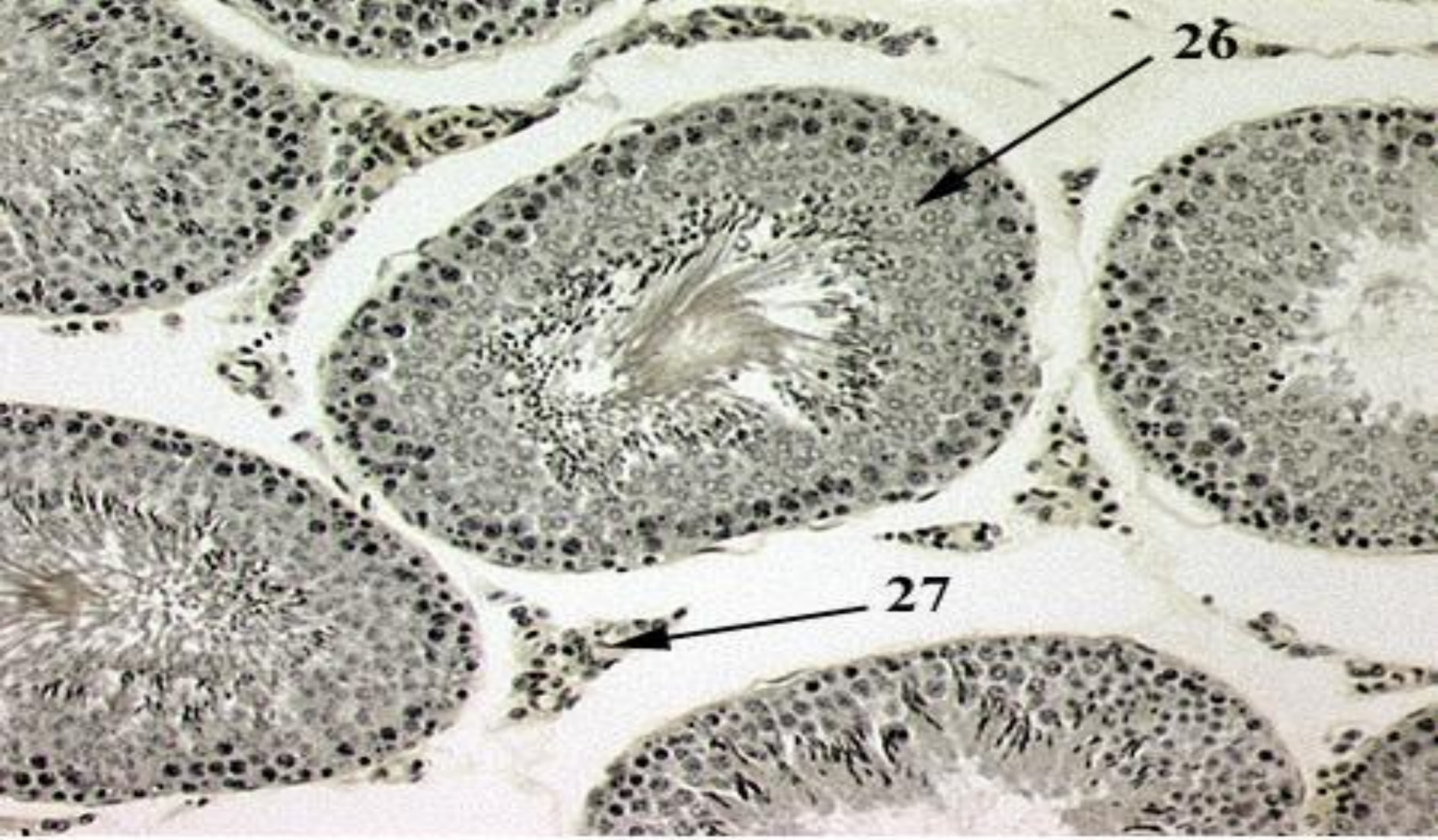

Dorsal arteries
Deep dorsal vein
Superficial dorsal vein
Erectile tissue (vascular spaces)
Tunica albuginea
Deep artery
Corpus cavernosum
Fascia penis
Corpus spongiosum
Penile urethra
Epidermis
Dermis
Skin

**Penis (TS)**

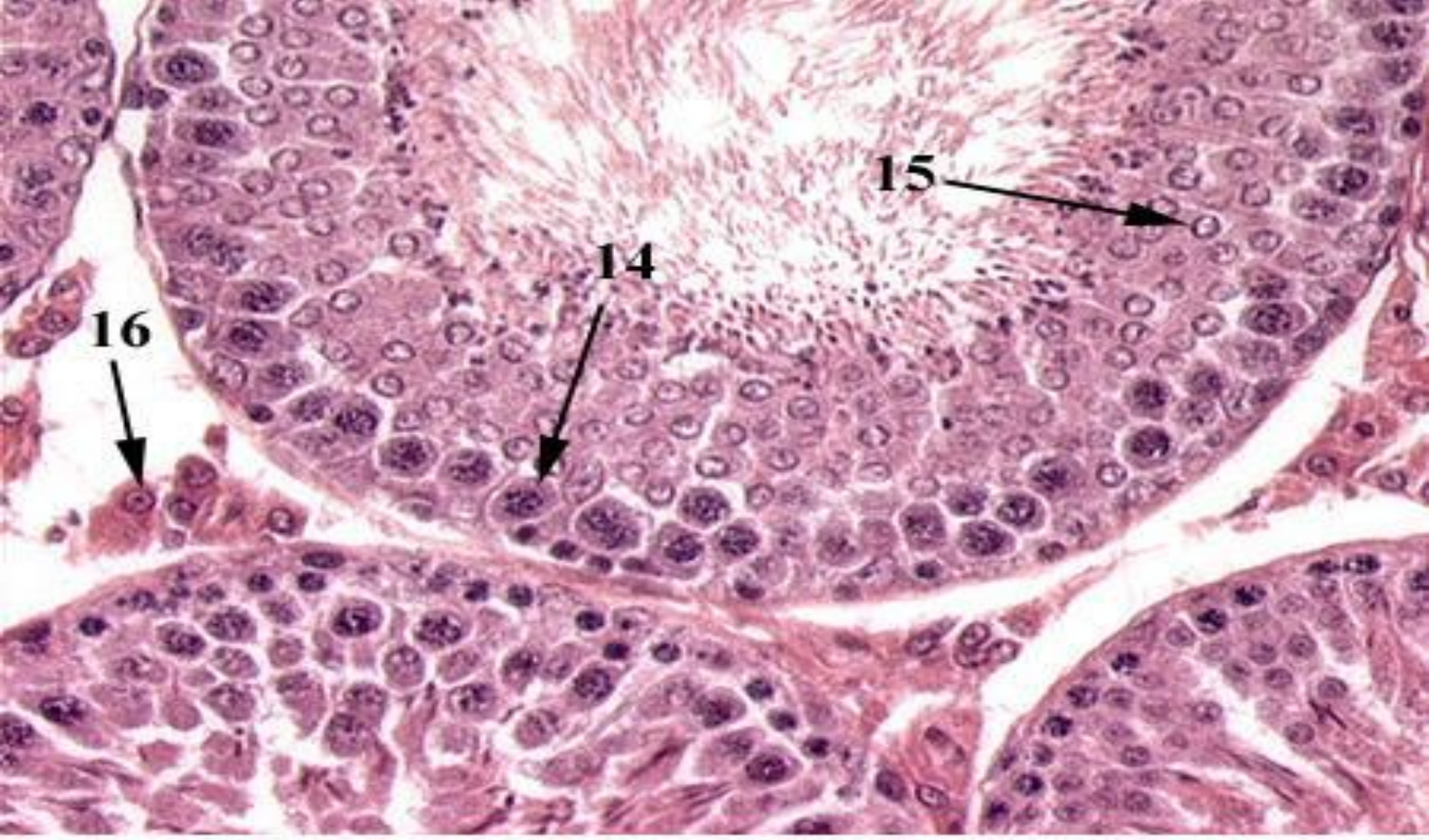

Deep dorsal vein
Superficial dorsal vein
Dorsal artery
Dorsal artery
Tunica albuginea
Deep artery
Corpus cavernosum of the penis
Urethra
Corpus cavernosum of the urethra
Erectile tissue



# Formative assessment



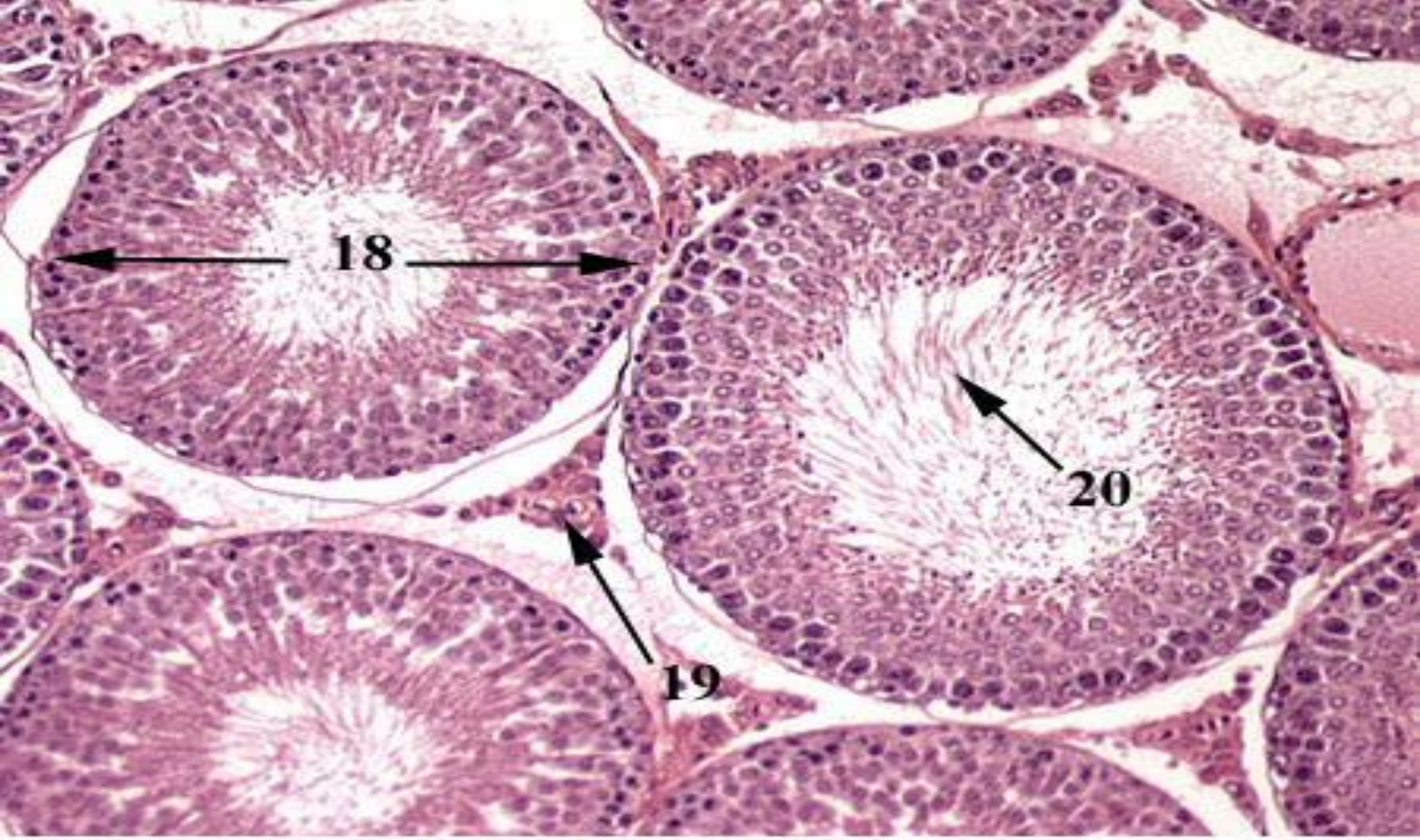

25. Identify the organ.
26. Identify the entire structure indicated by the arrow.
27. Identify the cell type indicated by the arrow.
28. What do these (#27) cells produce ?



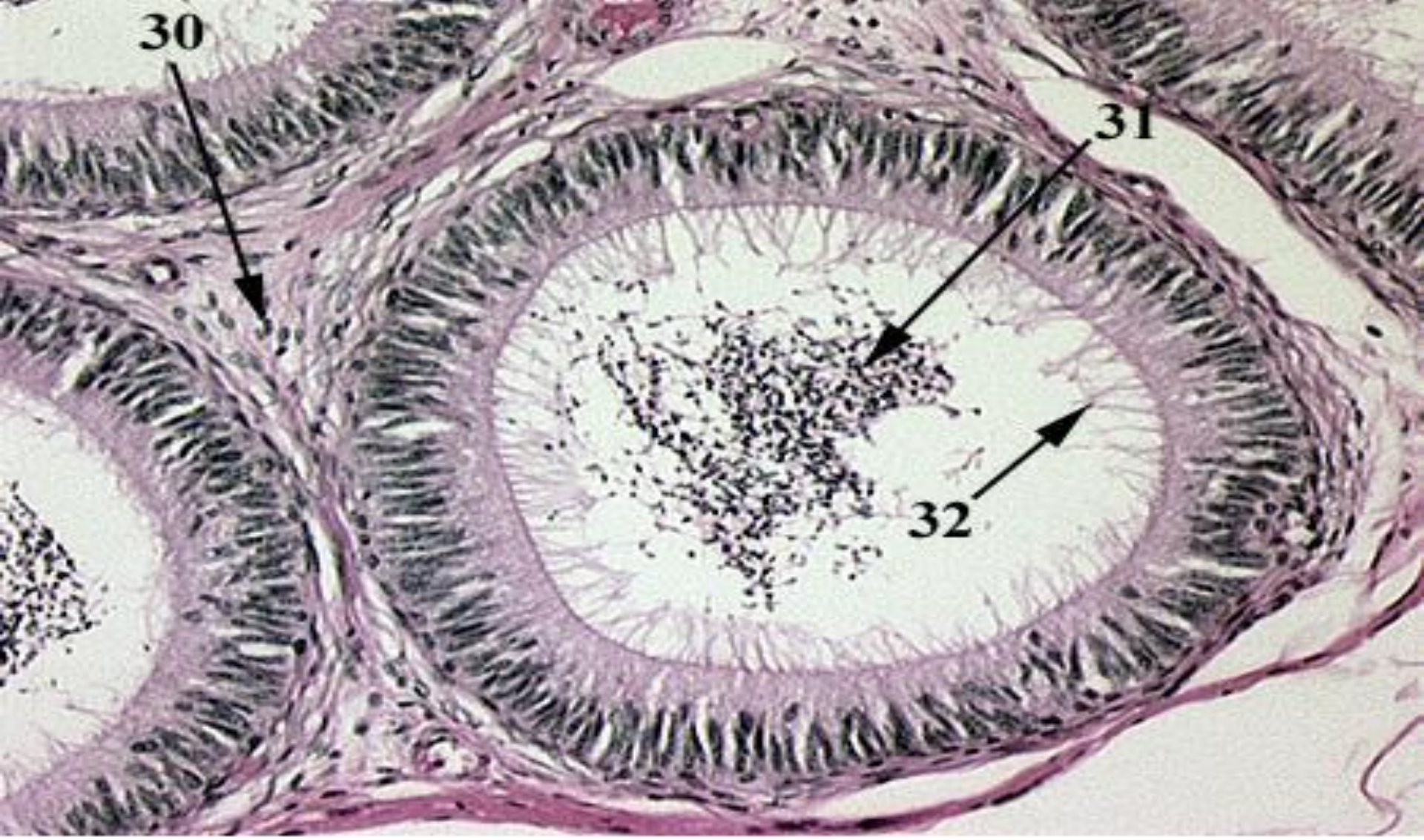

13. Identify the organ.
14. Identify the cell type indicated by the arrow.
15. Identify the cell type indicated by the arrow.
16. Identify the cell type indicated by the arrow.


37. Identify the organ.
38. Identify the entire structure indicated by the arrow.
39. Identify the tissue indicated by the arrow.
40. Identify the structure indicated by the arrow.

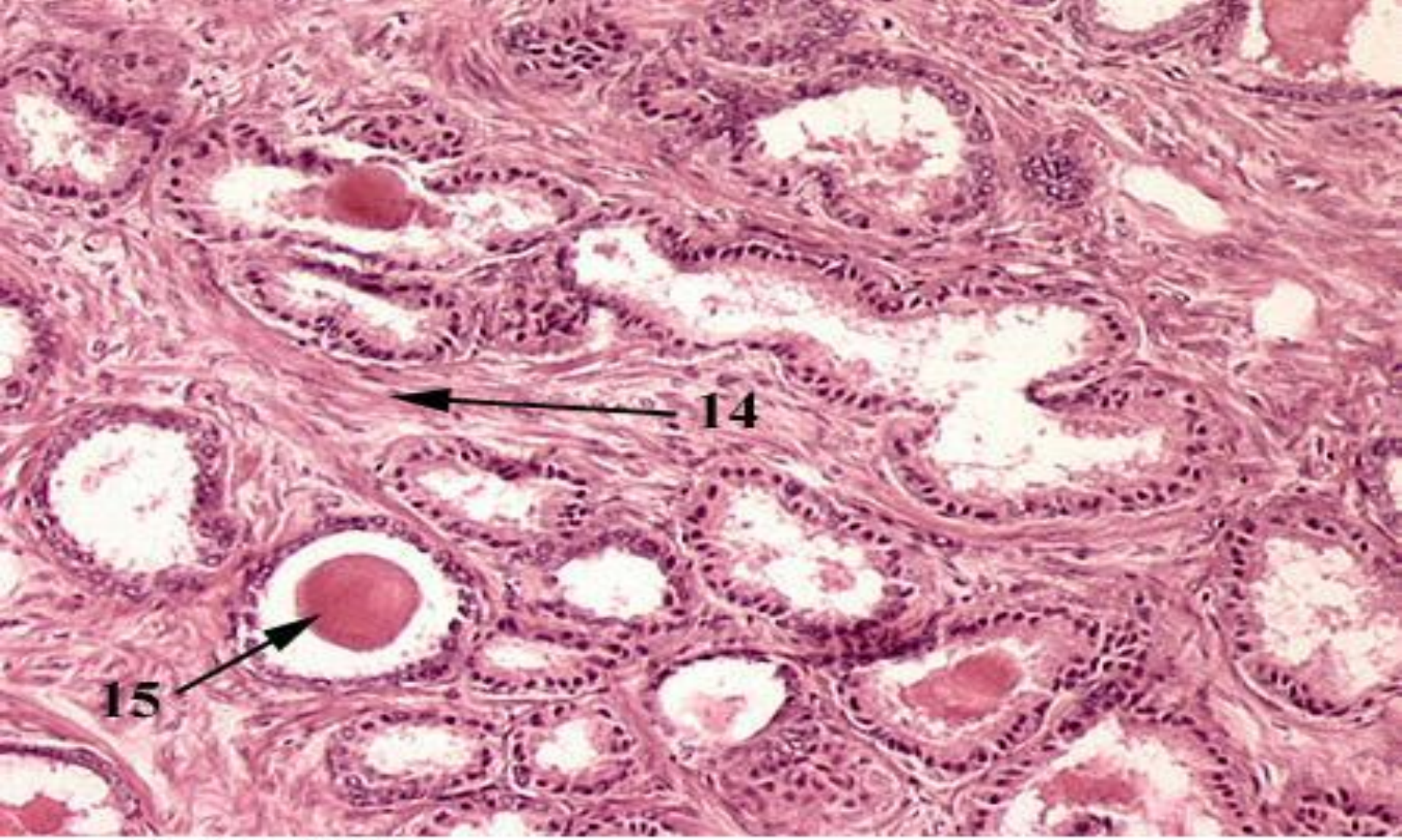

1. Identify the organ.
2. Identify the structure indicated by the arrow.
3. Identify the structure indicated by the arrow.
4. Identify the structure indicated by the arrow.




17. Identify the organ.
18. Identify the entire structure indicated by the arrows.
19. Identify the cell type indicated by the arrow.
20. Identify the structures indicated by the arrow.

