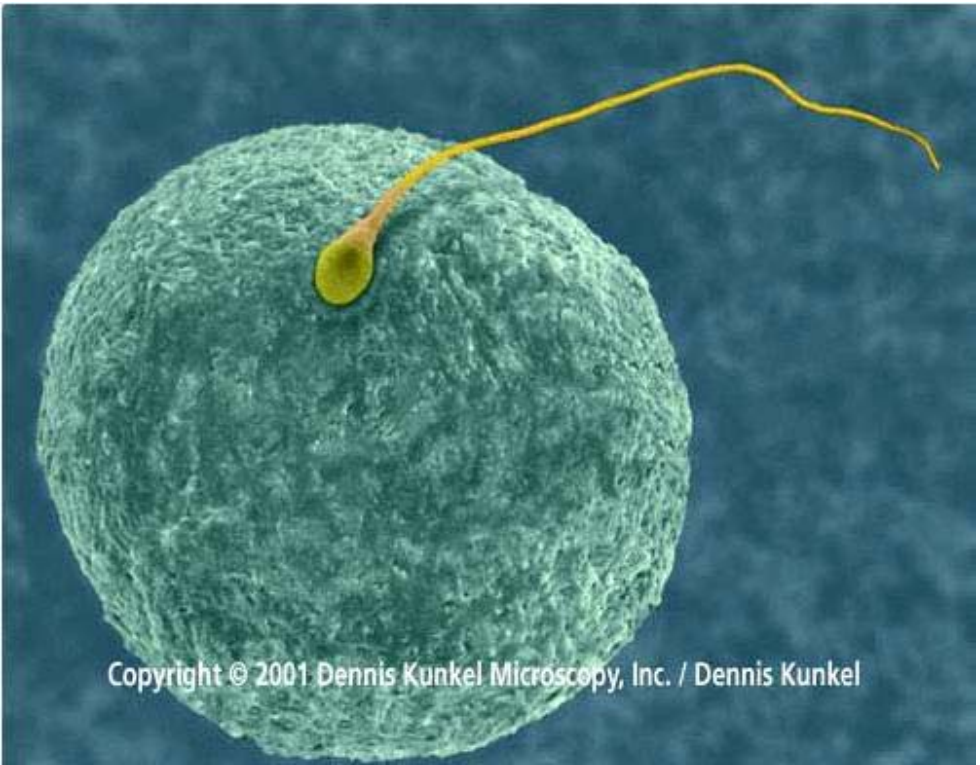
Reproductive system

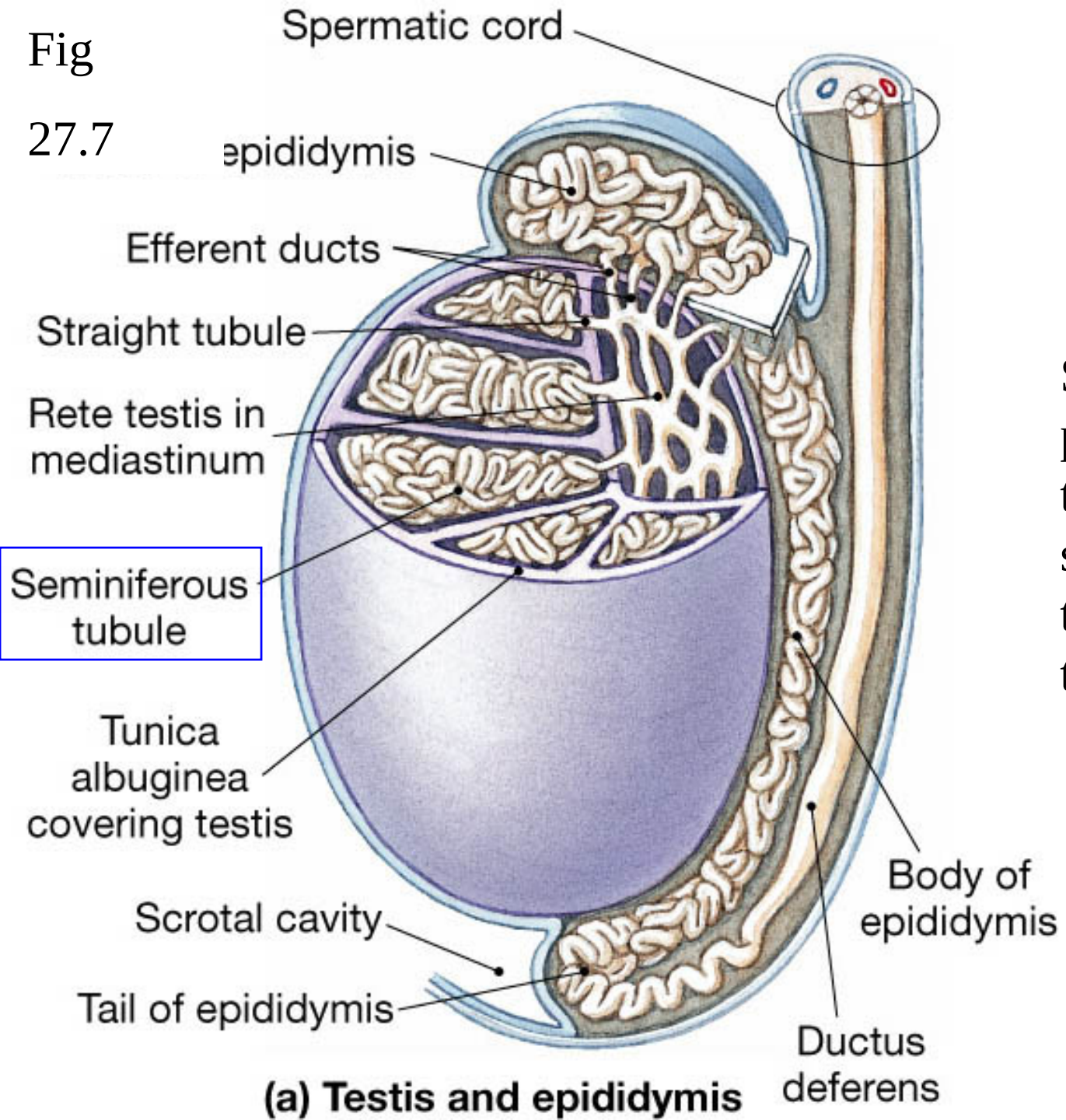


Functions of the reproductive system

- Production of gametes (reproductive cells) and hormones
- Fertilization
- Male
  - Sperm production, transport of sperm to the uterus
- Female
  - Ova production, fusion of gametes, development of the zygote