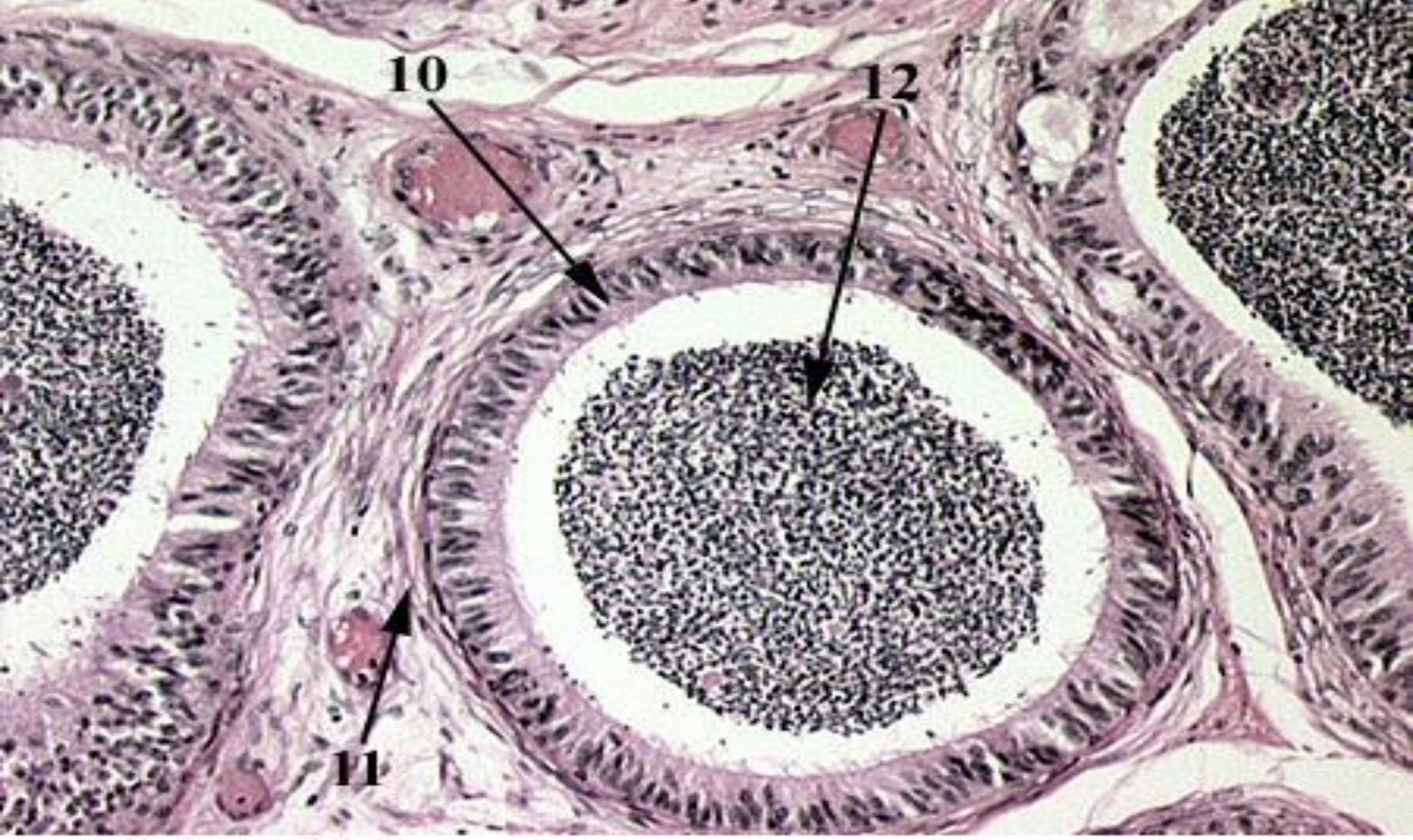



29. Identify the organ.
30. Identify the layer indicated by the arrow.
31. Identify the cell type indicated by the arrow.
32. Identify the structures indicated by the arrow.

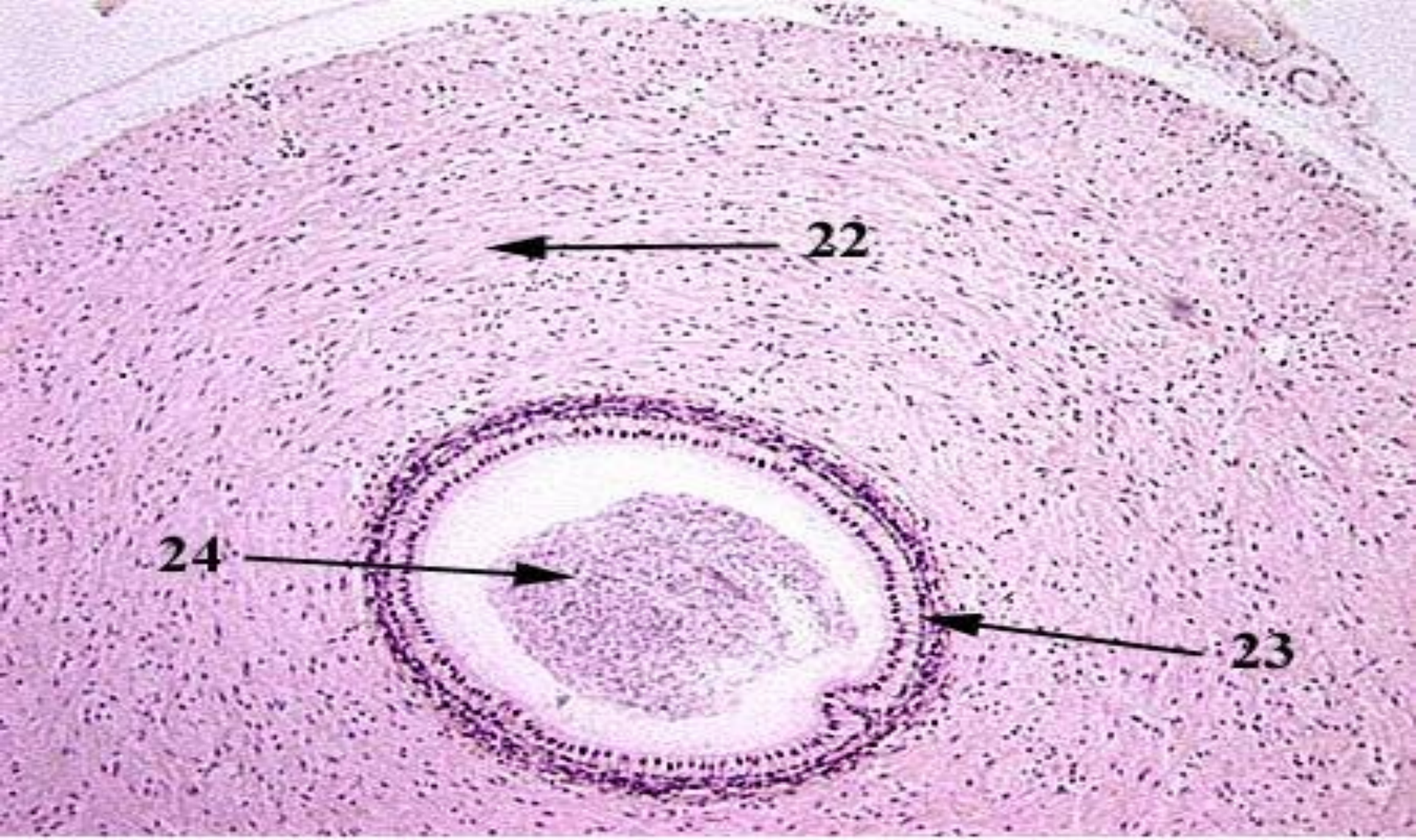



13. Identify the organ.
14. Identify the tissue indicated by the arrow.
15. Identify the structure indicated by the arrow.
16. Where in the body is this organ located ?

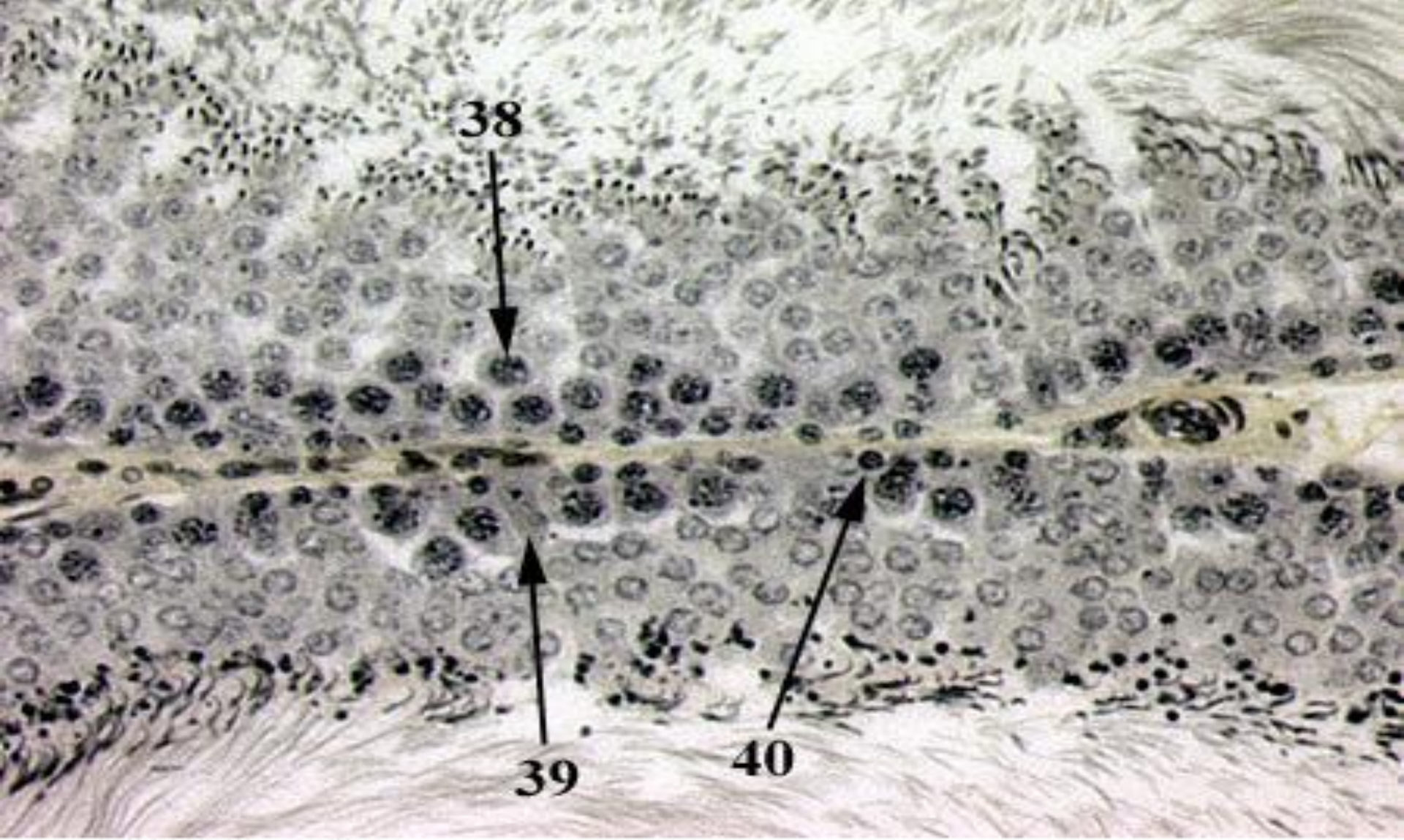

17. Identify the entire structure that fills the field.
18. Identify the cell type indicated by the arrow.
19. Identify the cell type indicated by the arrow.
20. Identify the cell type indicated by the arrow.




9. Identify the organ.
10. Identify the tissue indicated by the arrow.
11. Identify the tissue indicated by the arrow.
12. Identify the cell type indicated by the arrow.




21. Identify the organ.
22. Identify the tissue indicated by the arrow.
23. Identify the tissue indicated by the arrow.
24. Identify the cell type indicated by the arrow.



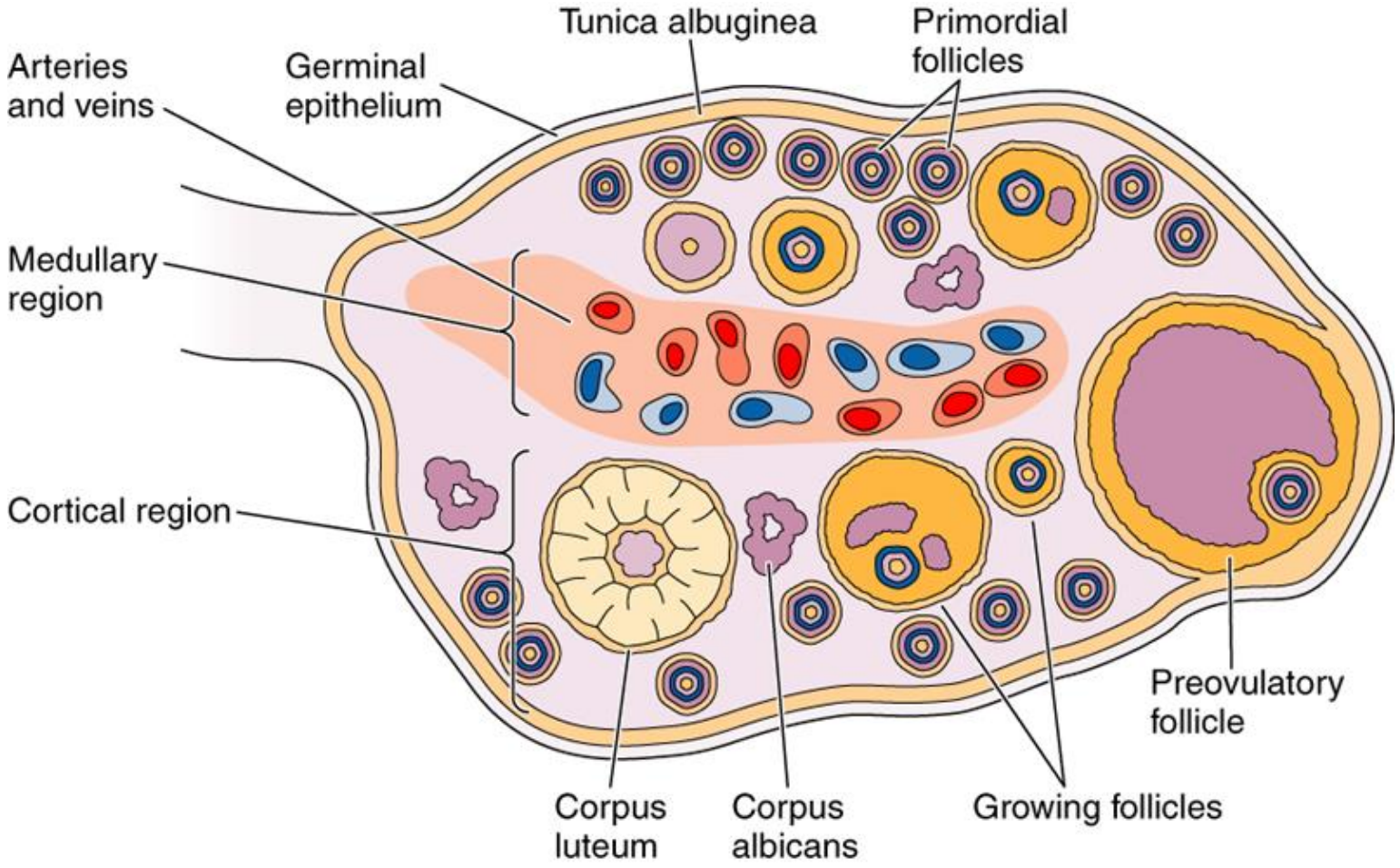

37. Identify the organ.
38. Identify the cell type indicated by the arrows.
39. Identify the cell type indicated by the arrow.
40. Identify the cell type indicated by the arrow.

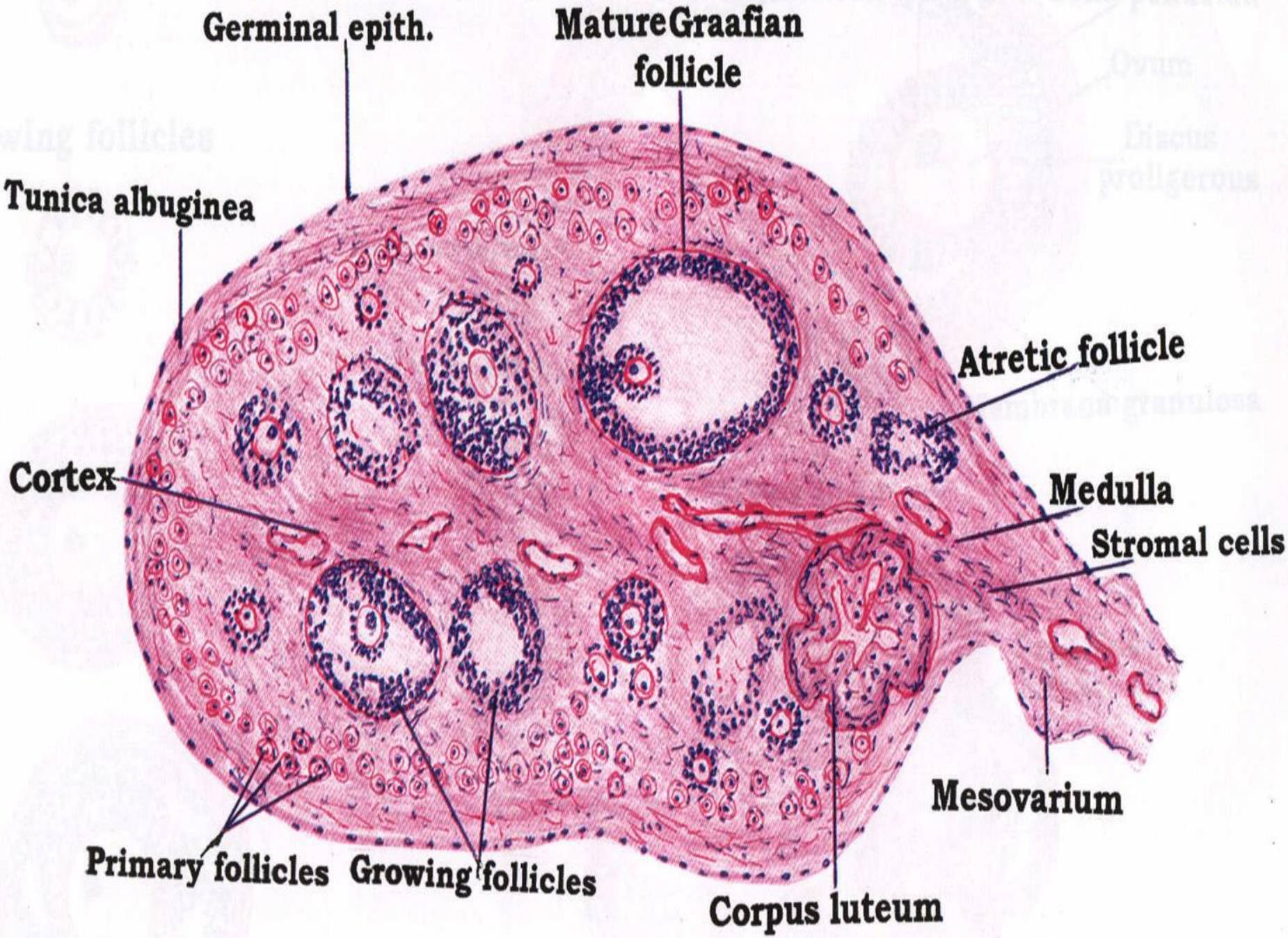


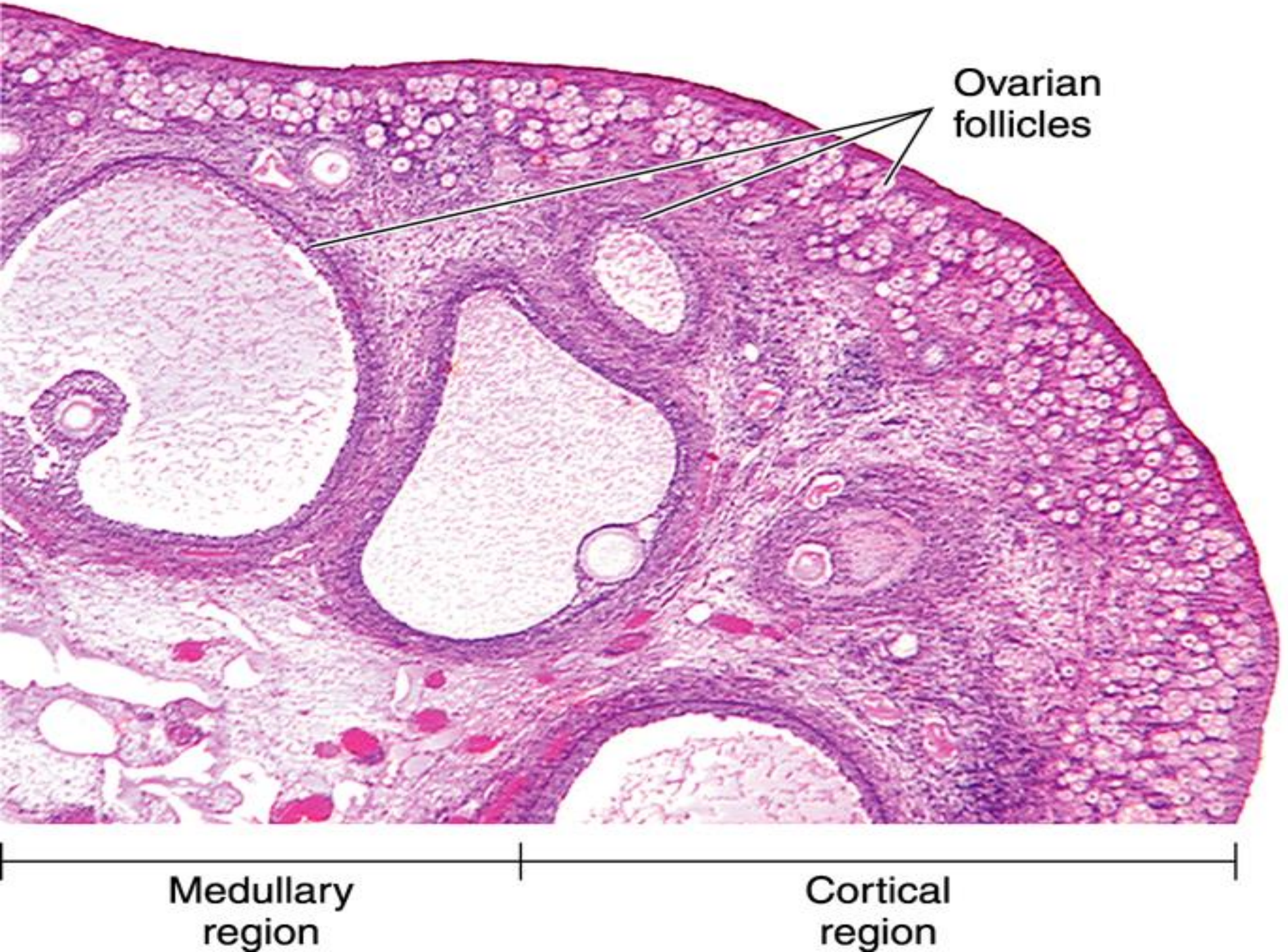
# Female Genital system

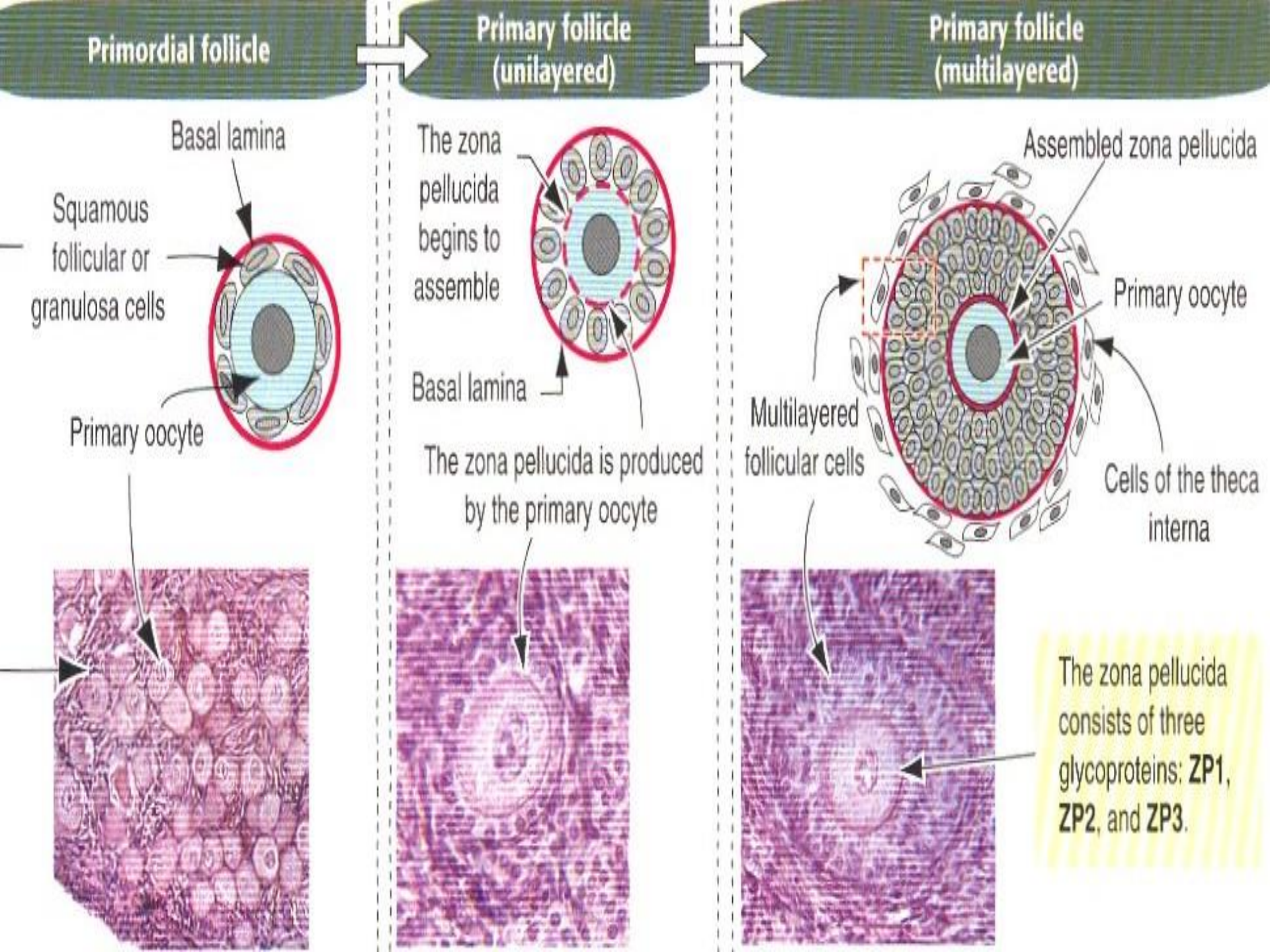
Practical

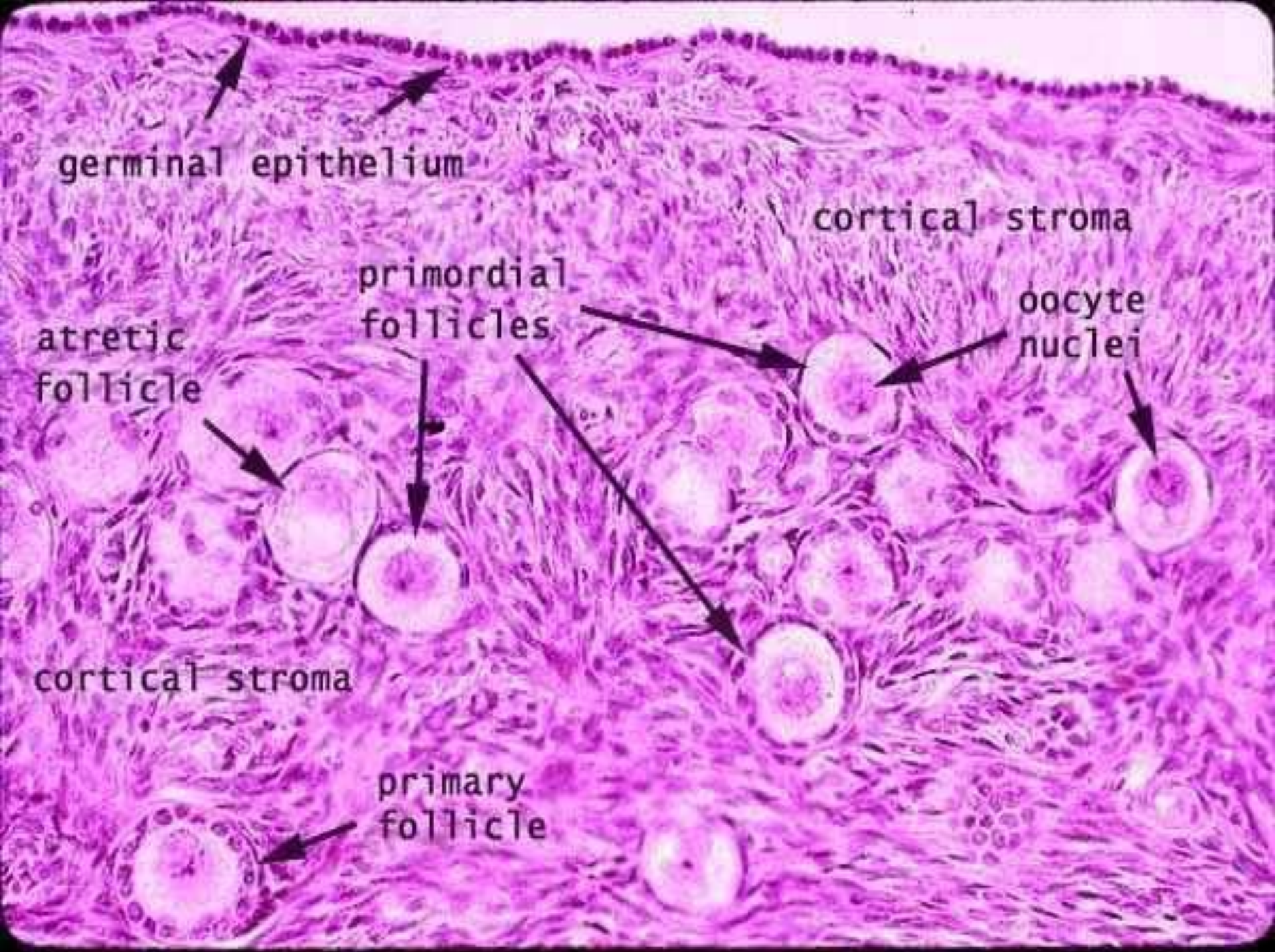
# Ovary


Tunica albuginea
Primordial follicles
Arteries and veins
Germinal epithelium
Medullary region
Cortical region
Preovulatory follicle
Corpus luteum
Corpus albicans
Growing follicles

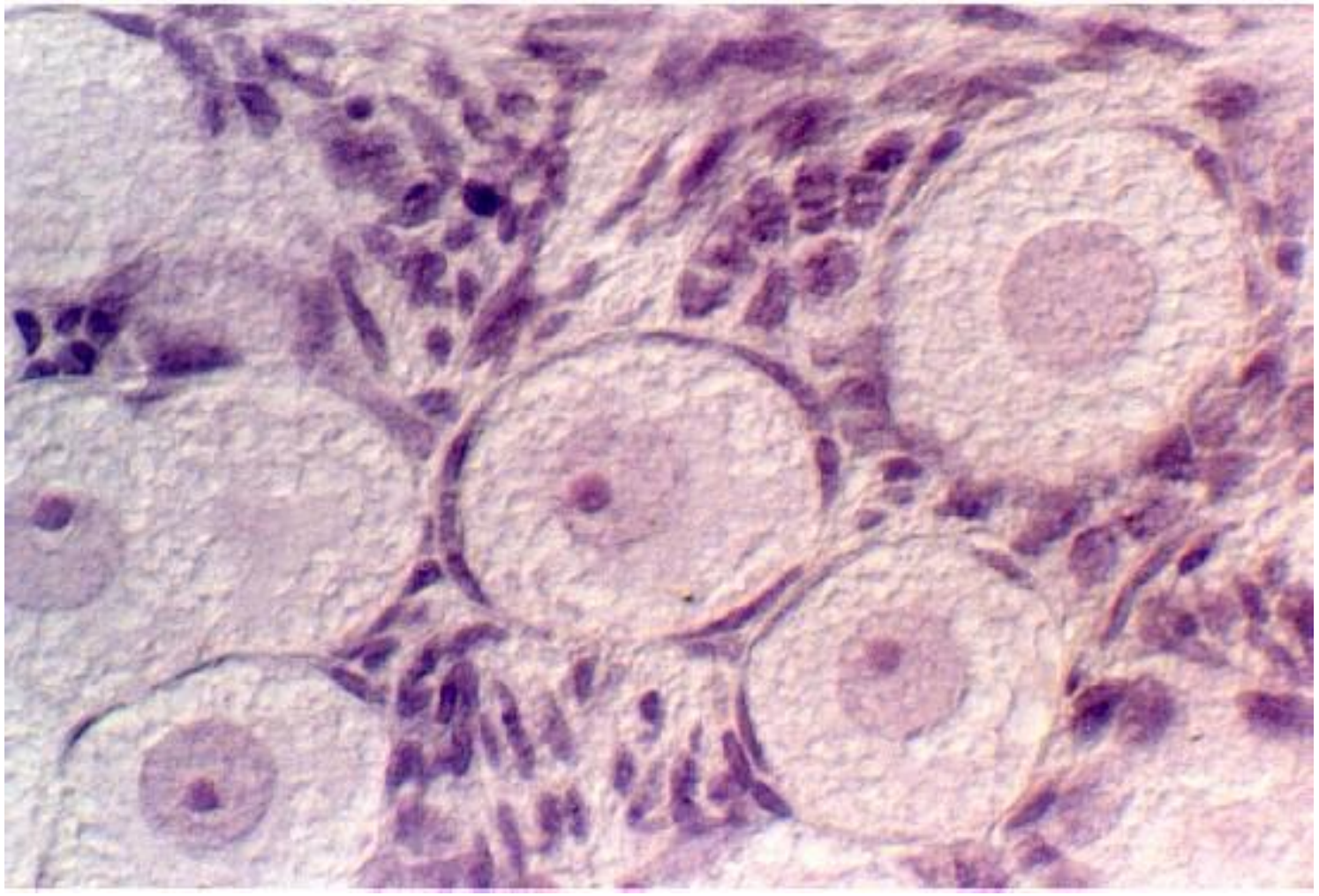

Germinal epith.
Mature Graafian follicle
Tunica albuginea
Atretic follicle
Cortex
Medulla
Stromal cells
Mesovarium
Primary follicles
Growing follicles
Corpus luteum


Ovarian follicles
Medullary region
Cortical region


Primordial follicle
Primary follicle (unilayered)
Primary follicle (multilayered)
Basal lamina
Squamous follicular or granulosa cells
Primary oocyte
The zona pellucida begins to assemble
Basal lamina
The zona pellucida is produced by the primary oocyte
Assembled zona pellucida
Primary oocyte
Multilayered follicular cells
Cells of the theca interna
The zona pellucida consists of three glycoproteins: ZP1, ZP2, and ZP3.

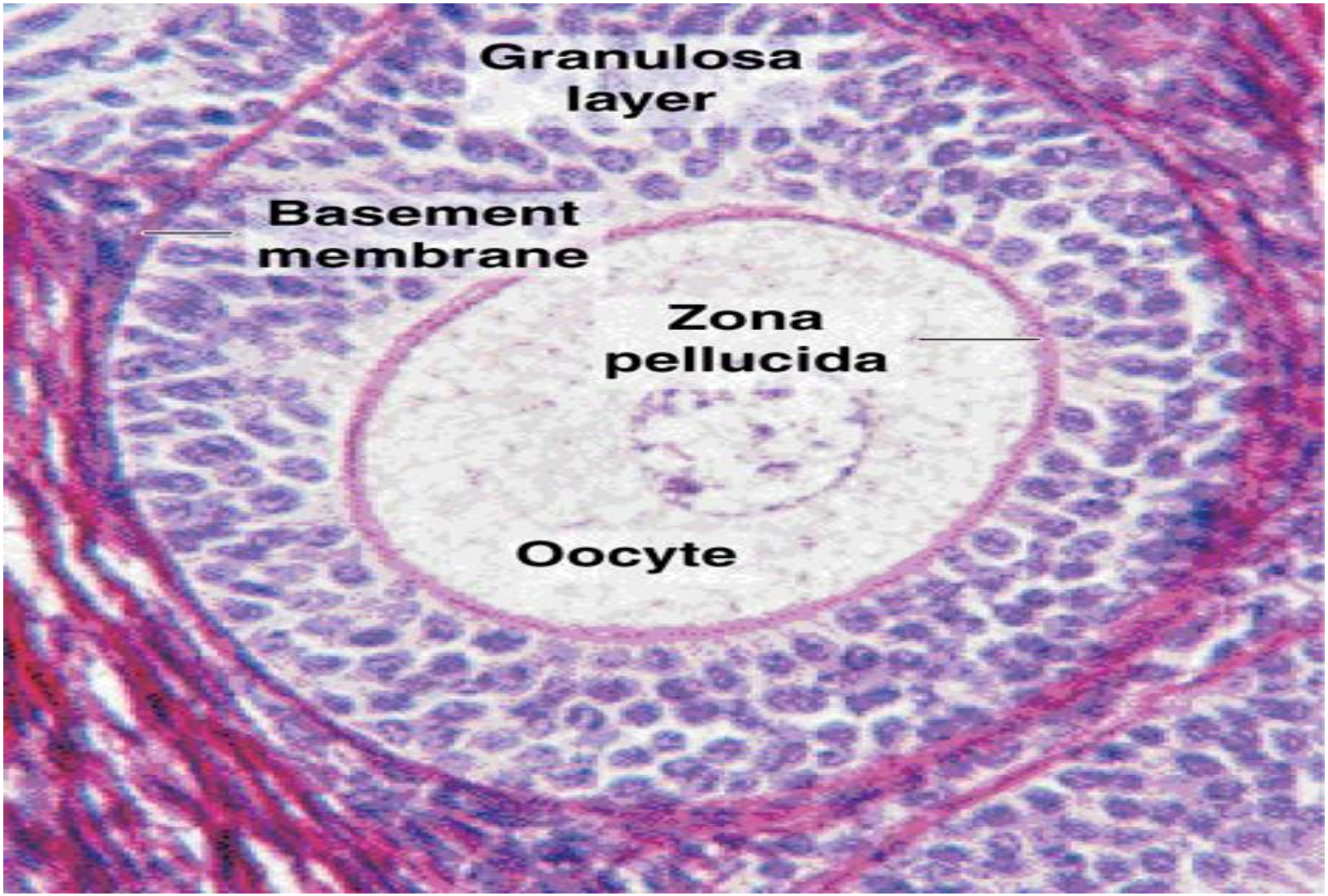

germinal epithelium
cortical stroma
primordial follicles
oocyte nuclei
atretic follicle
cortical stroma
primary follicle