Male reproductive system

Fig 27.7



(a) Testis and epididymis

Sperm is produced in the seminiferous tubules of the testis

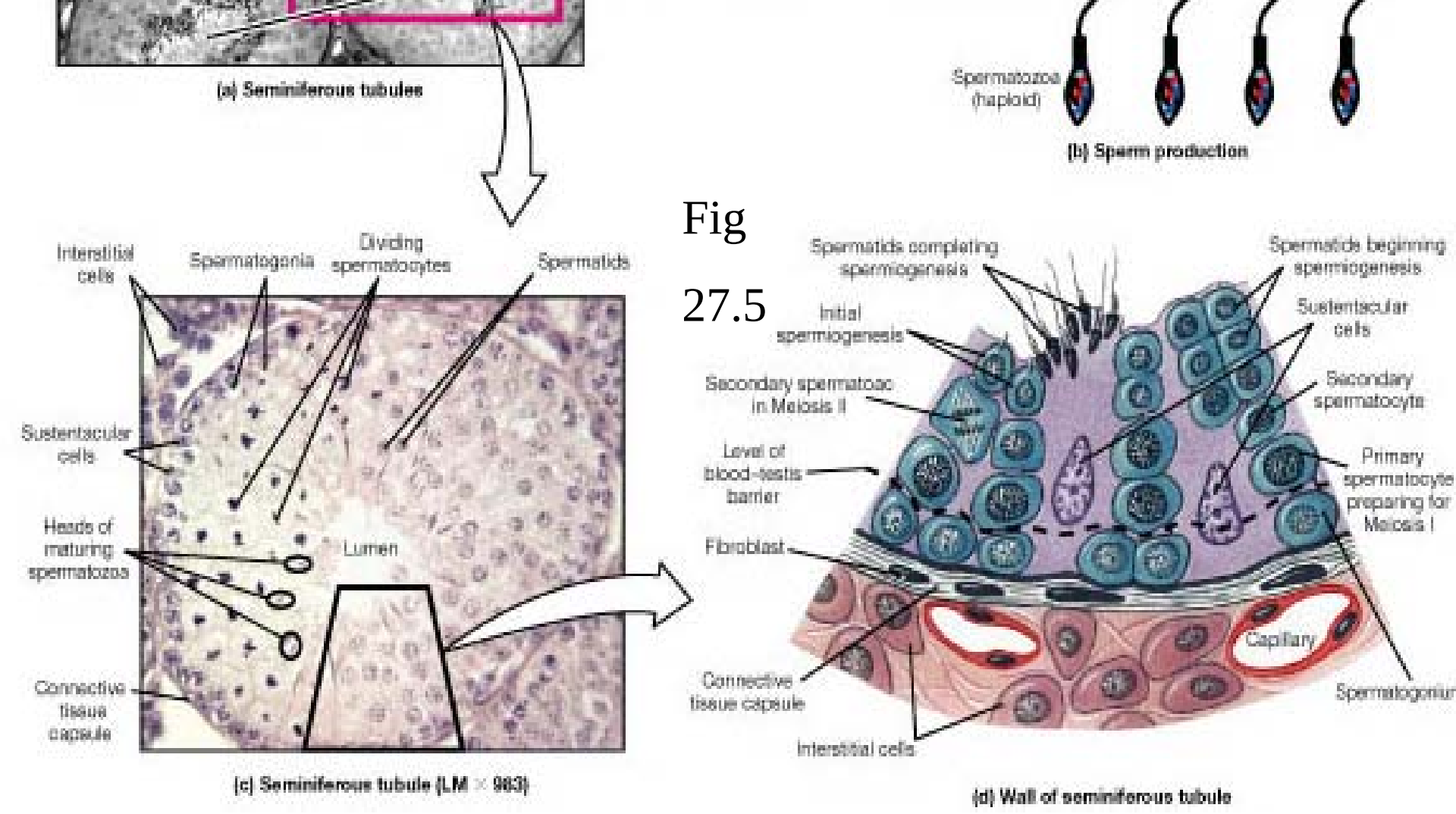


Fig 27.5

There is about one mile of seminiferous tubule in men

This allows men to produce about 500,000,000 sperm/day