# Primordial follicles

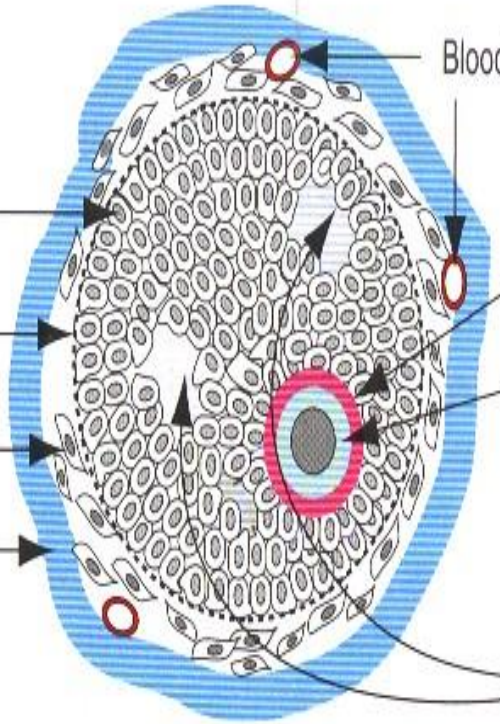


# Unilaminar primary follicle

# Multilaminar primary follicle



## Secondary follicle (vesicular)



Blood vessels

Follicular cell

Zona pellucida

Basal lamina

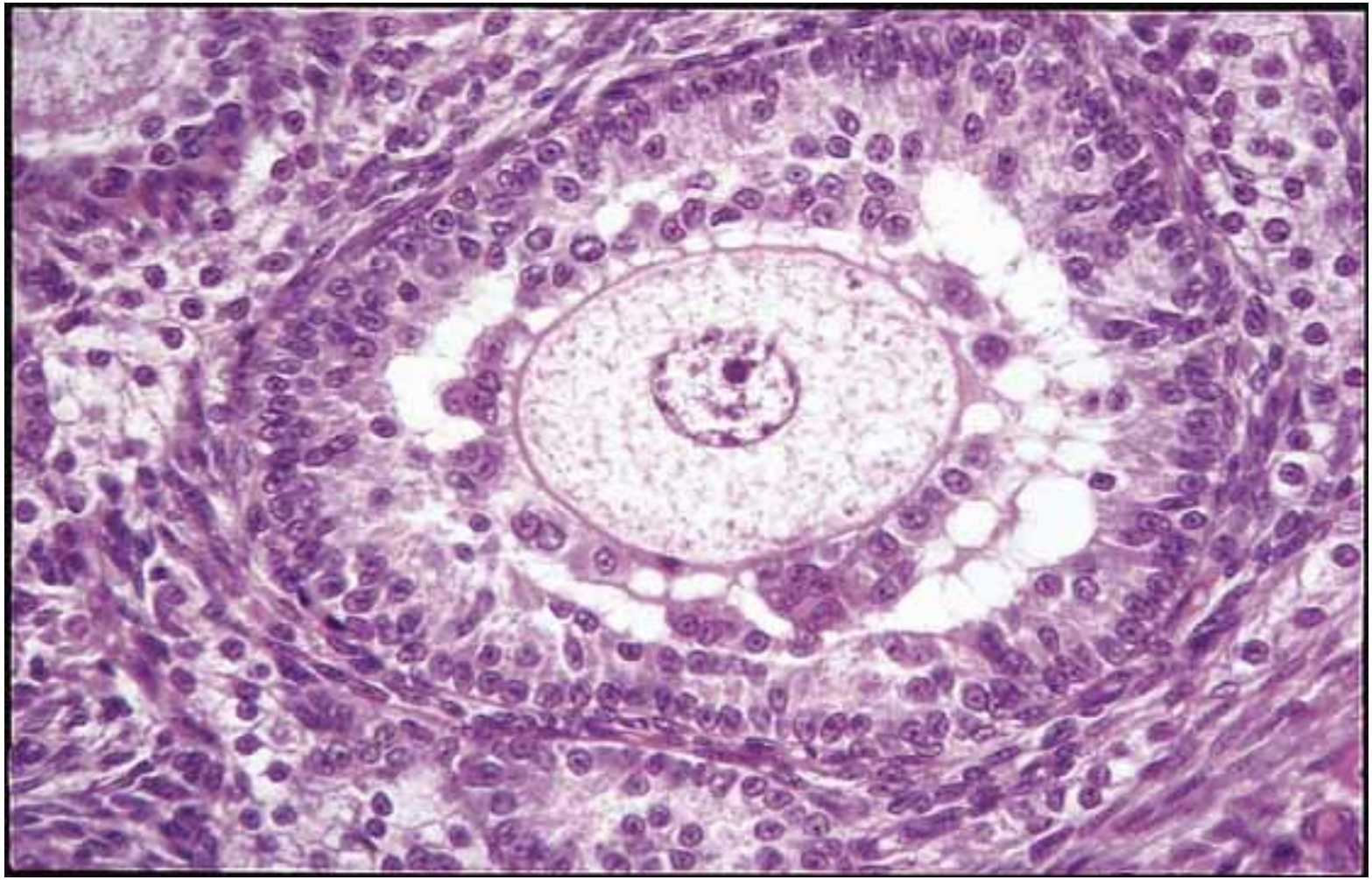
Oocyte

Endocrine cell of the theca interna

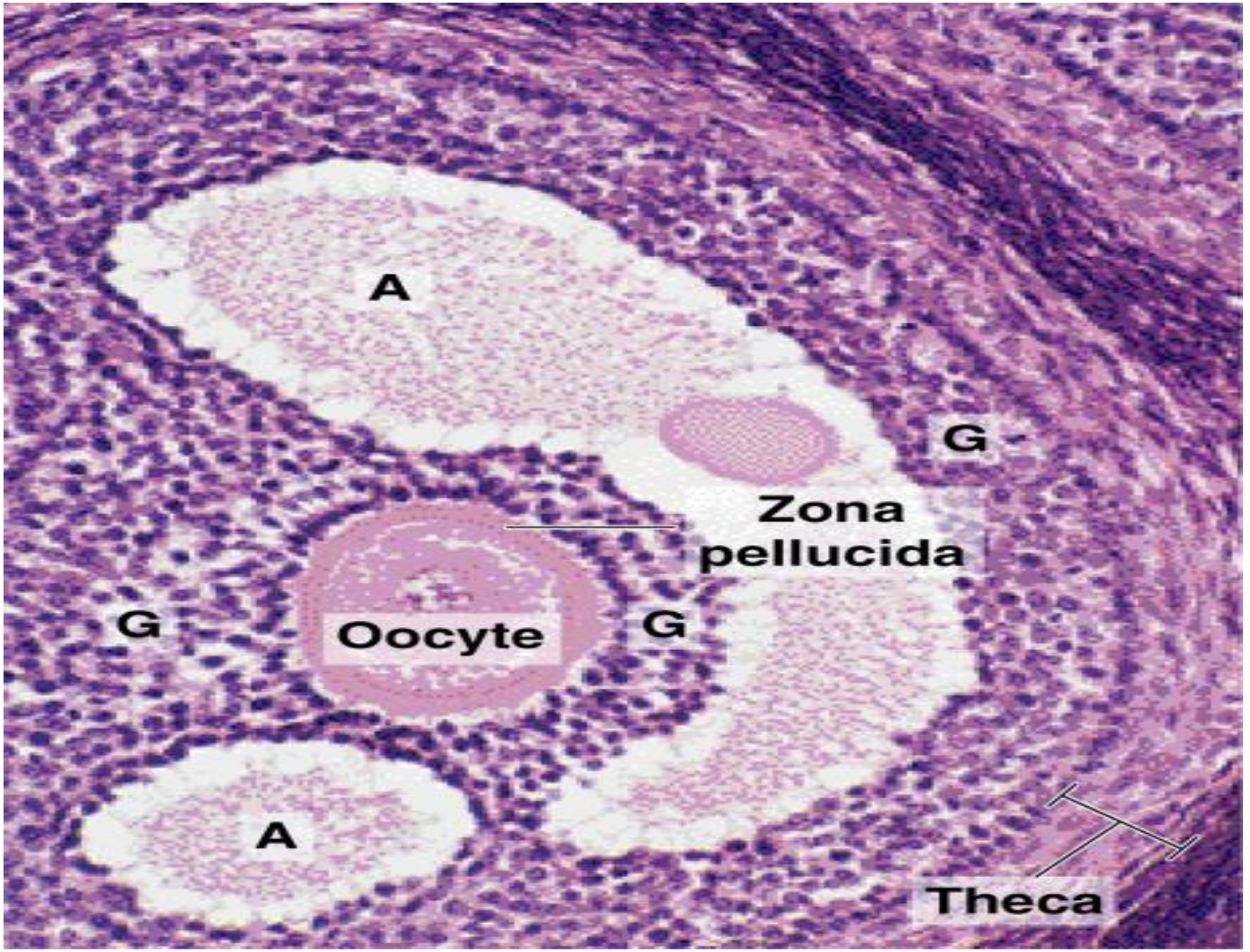
Theca externa (stromal cells continuous with the connective tissue).

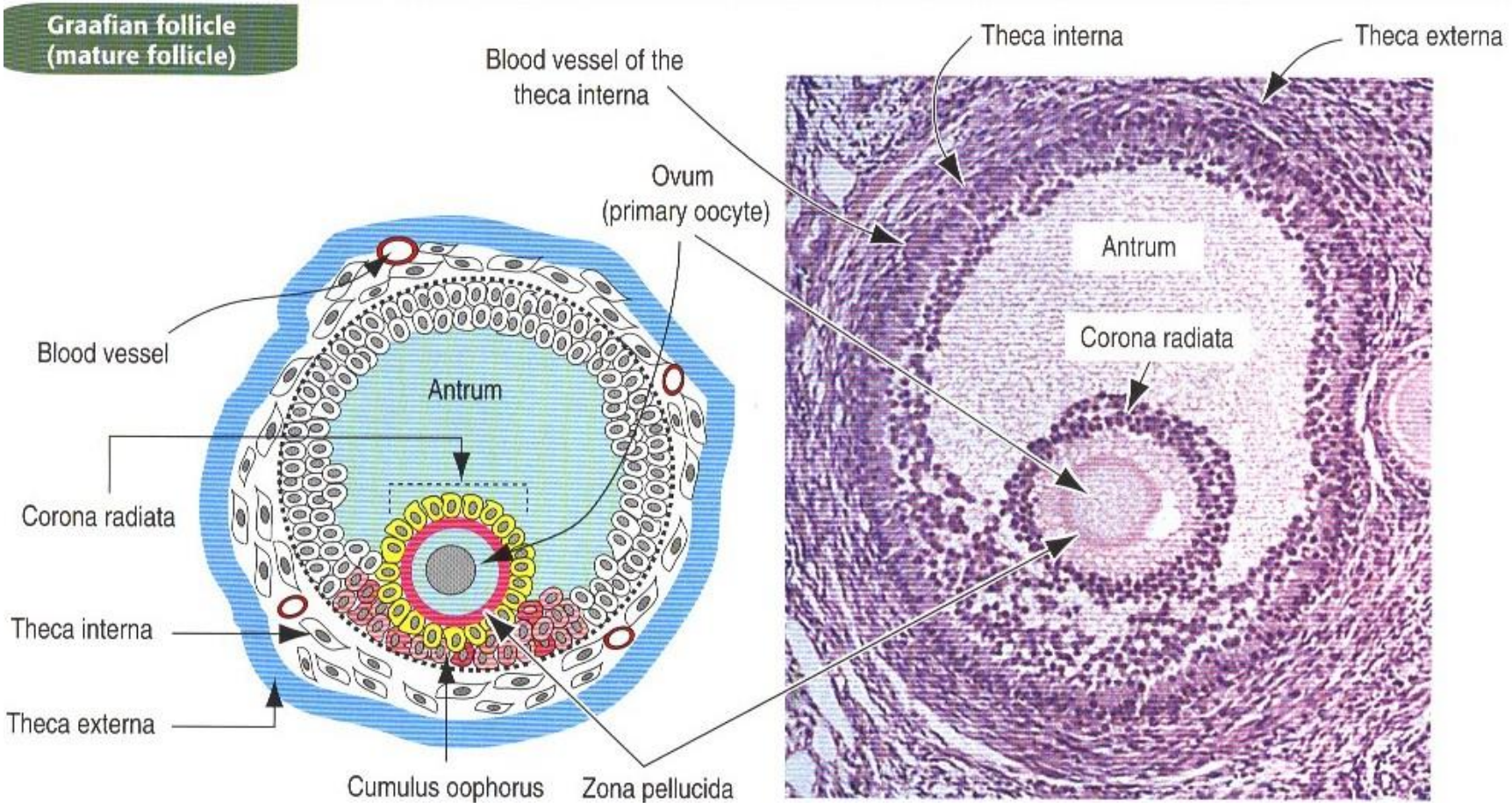
Initial antrum formation. The fluid of the antrum (liquor folliculi) is rich in hyaluronate, steroids, growth factors, and gonadotropins.

# Secondary follicle

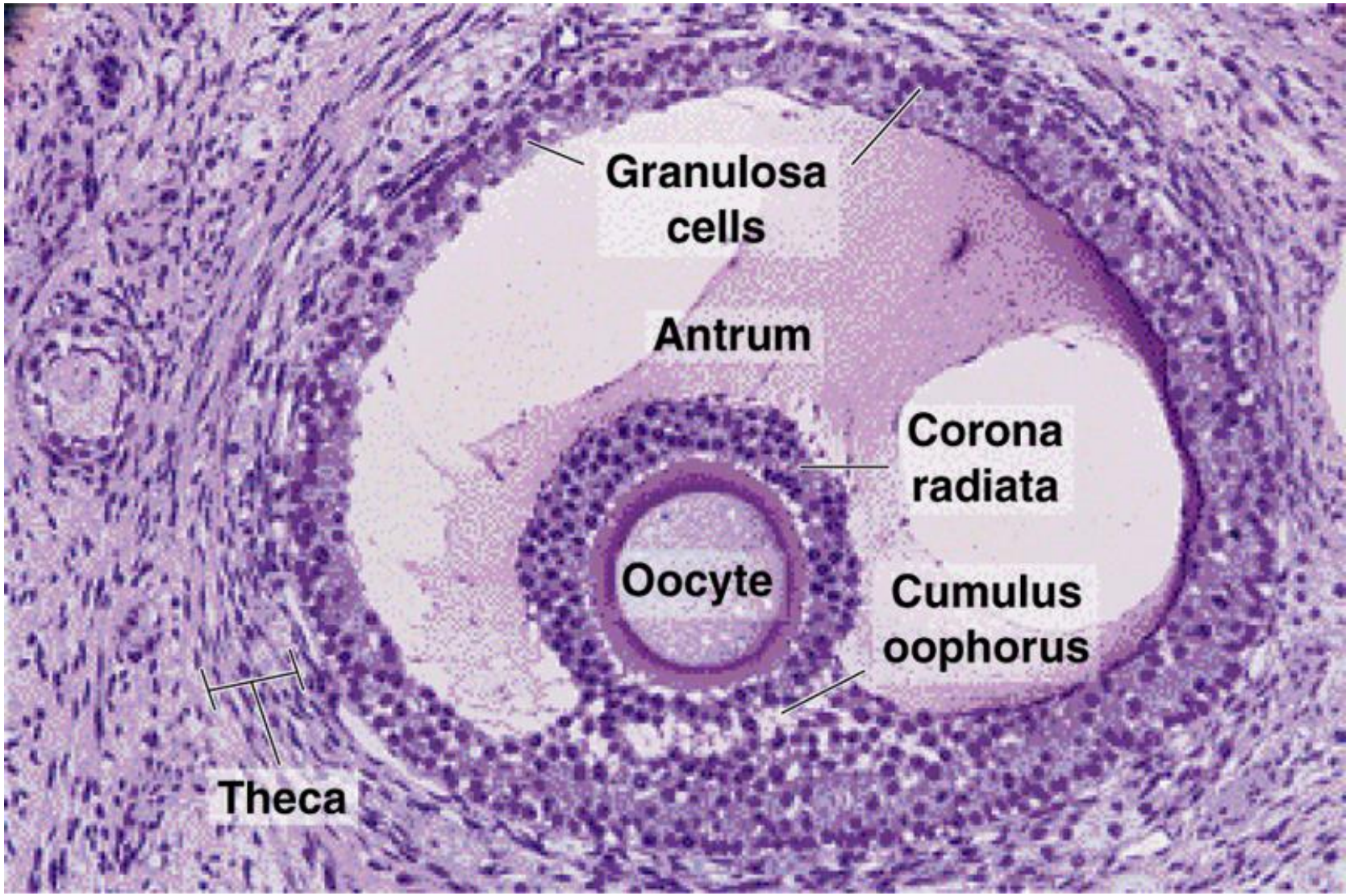


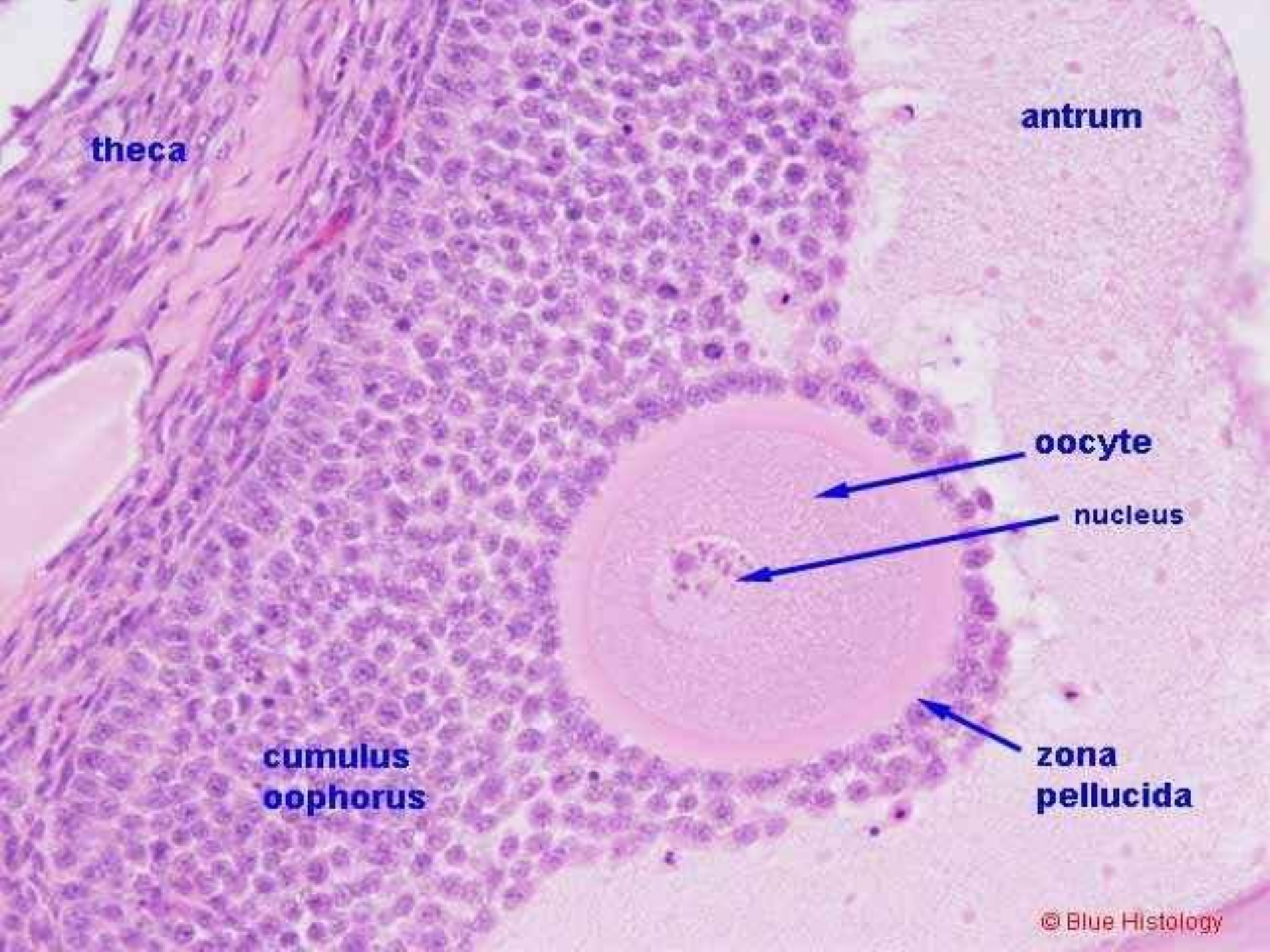
# Secondary follicle

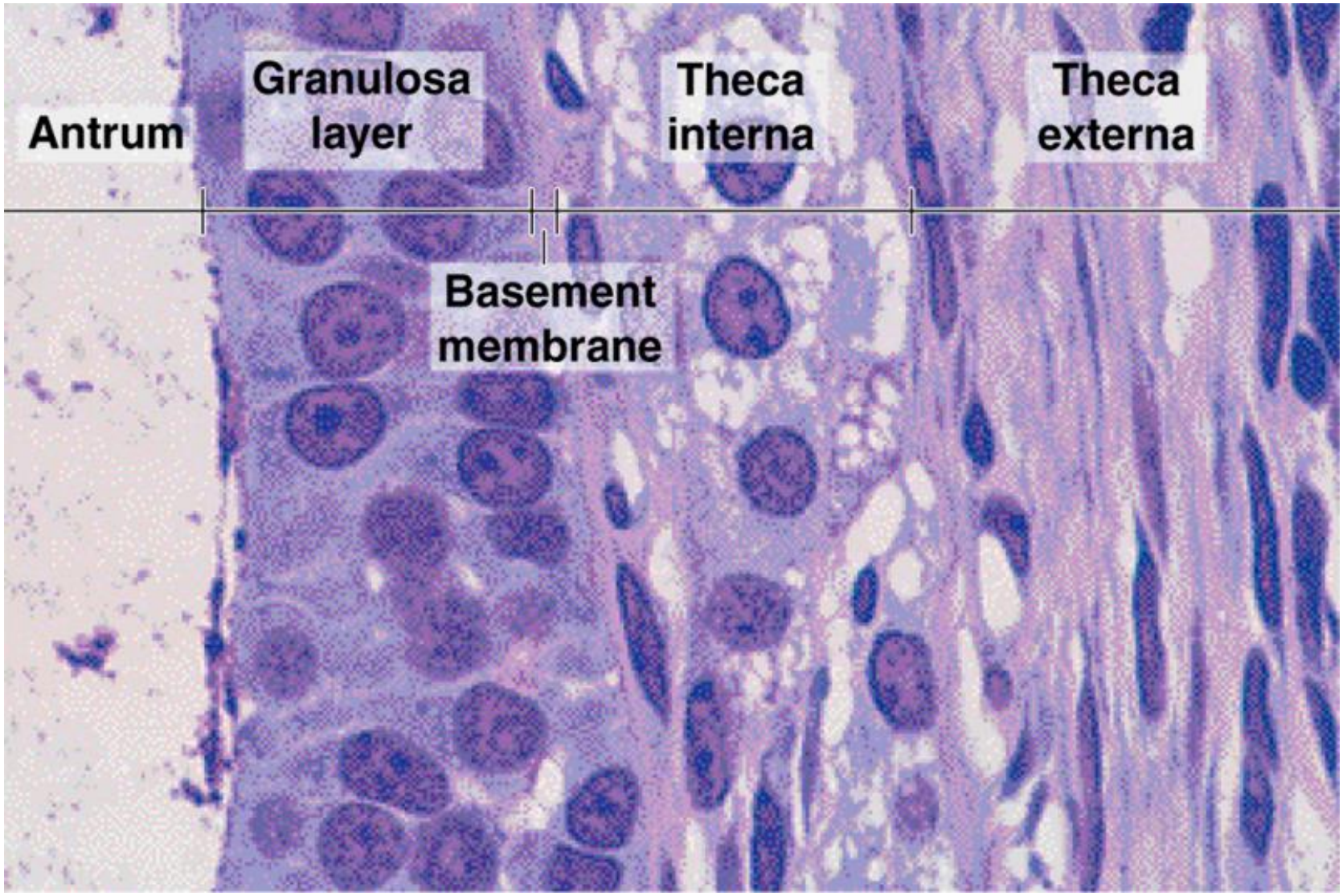



Graafian follicle
(mature follicle)
Blood vessel of the
theca interna
Ovum
(primary oocyte)
Blood vessel
Antrum
Corona radiata
Theca interna
Theca externa
Cumulus oophorus
Zona pellucida
Theca interna
Theca externa
Antrum
Corona radiata

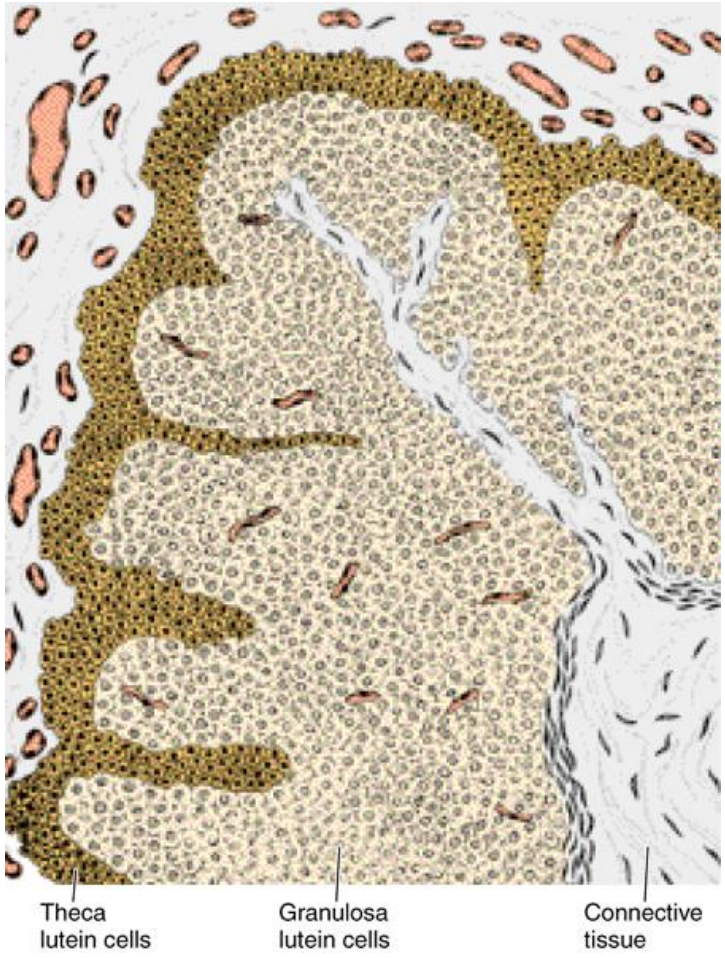
# Mature Graffian follicle

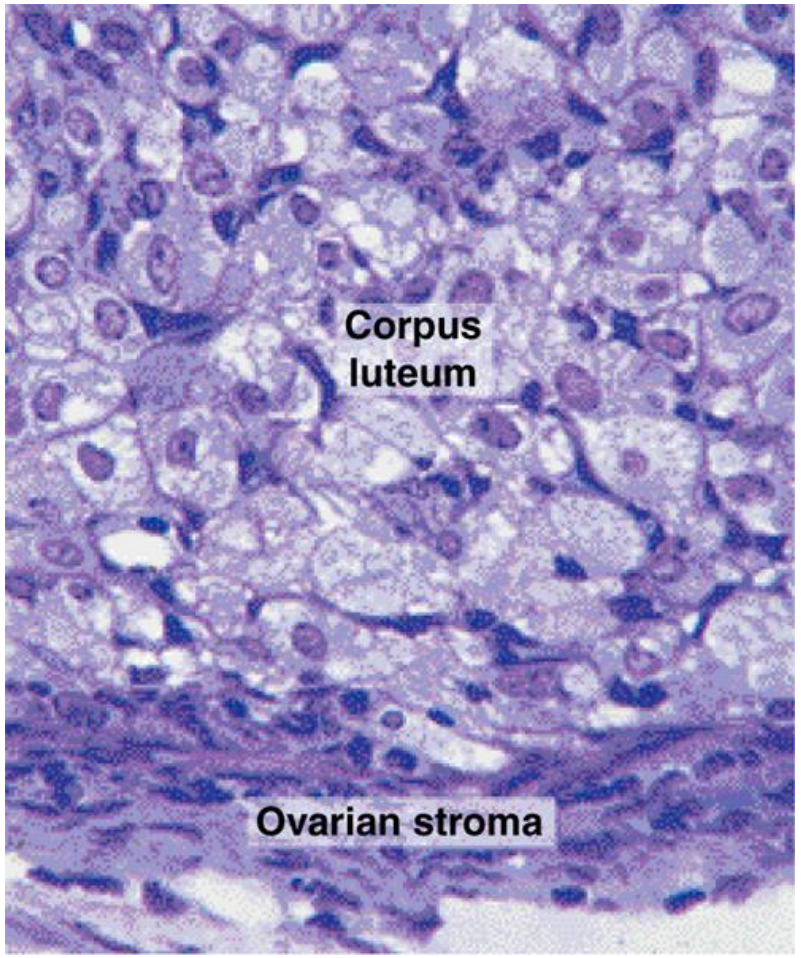



theca
antrum
oocyte
nucleus
cumulus
oophorus
zona
pellucida
© Blue Histology


Antrum
Granulosa layer
Basement membrane
Theca interna
Theca externa

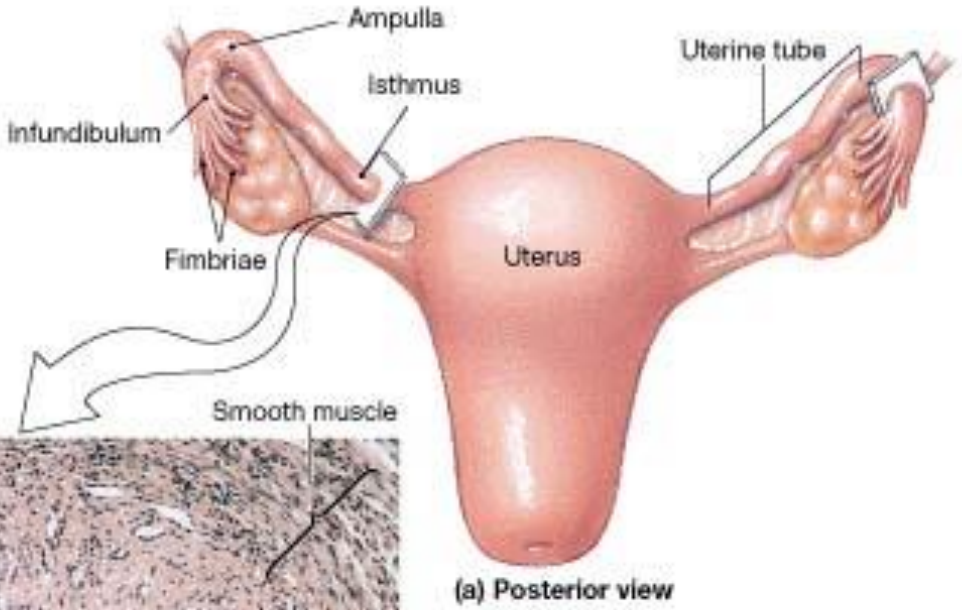
# Corpus luteum

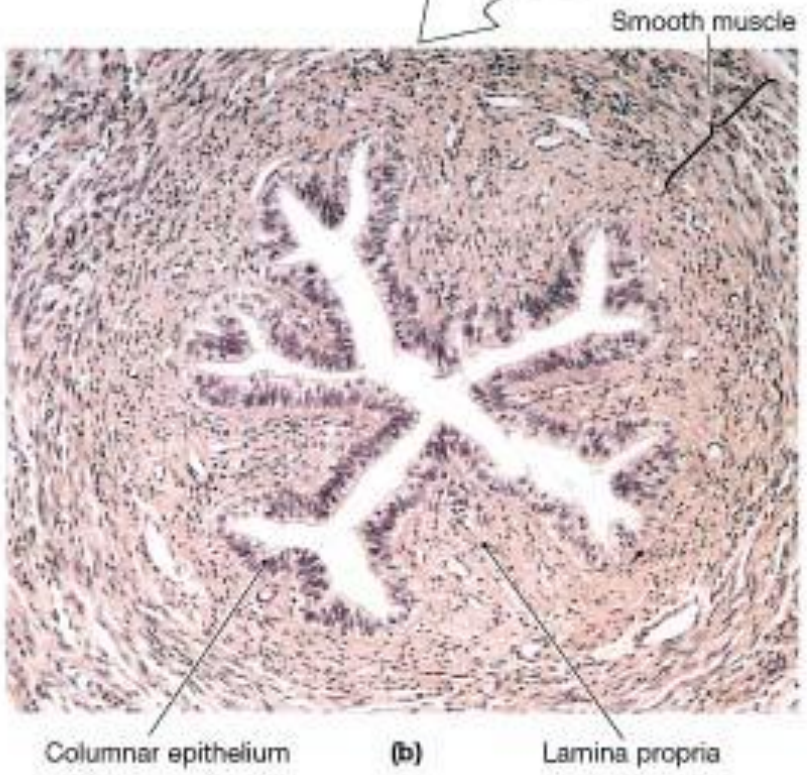


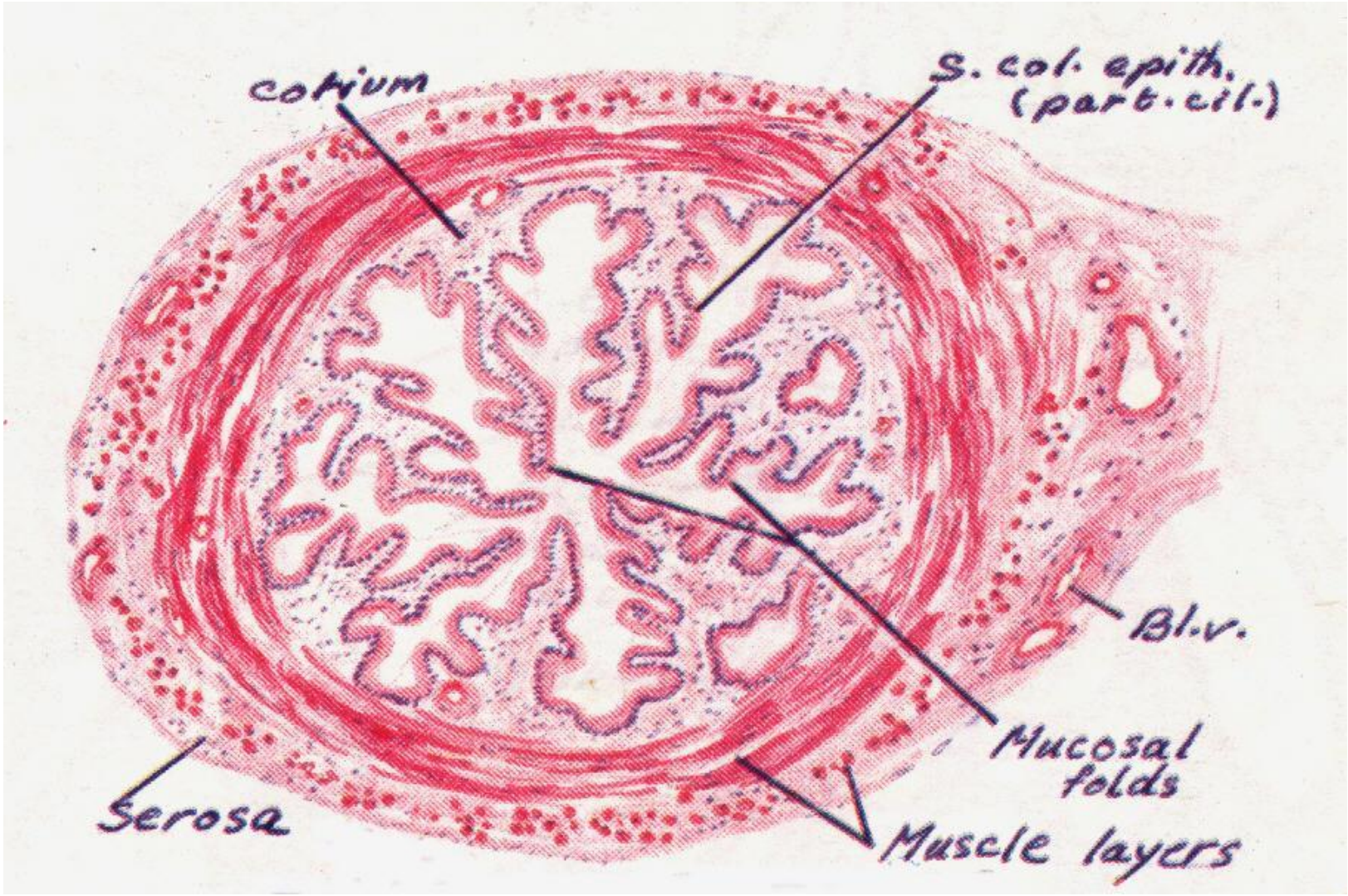

Corpus luteum

**FIGURE 28-17 The Uterine Tubes.** **(a)** Regions of the uterine tubes. **(b)** A sectional view of the isthmus. (LM × 122)