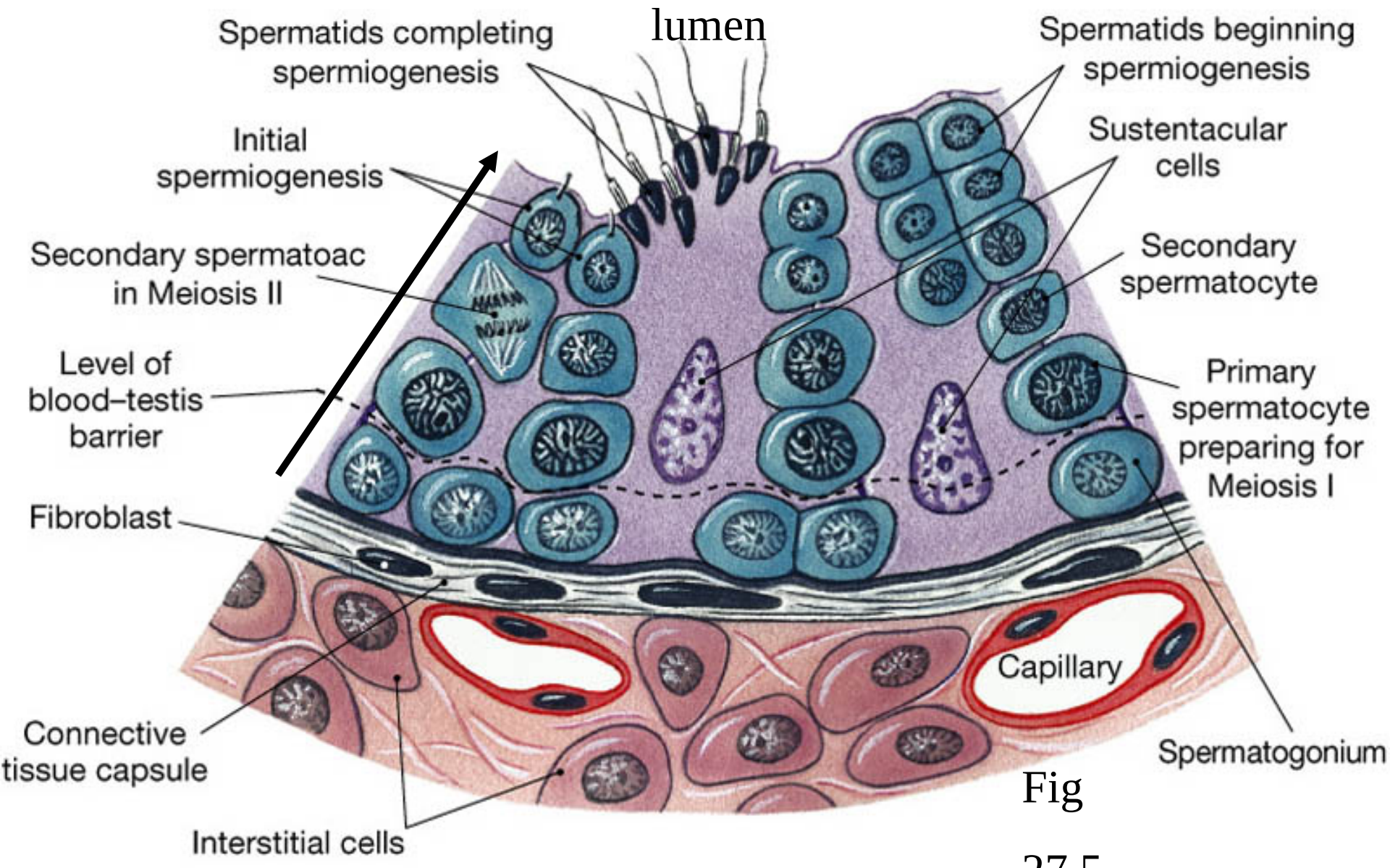


Fig 27.5

(d) Wall of seminiferous tubule

Sperm production

- Spermatogonia-stem cells that develop into spermatids
- Become active at puberty

- Spermatogenesis-production of spermatids
- Occurs in the seminiferous tubules of the testis