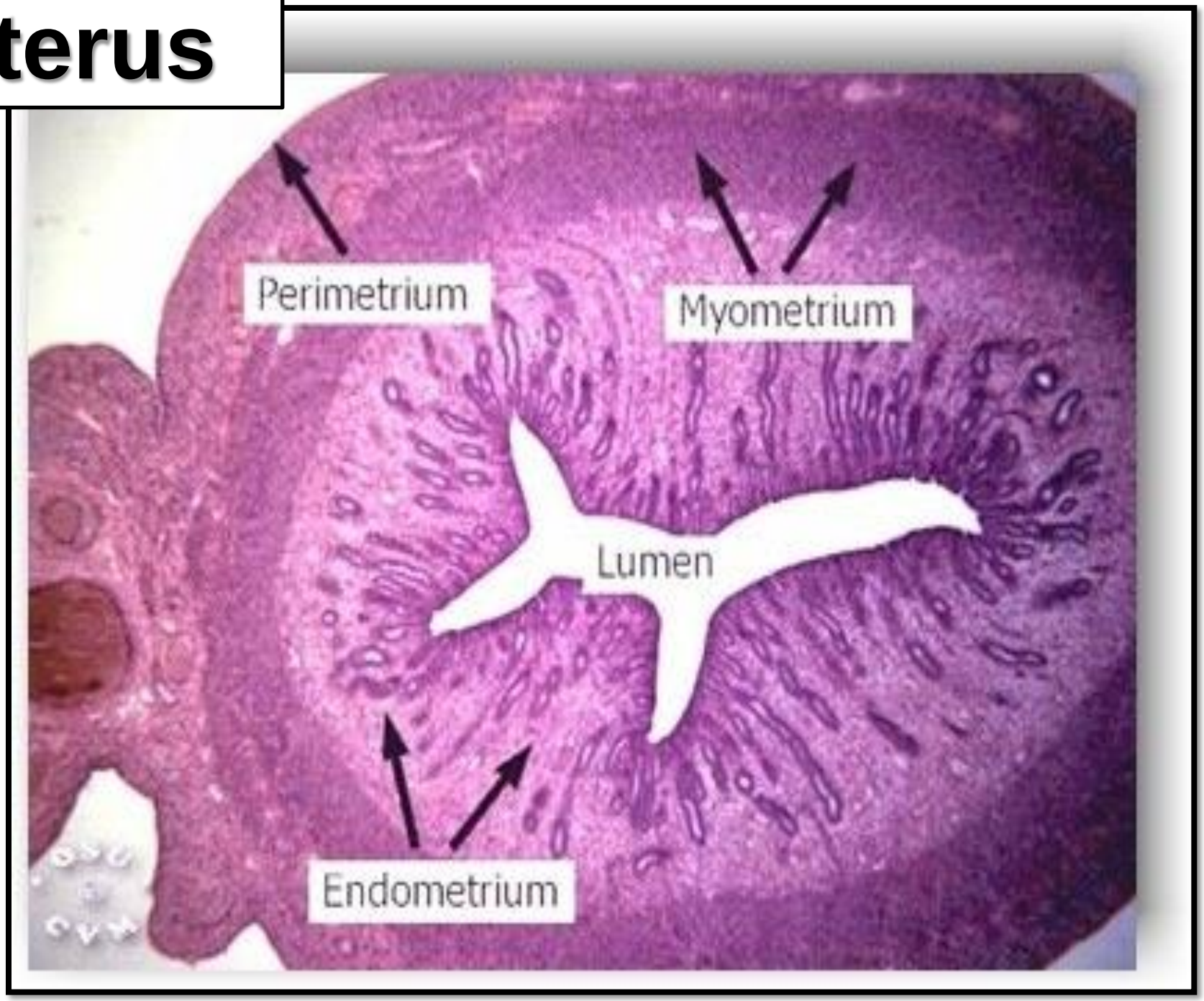


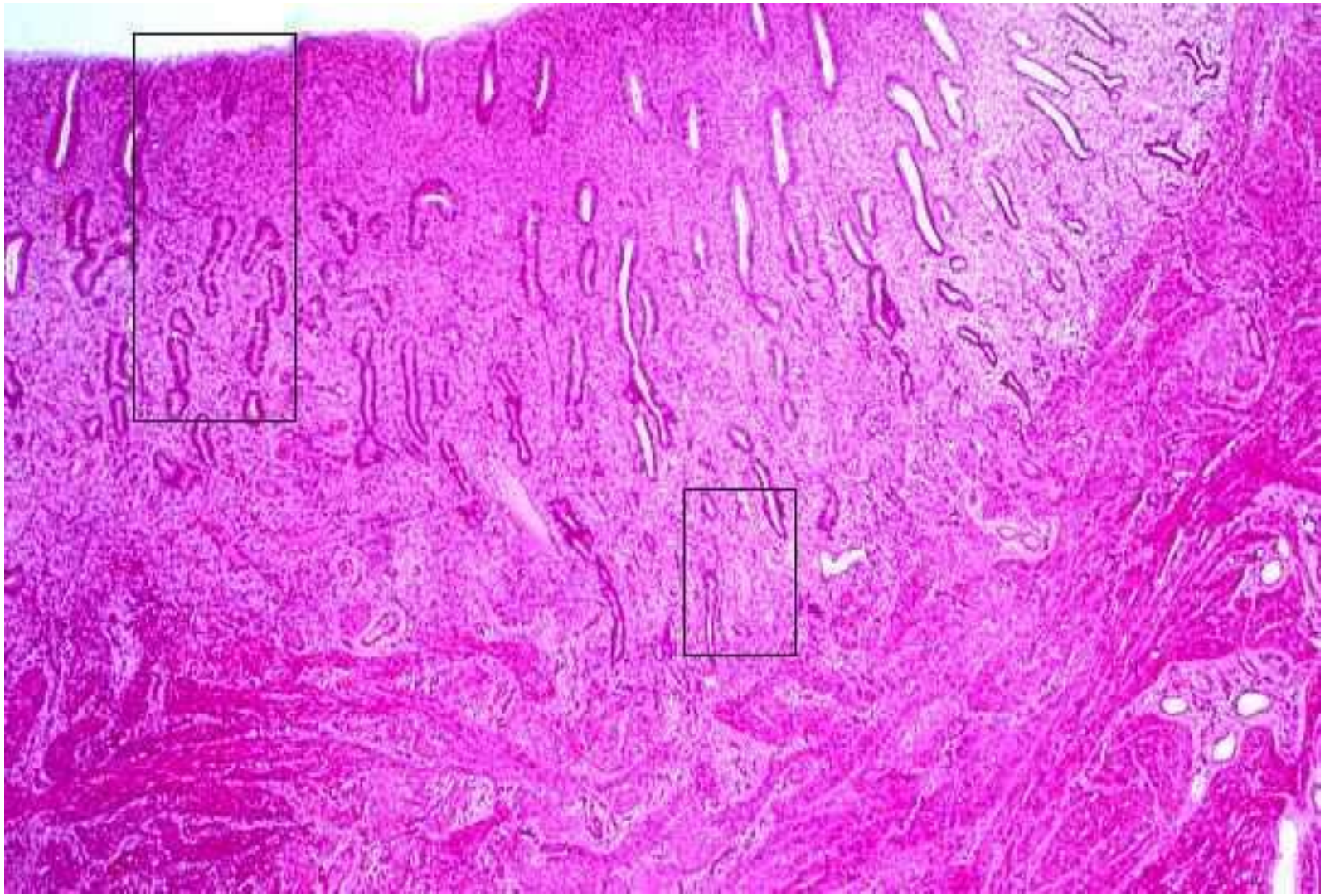
# Fallopian tube



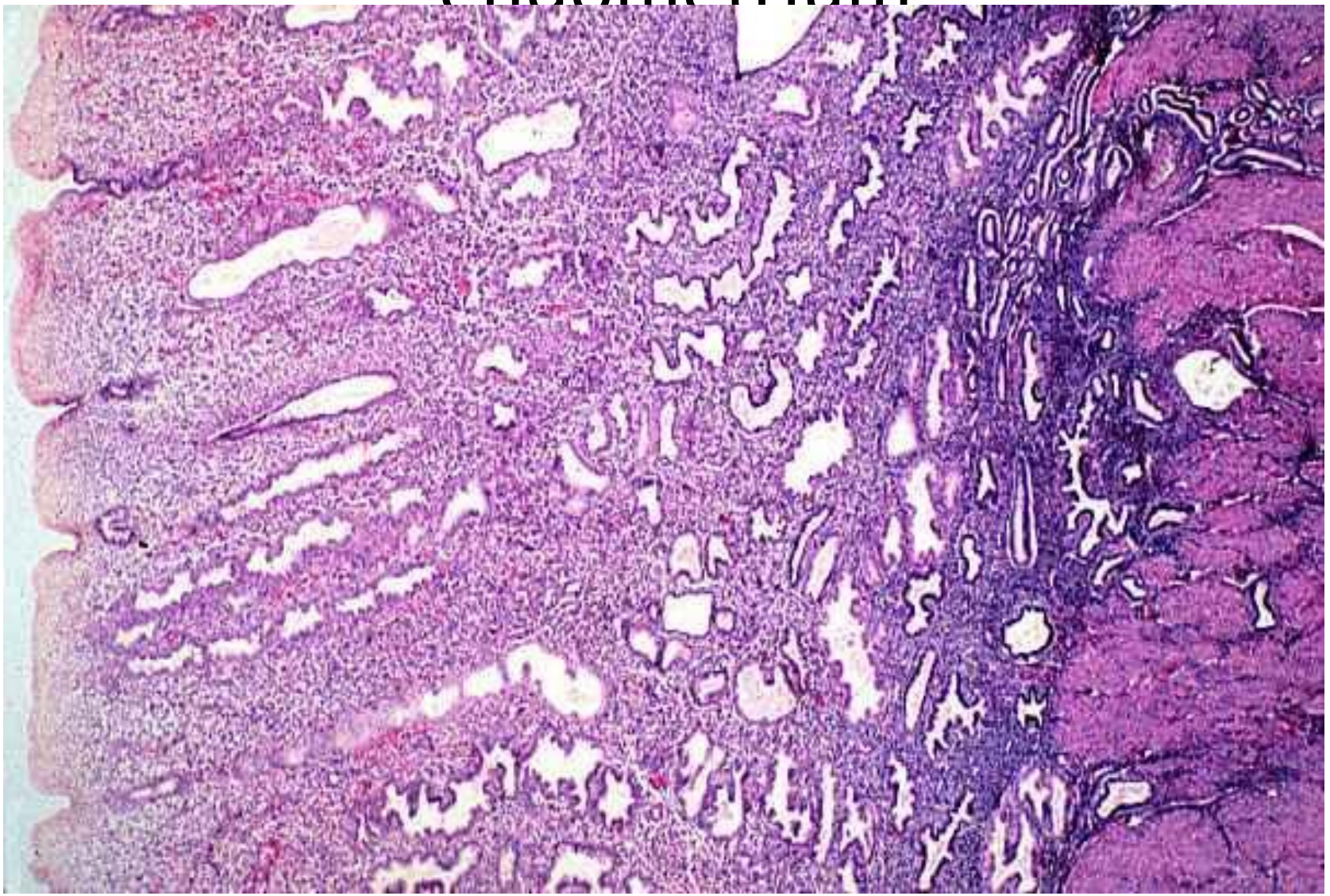
# Uterus



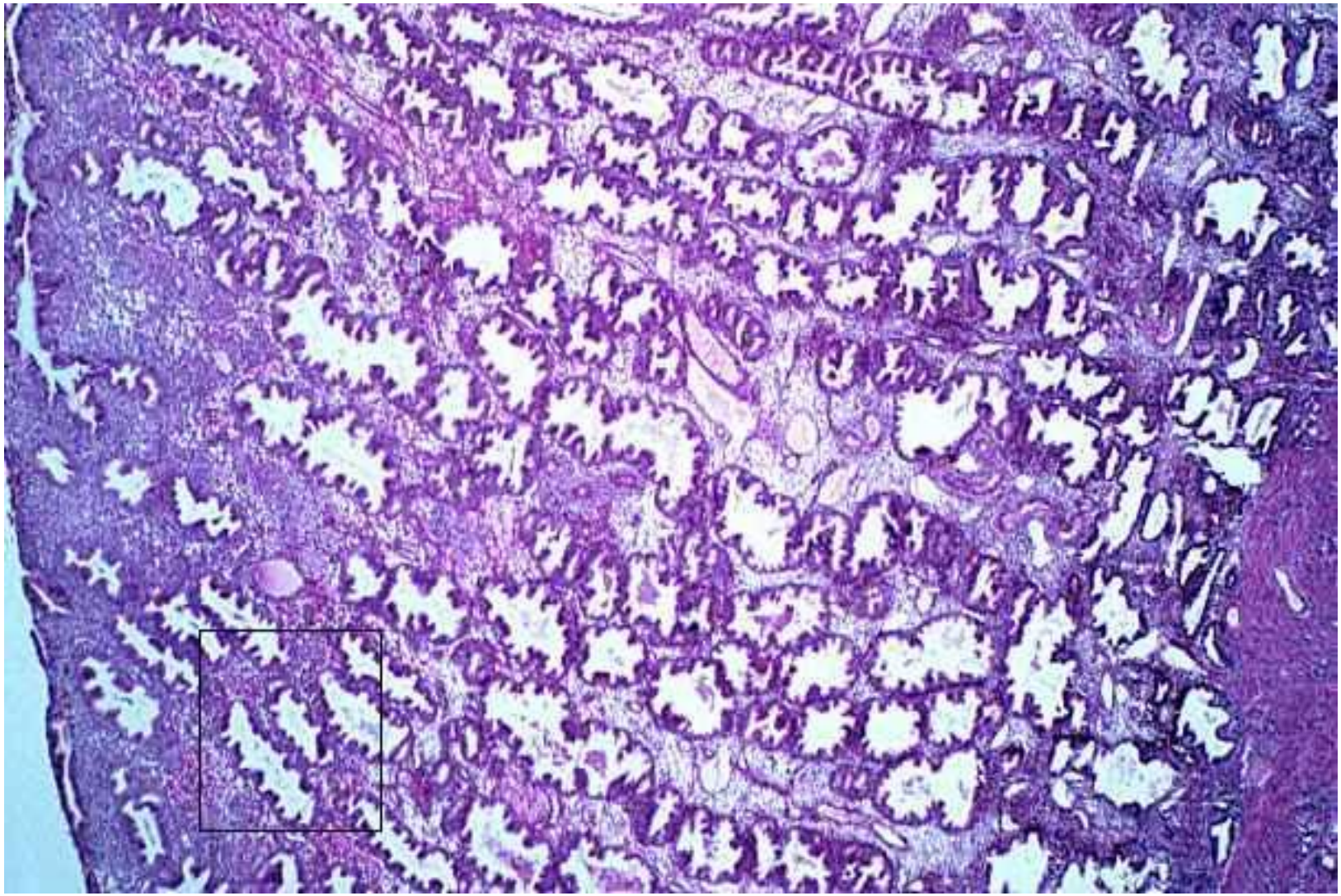
# Follicular (proliferative) phase of endometrium



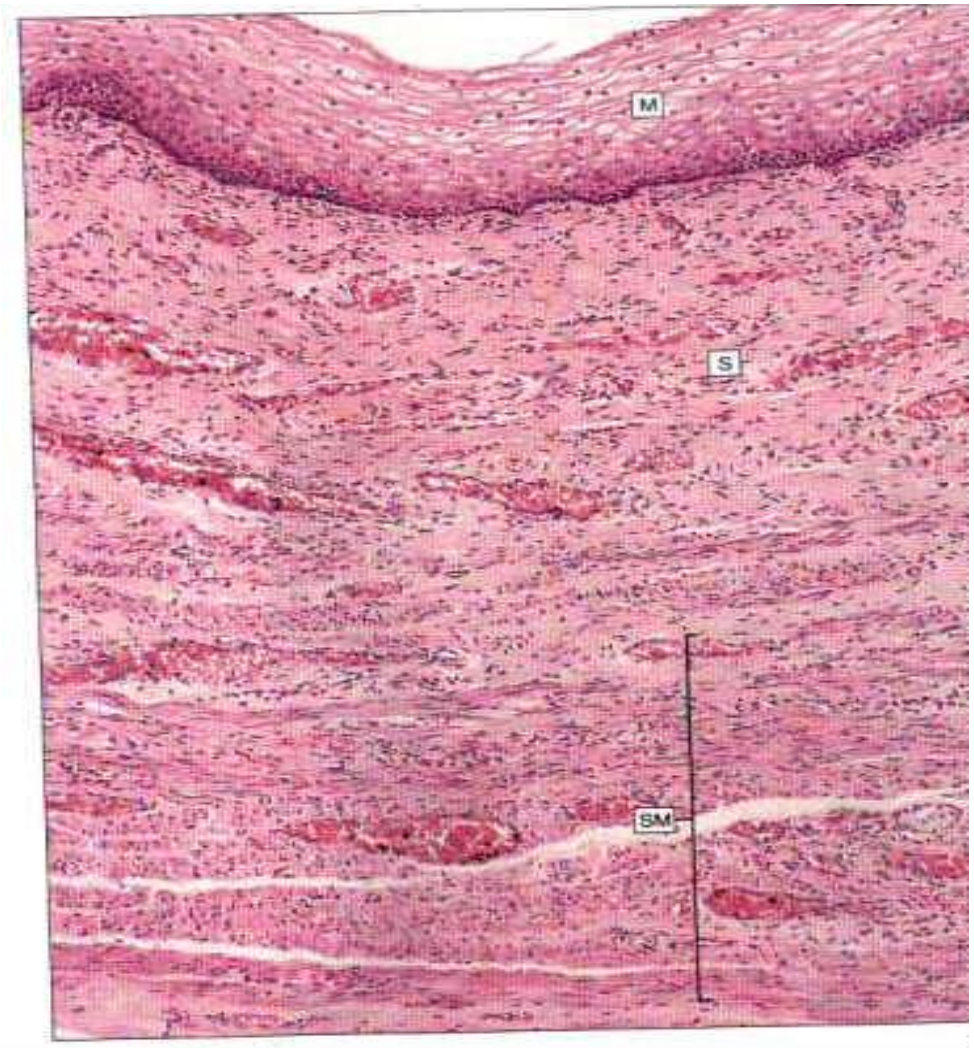
# Early secretory phase of endometrium

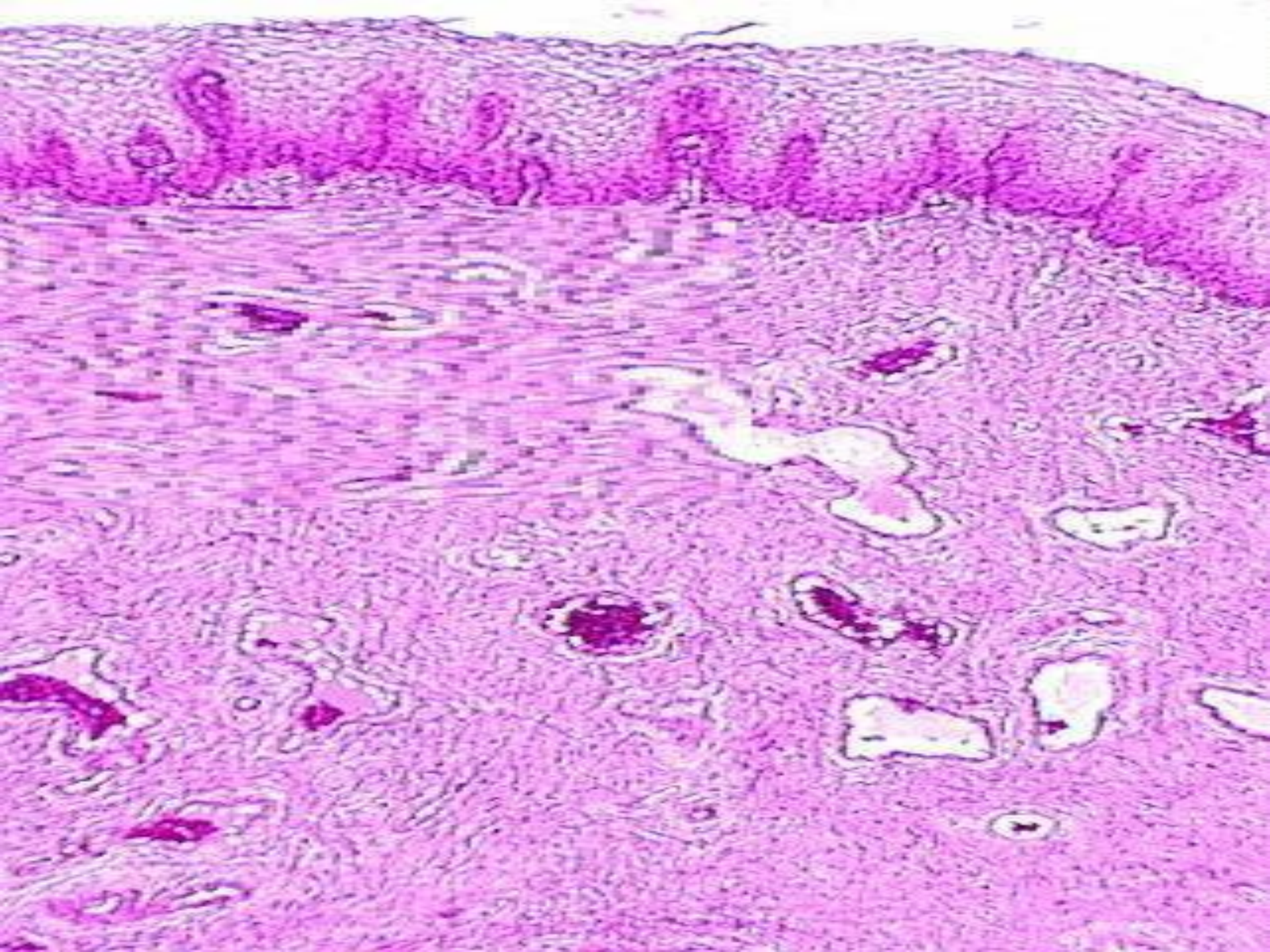


# Late secretory phase of endometrium

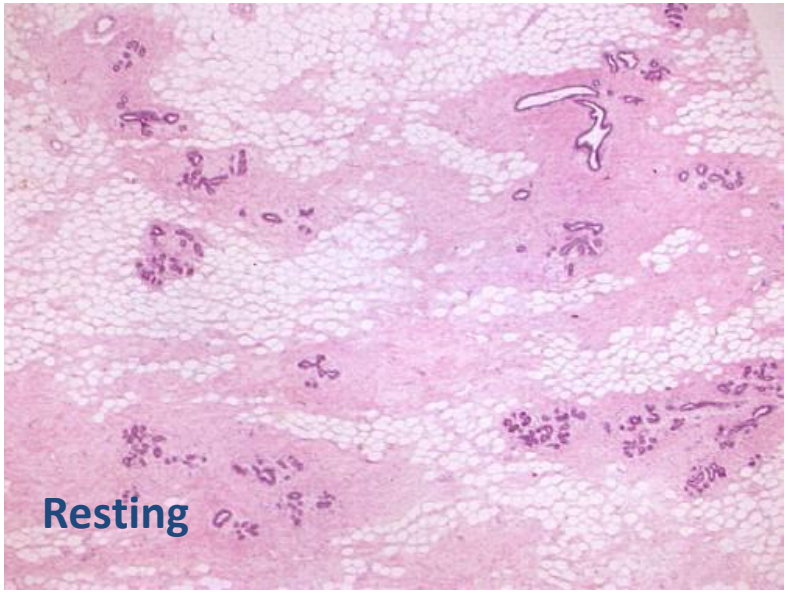


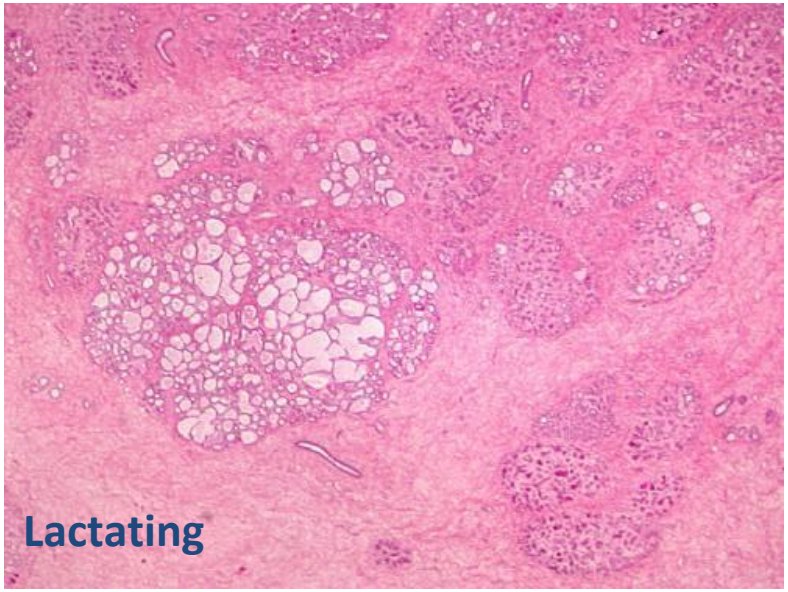
# vagina

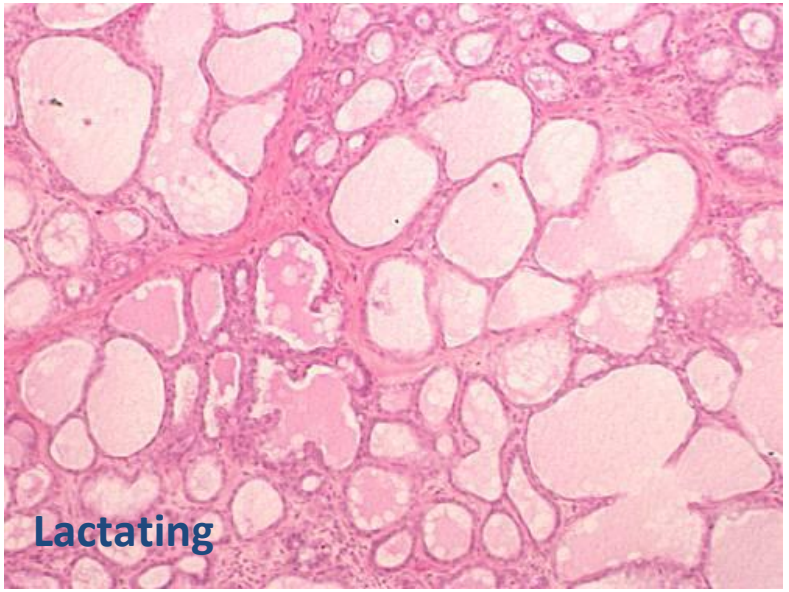


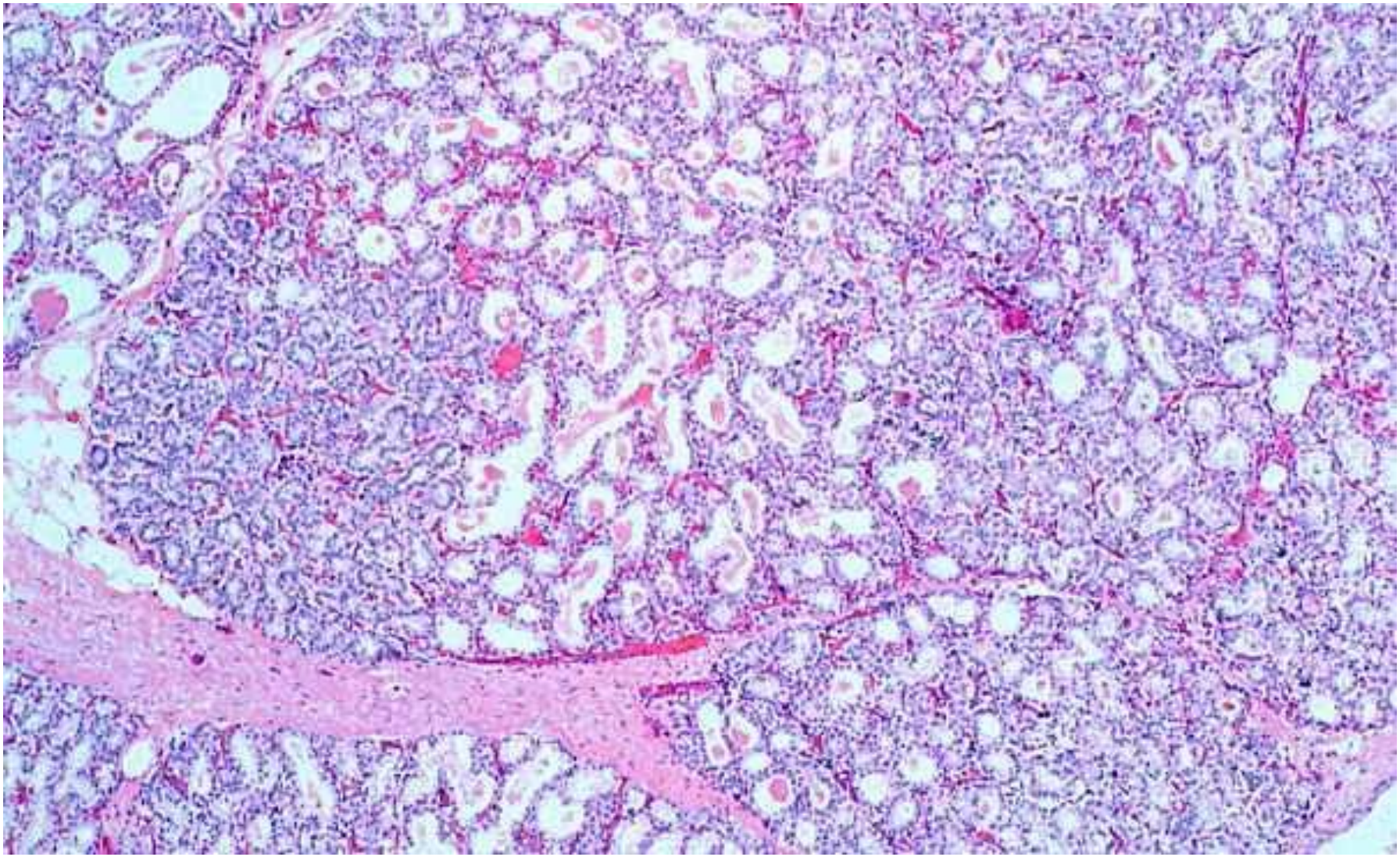
# Mammary Gland



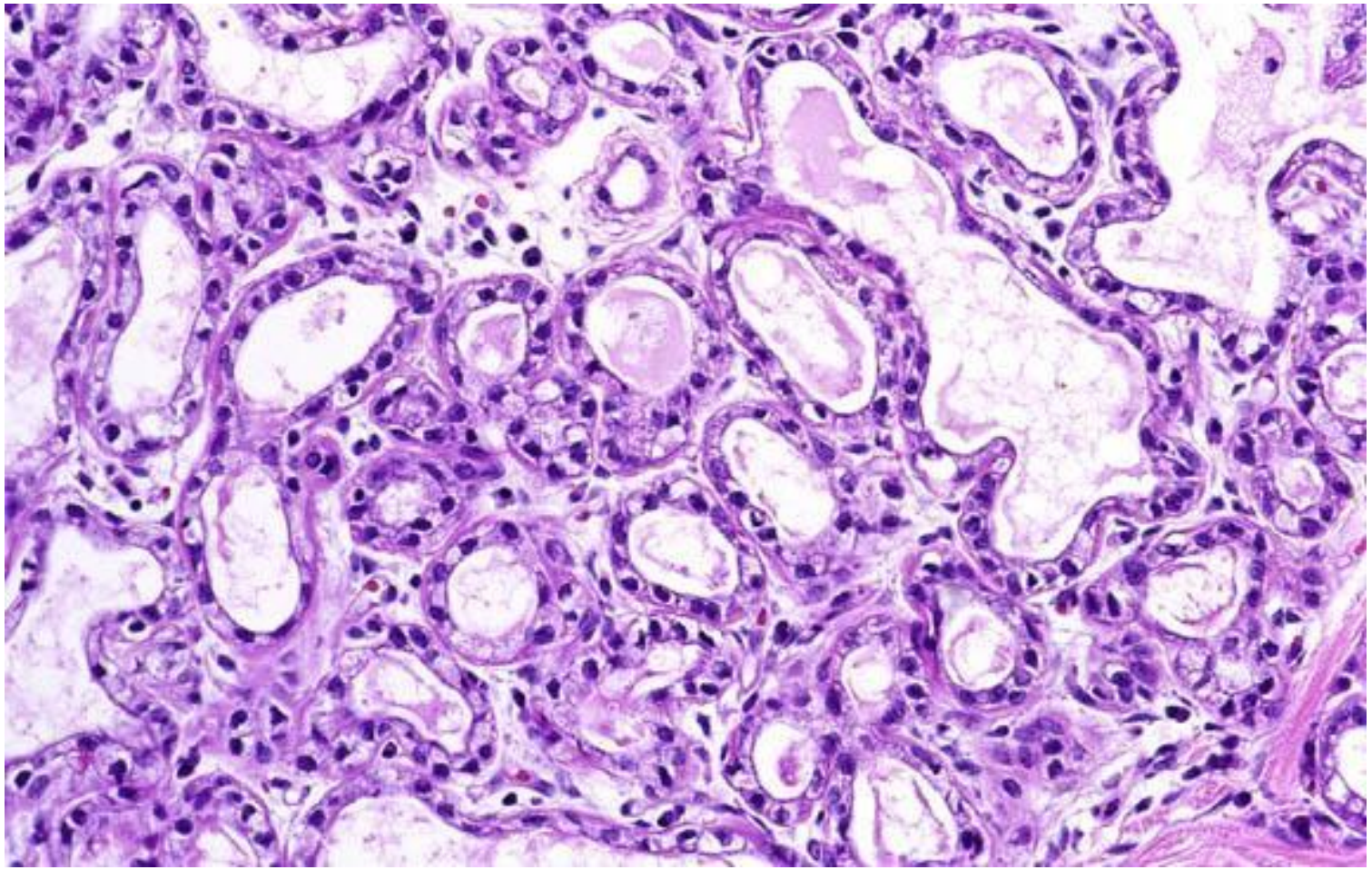



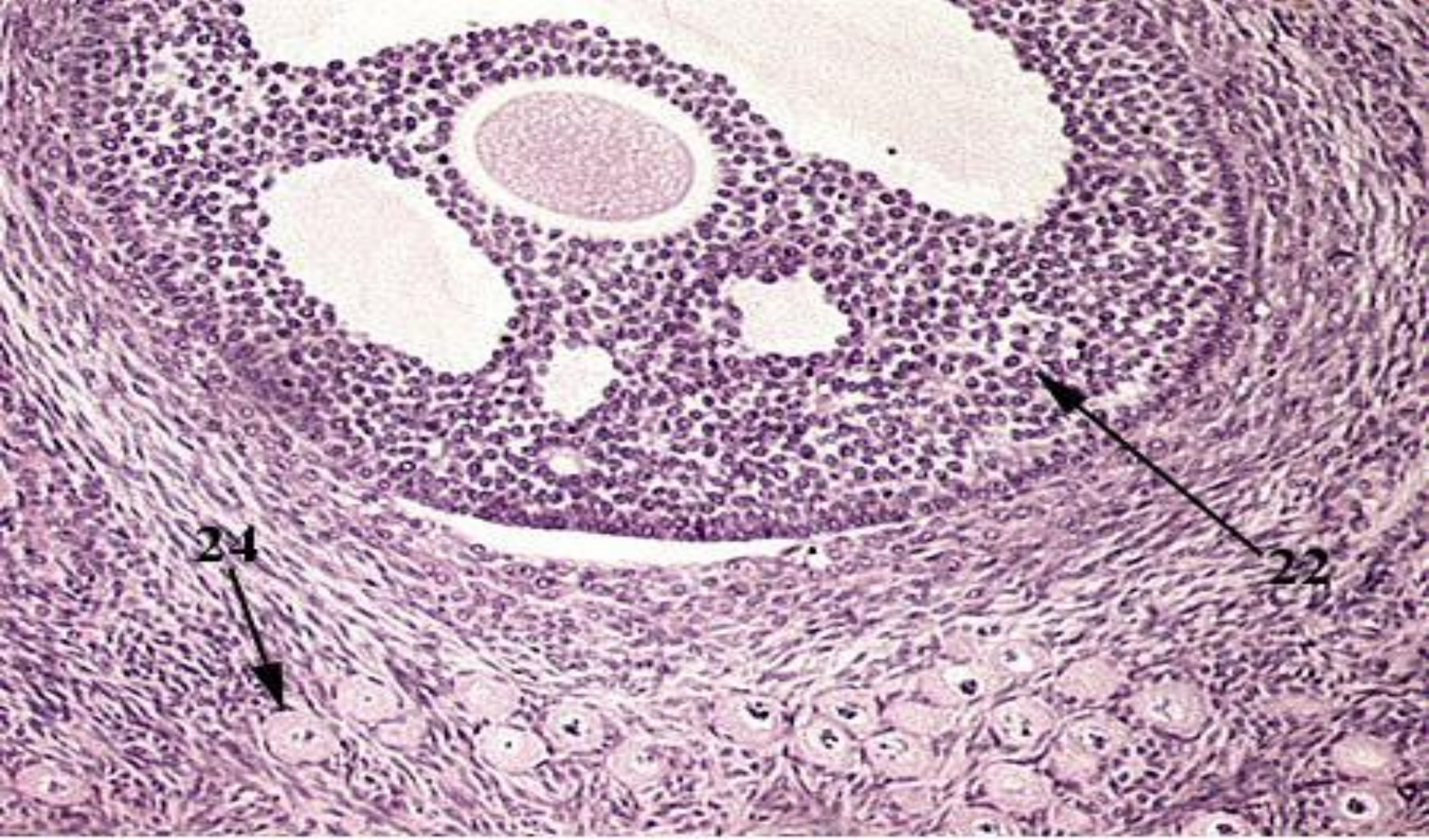
# Lactating mammary gland



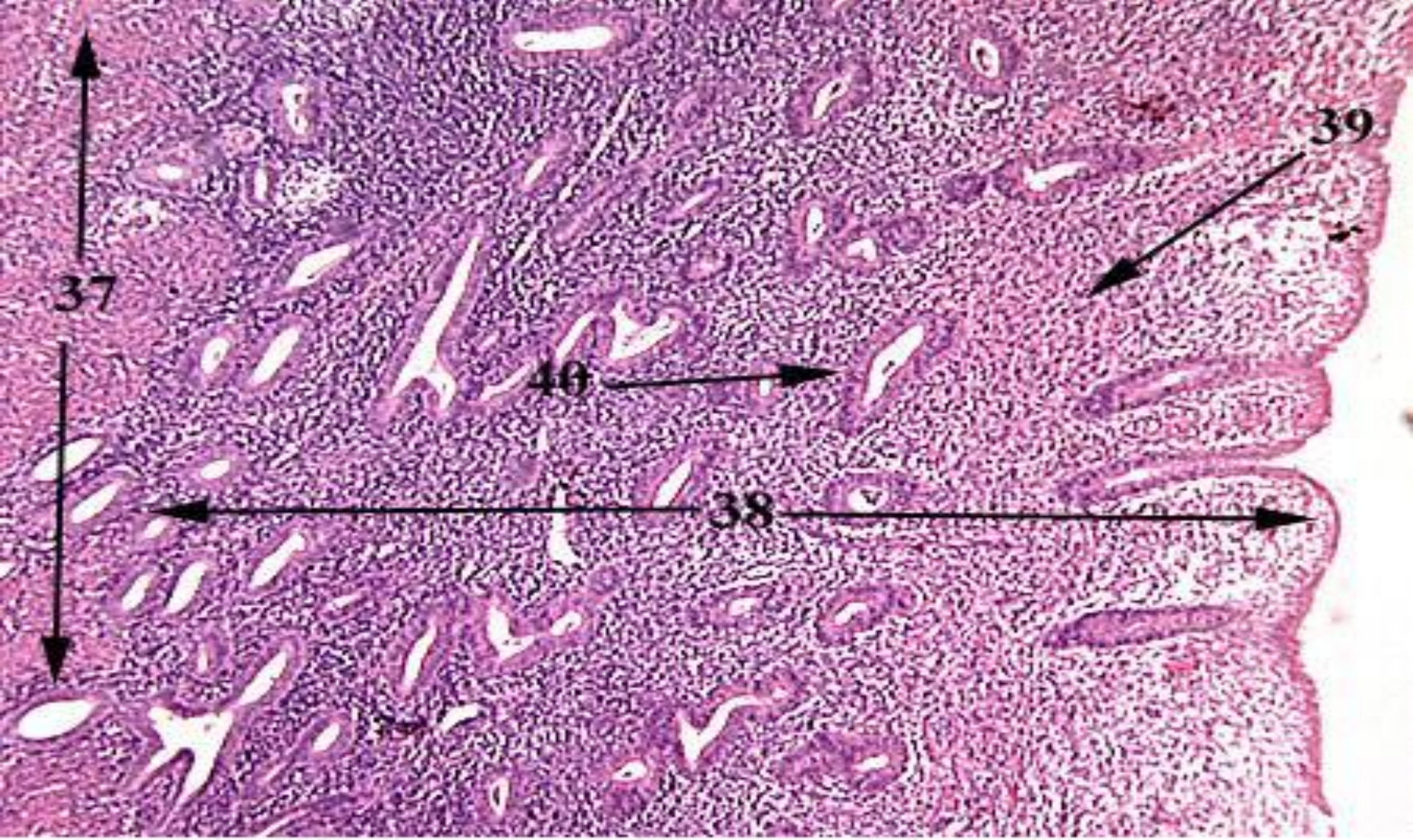
# Lactating mammary gland



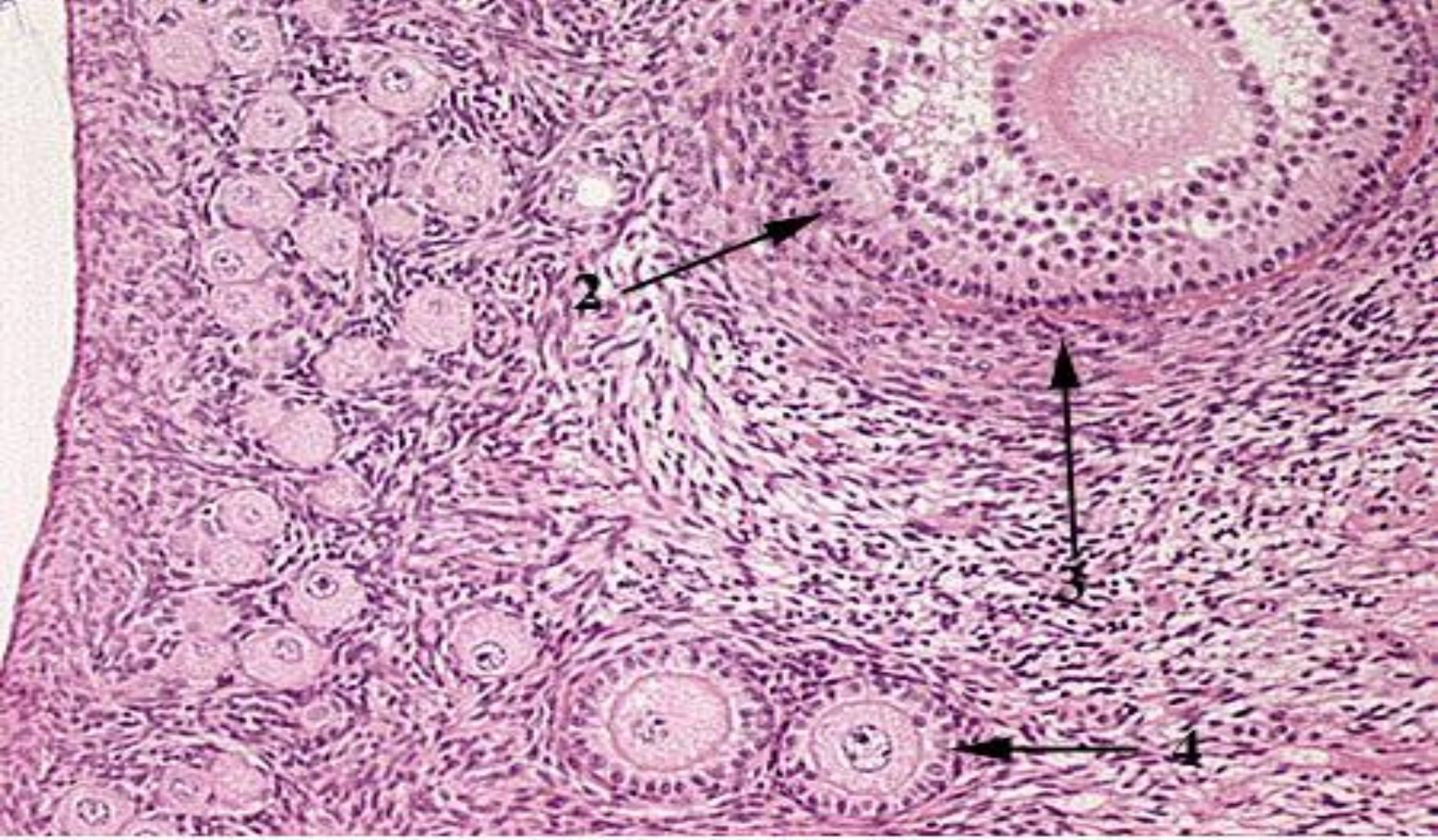
Formative assessment



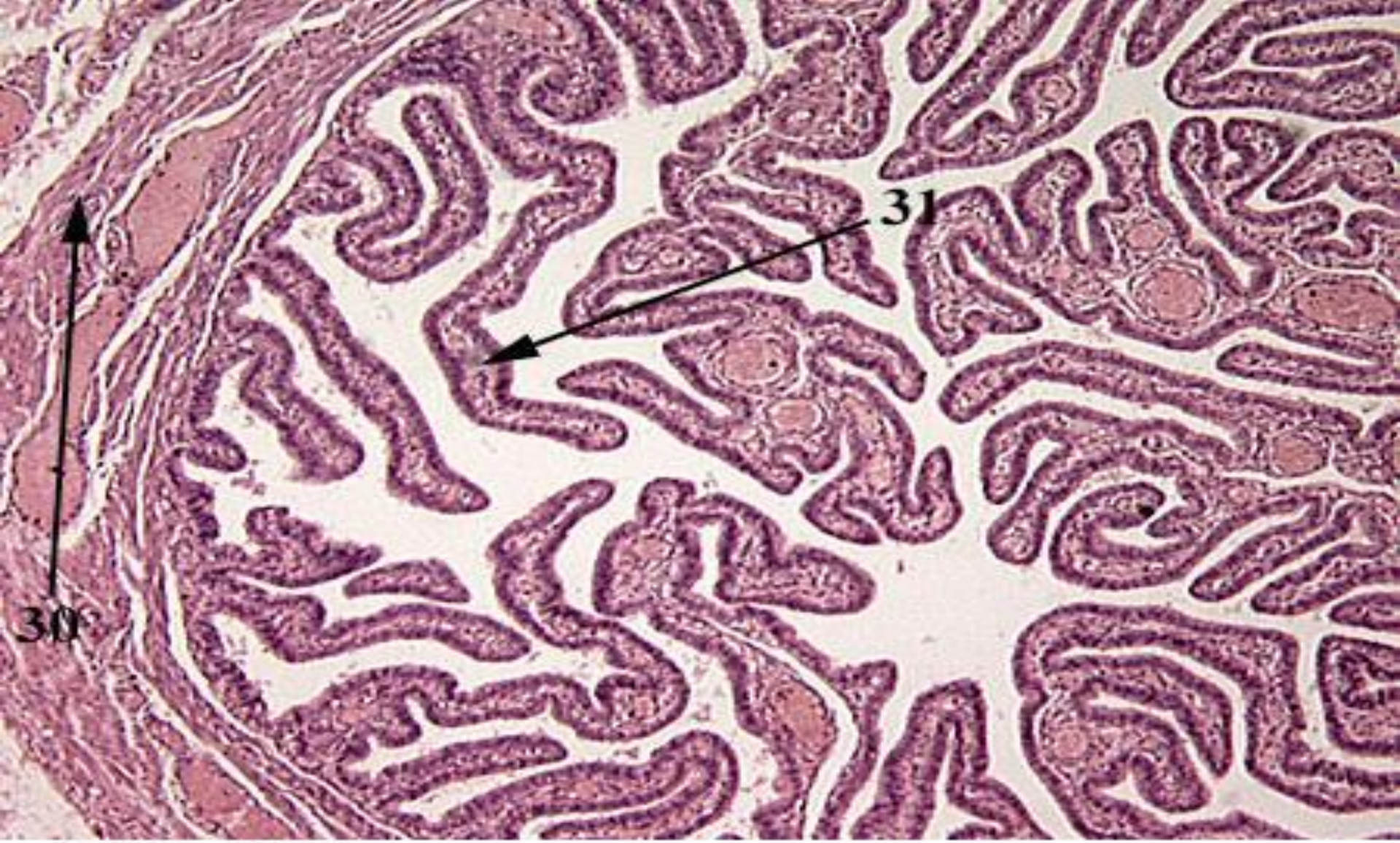

21. Identify the organ.
22. Identify the entire structure indicated by the arrows.
23. Identify the cell type indicated by the tip of the arrow.
24. Identify the structure indicated by the arrow.




37. Identify the region of the organ indicated by the arrows.
38. Identify the region of the organ indicated by the arrows.
39. Identify the tissue indicated by the arrow.
40. Identify the structure indicated by the arrow.