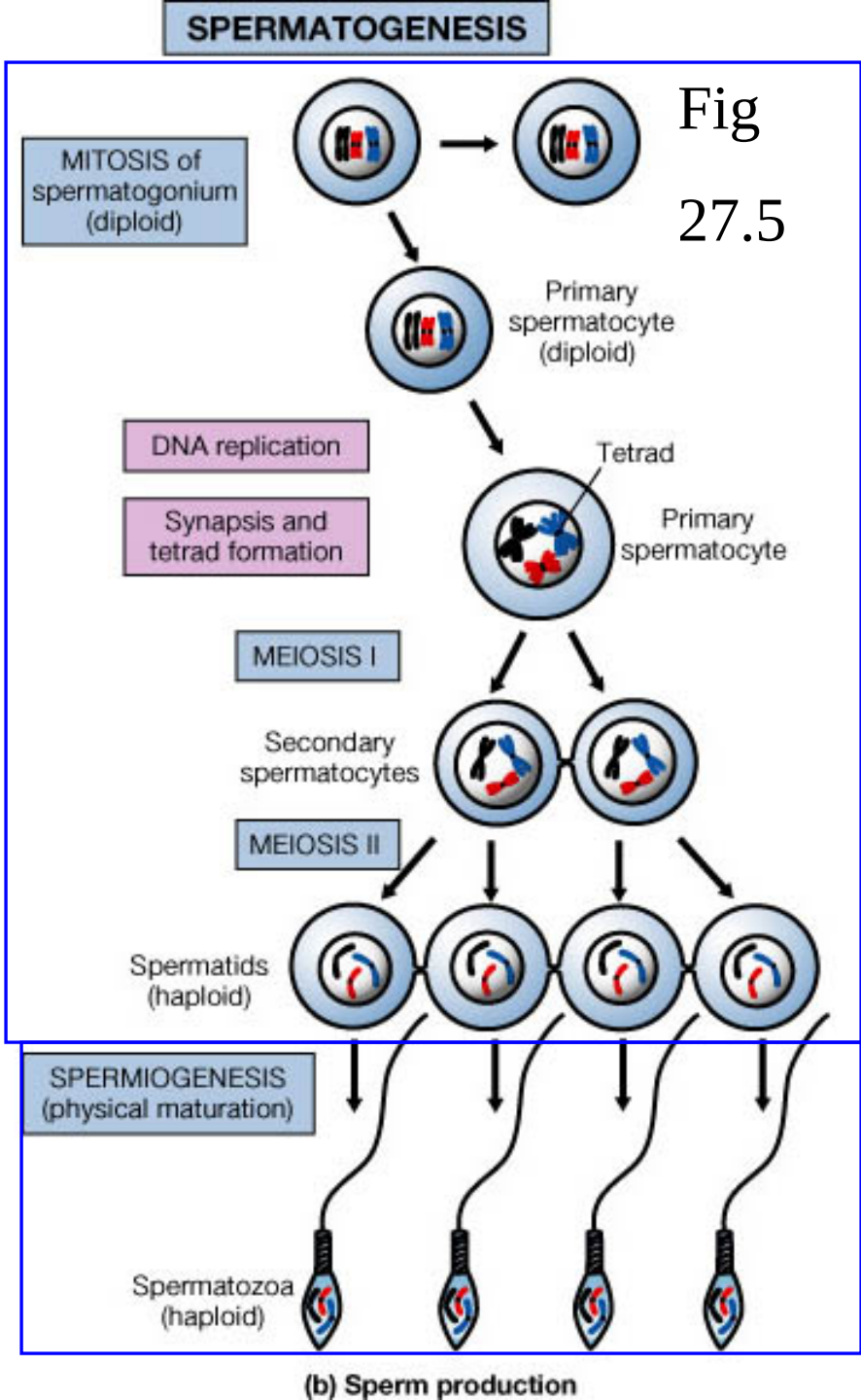
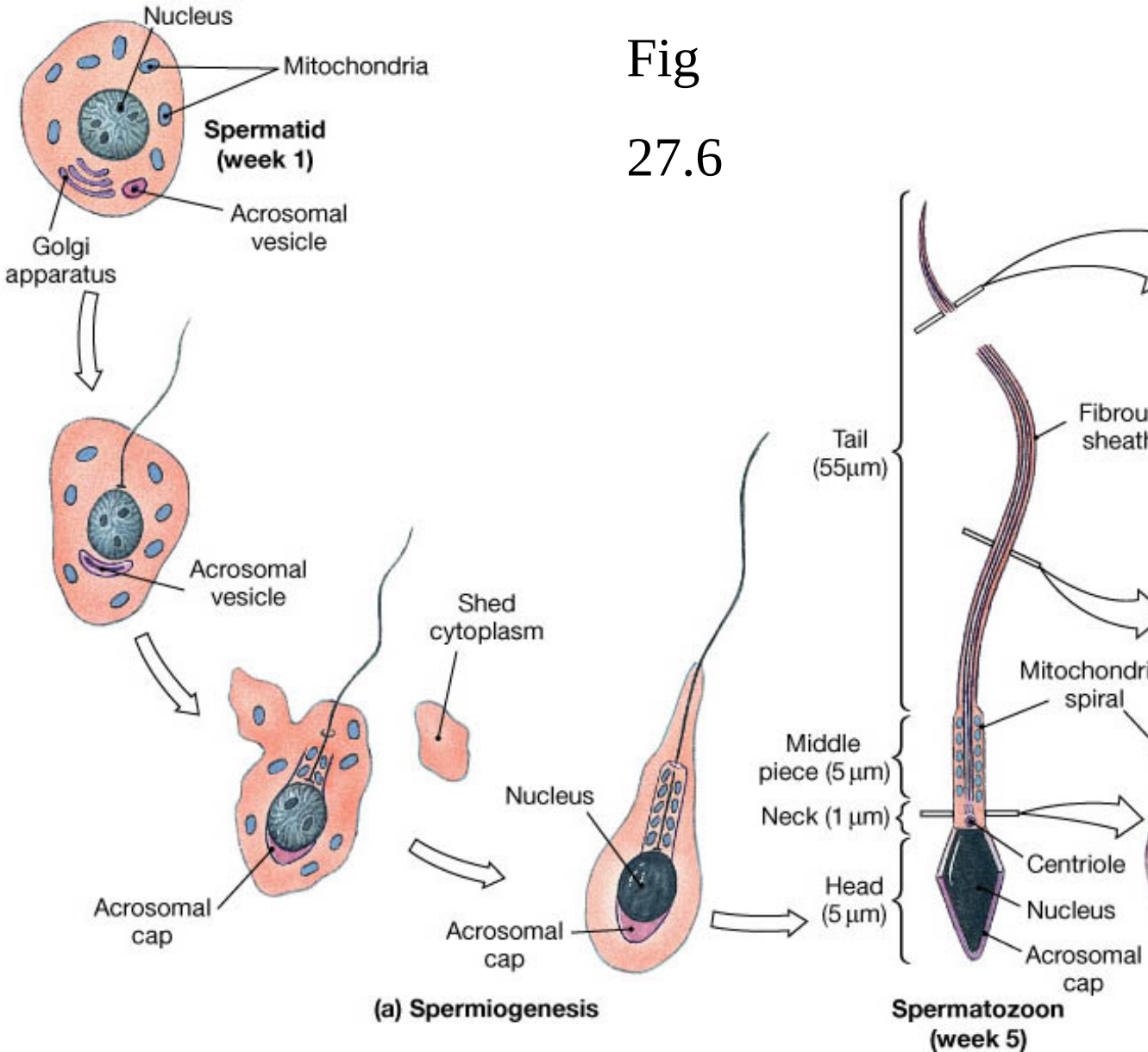