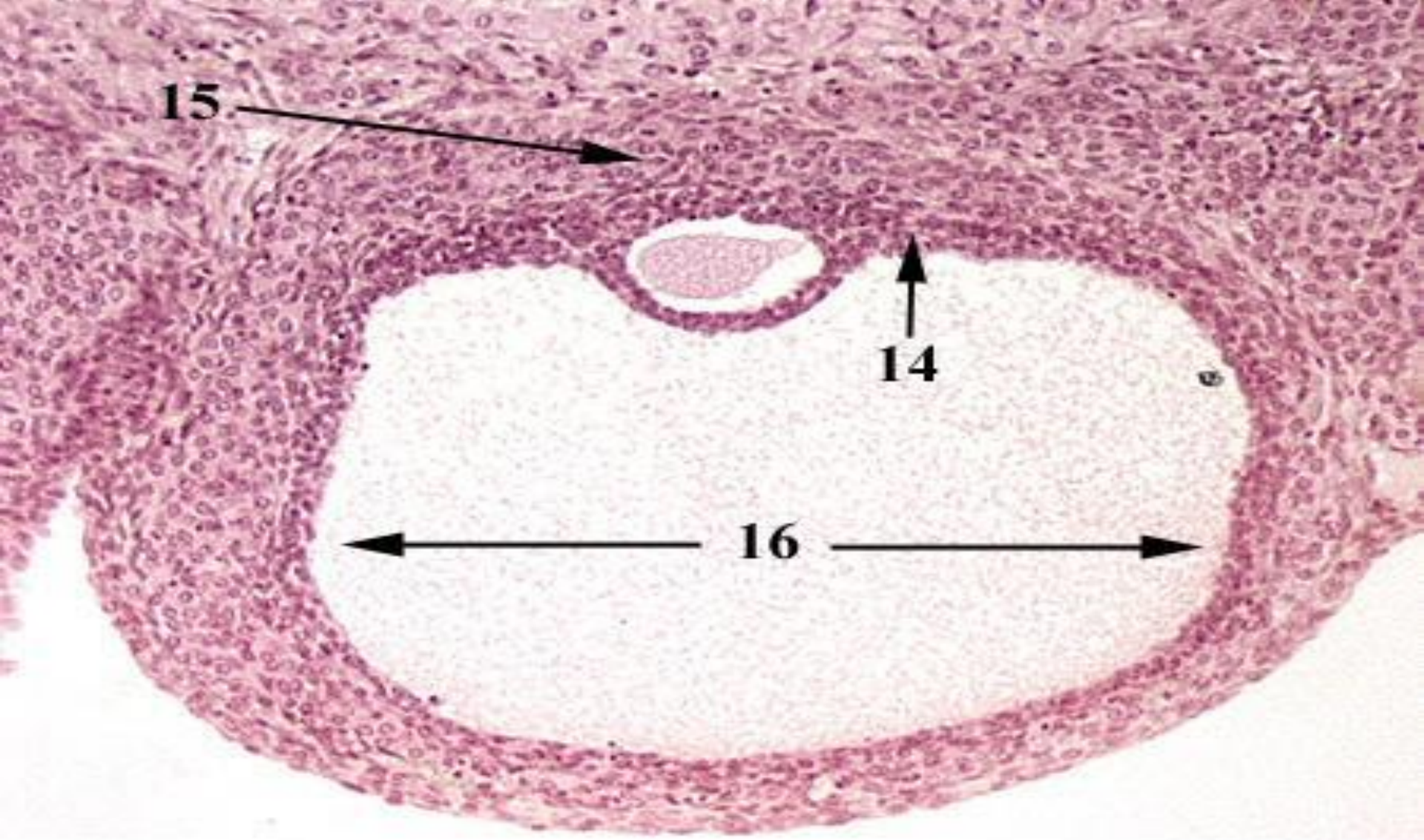



1. Identify the organ.
2. Identify the entire structure indicated by the arrow.
3. Identify the layer indicated by the arrow.
4. Identify the structure indicated by the arrow.

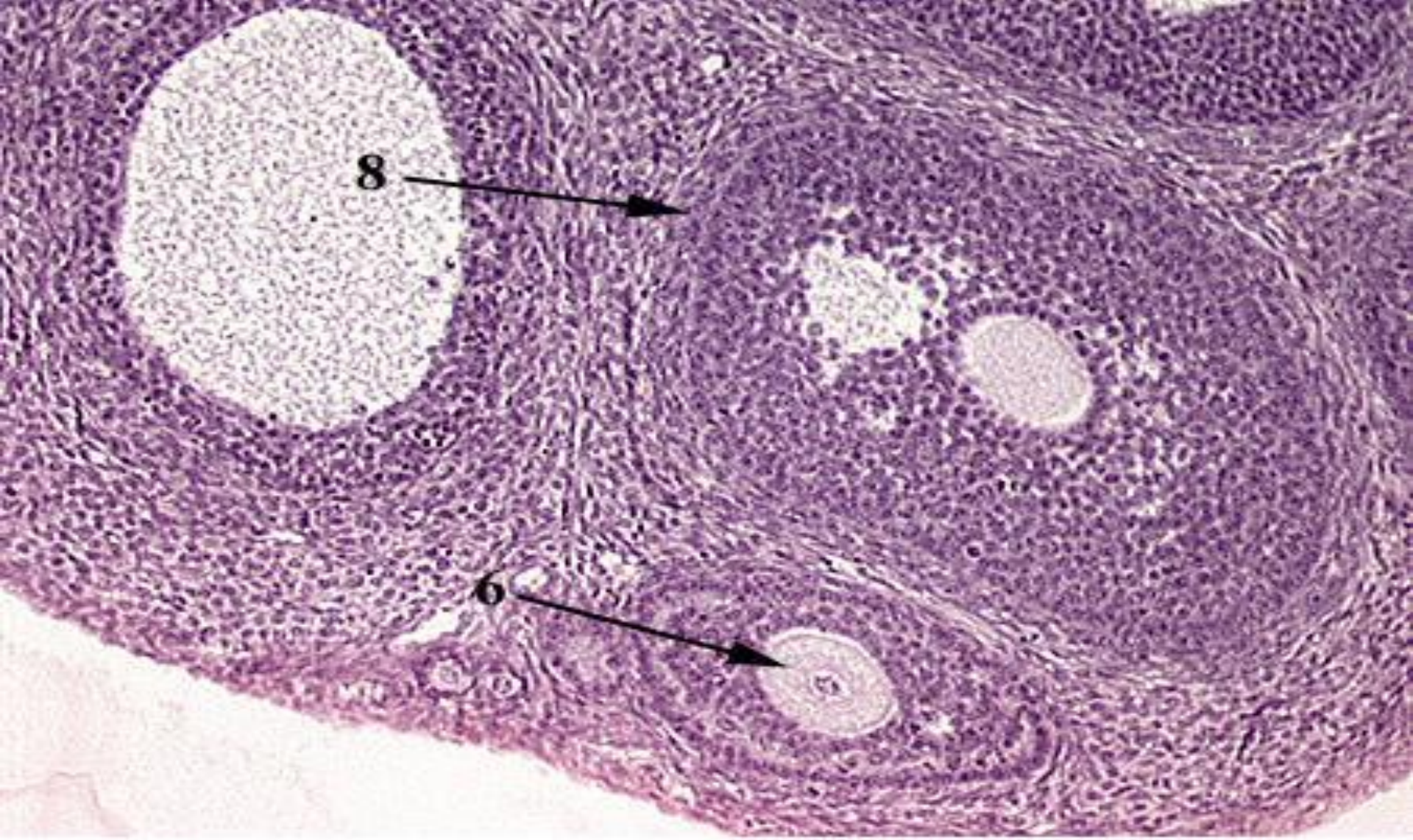



29. Identify the organ.
30. Identify the tissue indicated by the arrow.
31. Identify the entire structure indicated by the arrow.
32. Identify the layer at the tip of the arrow.


13. Identify the organ.
14. Identify the entire structure indicated by the arrow.
15. Identify the structure indicated by the arrow.
16. Identify the structure indicated by the arrow.




13. Identify the structure which fills the field.
14. Identify the cell type indicated by the arrows.
15. Identify the layer indicated by the arrow.
16. Identify the space indicated by the arrow.




5. Identify the organ.
6. Identify the entire structure indicated by the arrow.
7. Identify the cell at the tip of the arrow.
8. Identify the layer indicated by the arrow.

# Practical ERS

## Physiology

**Physiology :**

1- Thyroid function tests
2- Tetany
3- Semen analysis
4- detection of ovulation

# CONTENTS

**Subject**

1- Thyroid function tests

2- Tetany

3- Semen analysis

4- Detection of ovulation

# Thyroid function tests

## 1. measurement of serum thyroid hormones :

### a. Measurement of free T3 and T4 : ( difficult tomeasure )

i. free T3 ( n. 0.4 ng % )

ii. free T4 ( n. 1.6 ng % )

### b. Measurement of protein bounded iodine :

i. not accurate as it affected by fluctuation of serumlevel of plasma proteins

ii. total T3 ( n. 70 – 170 ug % )

iii. Total T4 ( n. 5 – 12 ug % )

iv. so : may be

( a ) false high with high protein ( pregnancy ) may be( b ) false low with low protein ( liver cirrhosis – nephrotic syndrome )

a. Measurement of free binding sites for thyroid

hormones in blood ( T3 uptake test ) :

radioactive T3 is incubated with the patient's serumT3 will bind to the free thyroid binding proteins Estimate the number of free binding sites in the serum so : may be

( a ) low with thyrotoxicosis

( b ) high with hypothyroidism

b. Estimation of TSH in serum :

i. most sensitive test of thyroid function

ii. n. = 0.5 – 5 mu / L

iii. low concentration = hyperthyroidism

iv. high concentration = hypothyroidism

## 1. Radioactive iodine uptake studies :

**a. Uptake studies :**

i. give trace dose then measure the uptake by the gland

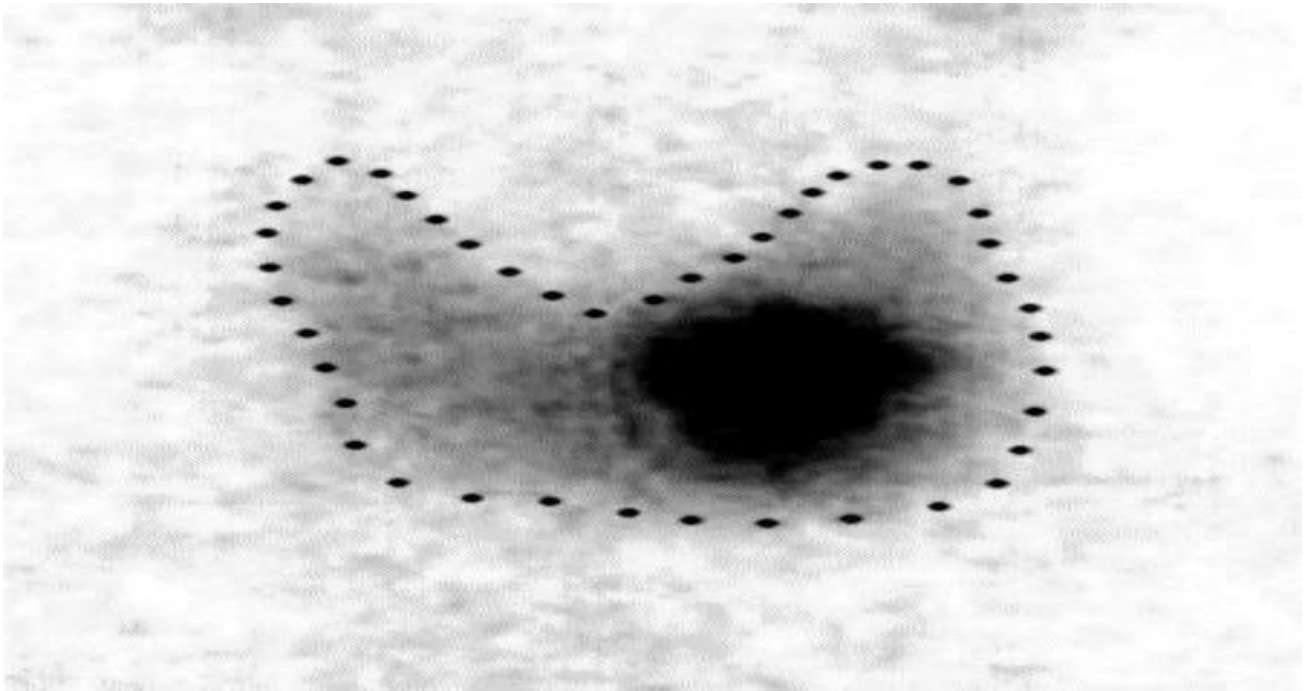
ii. n. = 11 – 55 % of the trace dose

iii. so may be ( a ) high uptake ( > 55 % ) = hyperthyroidism ( b )low uptake ( < 11 % ) = hypothyroidism

**b. Thyroid scan :**

i. after given a dose of radioactive iodine , the radioactivity ofthe gland is screened by ( GAMMA ) camera

ii. show functioning = hot nodule = toxic nodule



## 1. Non specific test :

a. ECG ( for arrhythmia )

b. Blood sugar and urine analysis ( for glucosuria )

c. High BMR ( basal metabolic rate )

d. Blood cholesterol ( n. 150 - 200 mg % ) :

i. decreased with hyperthyroidism

ii. increased with hypothyroidism

# Case

Hoda is a 40 years old school teacher. Her complaintthat she had lost 10 kg in the past 10 months despitea veracious appetite. She also complaint of nervousness, sleeplessness, heart palpitations and heat intolerance. On examination, Hoda was restlessand had tremors in her hands. Her ABP was 160 / 70 and her heart rate was 120 beats / min. She had a wide - eye stare and her neck appeared full .

Based on her symptoms and examination, her doctorsuspected that Hoda had thyrotoxicosis and asked for some laboratory tests.

1) Mention the investigations were performed to determine the cause of her conditions .

2) Why was her TSH level decreased ?

3) Explain why is each of the following symptoms consistent with increased level of thyroid hormones .

a. Weight loss :

b. Heat intolerance :

c. Increased heart rate :

d. Increased pulse pressure :

e. Presence of tremors :

4) Explain the mechanism of :

a. Goiter

b. Exophthalmos

# Tetany

State of increase neuromuscular excitability .
Causes :
hypocalcaemia :
o hypoparathyrodism
surgical removal irradiation
o decrease Ca intake :
o decrease Ca absorption :
malabsorption syndrome

- decrease active vitamin D ( as in chronic renal failure )

- alkalosis ( decreases ionized Ca)
  - Respiratory alkalosis(any case of hyperventilation )
  - Metabolic alkalosis

- Loss of HCL ( vomiting – gastrectomy )

- Hypokalemia ( Conn's syndrome )

**C / P :**

- **Latent tetany : ( serum Ca = 7 – 9 mg% )**

**o Manifestation of tetany are not present**

**o Manifestation appear by provocative tests :**

- **Chvostek's test :**

- **tapping over facial nerve leading to contraction offacial muscles**

- **Trousseau' s test :**

- **inflation of a blood pressure cuff above systolic blood pressure for 3 minutes leading to carpal spasm**

- **Erb's test :**

**( normally : 8 mille ampere at least are needed for stimulation )**

- **manifest tetany : ( serum Ca < 7 mg % )o parasthesia**

**around mouth and fingers**

**o spasm :**

- **eye lid : blepharospasmmouth :**
- **trismus of jaw larynx**
- **:laryngospasm carpopedal**
- **spasm**
- **GIT : abdominal colic**
-

**O Convulsions in severe cases**

**O Cardiovascular :**

**( hypotension – QT prolongation in ECG )**

**Investigation :**

- **In hypoparathyrodism :**

**Low PTH**
**Low serum Ca**
**High P**

- **In alkalosis :**

**Increase PH**
**Low ionized Ca**

**Treatment :**

- **Acute attack: IV Ca gulconate 10 ml 10% very slowly in 10 minutes .**
- **Treatment of the cause**

## Case

**Thyroidectomy was carried for patient suffered fromthyrotoxicosis. The operation was successful, and she was recovering well. His nervousness, palpitations disappeared, she was gaining weight and her blood pressure returned to normal. However,she began to feel numbness around her mouth , tingling in her fingers and muscle cramps.**
**Examination revealed a positive Chovestek sign. Hertotal calcium concentration was 7.8 mg/dl and ionized Ca concentration was 3.5 mg/dl .**

1) What is the normal level of Ca .

2) What are the forms of plasma Ca .

3) Mention hormones that control calcium level of blood .

4) What caused the patient to become hypocalcemic .

5) Why did hypocalcemia cause her symptoms .

6) Mention other causes of hypocalcemia .

7) How was this complication of thyroidectomy treated .

8) What are the types of tetany . which type did this patientpresent with .

9) Is tetany a fatal condition . explain why .

10) Mention another hormone essential for life .

# Semen analysis

**Remarks :**

- Should be done after 2 -3 days of no coitus
- Examination in 2Hr (motility at once , after 1 hour and 2 hour )

| Abnormal | Normal | Items |
| --- | --- | --- |
| Acidic<br>as in obstruction of ejaculatory duct . | 7.4 ( alkaline ) | PH |
| Aspermia ( no semen )Hypospermia<br>(< 2ml ) Hyperspermia ( > 6ml ) | 2 - 6 ml / ejaculate | Volume |
| Azospermia ( no sperm )<br>Oligospermia ( < 20 million ) | 20 - 60 million / ml | Sperm count |

| Abnormal | Normal | Items |
| --- | --- | --- |
| ☐ Asthenospermia ( week )<br>☐ Necrospemia ( dead ) | > 60 % at 2hr after ejaculate | Motility |
| Teratospermia( increased abnormal forms) | Normal form >60% | Morphology |
| Hyerviscosity limits sperm motility | Normal | Viscosity |
| Pyospermia ( +ve pus cells) | No | Pus cell |

**Urinary gonadotropins :**

- **Increased in primary hypogonadism**
- **Decreased in secondary hypogonadism**

- **Urinary 17 ketosteroids**
  **( 2/3 from adrenal cortex - 1/3 from testis )**
- **Decreased in primary hypogonadism**

- **Estimation of blood testosterone , FSH , LH**

**C )Testicular biopsy :**

- **To differentiate azospermia due to testicular damage or bilateral vas obstruction .**
- **If biopsy contains +ve sperm no testicular damage**

# Abnormalities of testicular functions

## 1) Cryptorchidism :

a. undescended testis .

b. due to decreased testosterone .

c. 10 % of newly born .

d. No spermatogenesis .

e. Normal secondary sex characters .

# Abnormalities of testicular functions

## 2) Hypogonadism :

| Primary | Secondary |
| --- | --- |
| **Originate from**<br>problem in testis | **Originate from**<br>problem with pituitary gland or hypothalamus |
| **Causes :** Undescended testisInjury to the testis Radiation<br>Klinefelter's Syndrome | **Causes :**<br>Inflammatory diseases affecting pituitary or hypothalamus |

# Detection of ovulation

## 1. History : ( regular cycles )

a. Mid ovulatory pain .
b. Mid ovulatory bleeding .
c. Premenstrual mastalgia .
d. Premenstrual headache .

## 2. Basal body temperature chart :

- Normally : ovulation ( biphasic chart ) which detected by rise of temperature by 0.5 C at mid cycleand continues for 14 days due to thermogenic effect of progesterone .

- An ovulation monophasic curve .

## 1. Premenstrual endometrial biopsy :

1. Time : on day 22 of cycle .
2. if endometrium shows :

o secretory phase ovulation occurred

o proliferative phase an ovulation

**. Study of cervix mucous :**

**o - ve spinnbarkiet test :**

- **+ve spinnbarkiet test : ( in first half of cycle )**
- **if a drop of cervical mucus is taken by tip of arteryforceps and the artery forceps is opened thread**

## 4. Study of cervix mucous :

**o - ve fern test :**

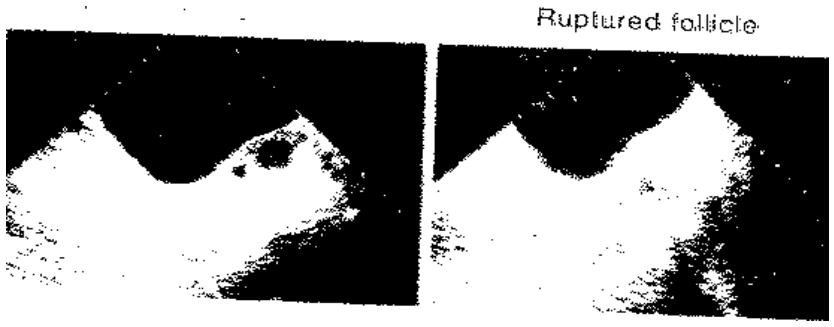
- **+ve fern test : ( in first half of cycle )**
- **drop of cervical mucus left to dry on a slide**
- **Examination under low power microscope ( palm leaf appearance)**

**4. Study of vaginal cytology :**

**Increased intermediate cells and leucocytes with ovulation which can be detected in second half of cycle (22th).**

**5. Ultrasound :**

**Around time of ovulation on day 11, 13, 15 of the cycle and ovulation can be detected by disappearance of mature graffian follicle .**



## 4. Hormonal assay :

a. Serum LH peak at mid cycle
b. Serum progesterone on the day 22 of cycle

## Case

**Kamilia is 23 years old. She is married since 2 years but has no children. Her husband's semen analysis was normal. Examination revealed no abnormality in her genital tract. Based on above findings the doctor arranged for her to take some tests to check her ovulation. Explain on physiological bases what findings led her doctor to diagnose an ovulation.**

**1) Blood FSH and LH levels on day 12 :.....**

**2) Blood progesterone level on day 21 :.....**

**3) Endometrial biopsy on day 21 :.....**

**4) Sonography on day 14 or 15 :**