Fig 27.5

Spermiogenesis

- Anatomical maturation of sperm cells
- A single Spermatid develops into a Spermatozoon
- Occurs in the seminiferous tubules of the testis

Fig 27.6



Sustentacular cells in seminiferous tubules

- Maintain the blood testis barrier
  - Allows the sperm to develop is an environment that is different from the general circulation
- Support of spermatogenesis & spermiogenesis
- Release the hormone Inhibin

- Inhibin-stops production of FSH in the anterior pituitary

Hormones

- Anterior pituitary-FSH & LH
- Follicle-stimulating hormone-supports sperm production
- Luteinizing hormone-stimulates interstitial cells of the testis to release testosterone

- Interstitial cells of the testis release testosterone
- Testosterone-
- Promotes production of mature sperm
- Maintain accessory organs (glands) of the reproductive tract
- Influences secondary sexual characteristics
  - Facial hair, muscle mass, body fat

Sperm development

- FSH, LH,& Testosterone, promote sperm production

- Inhibin inhibits sperm production

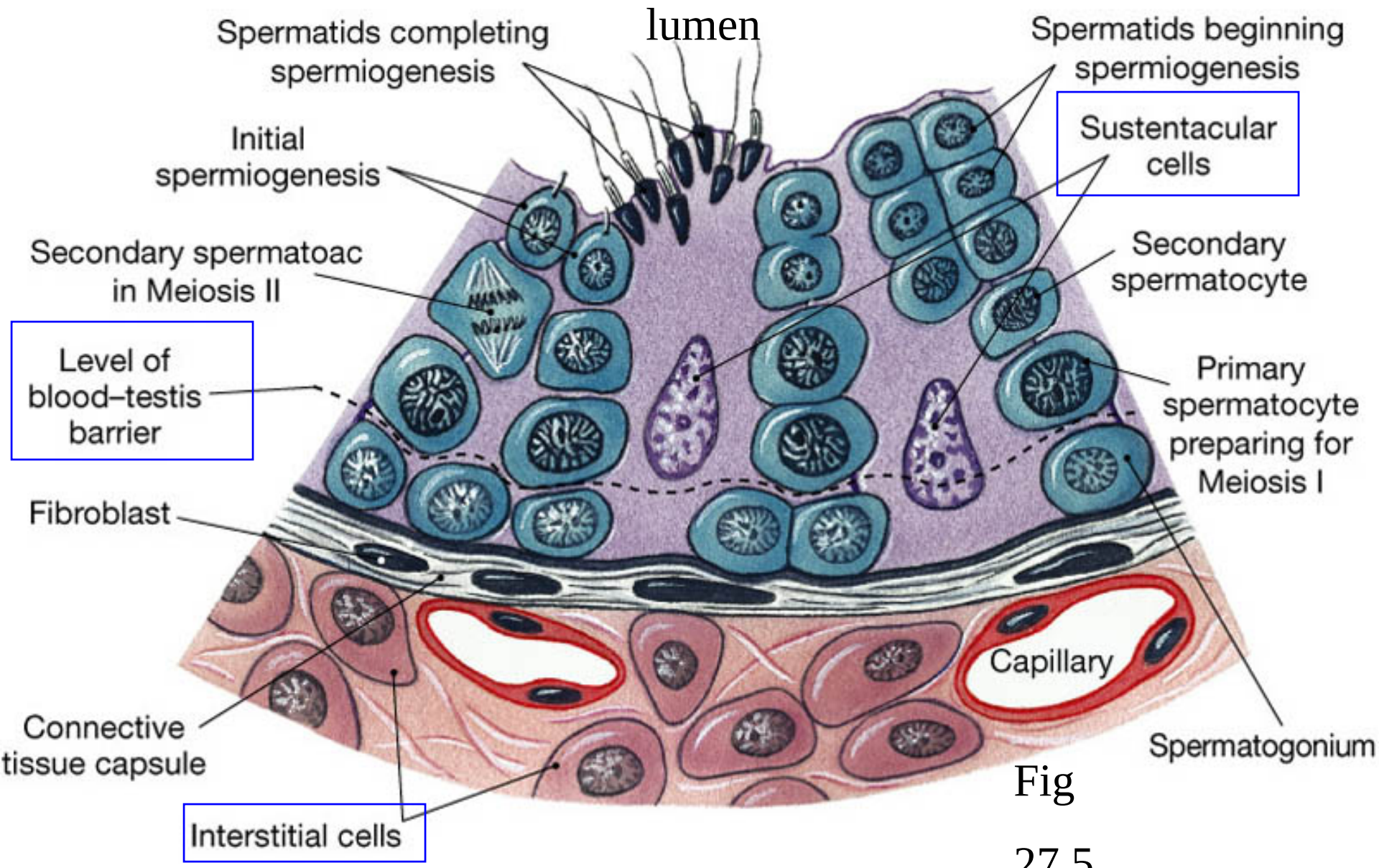
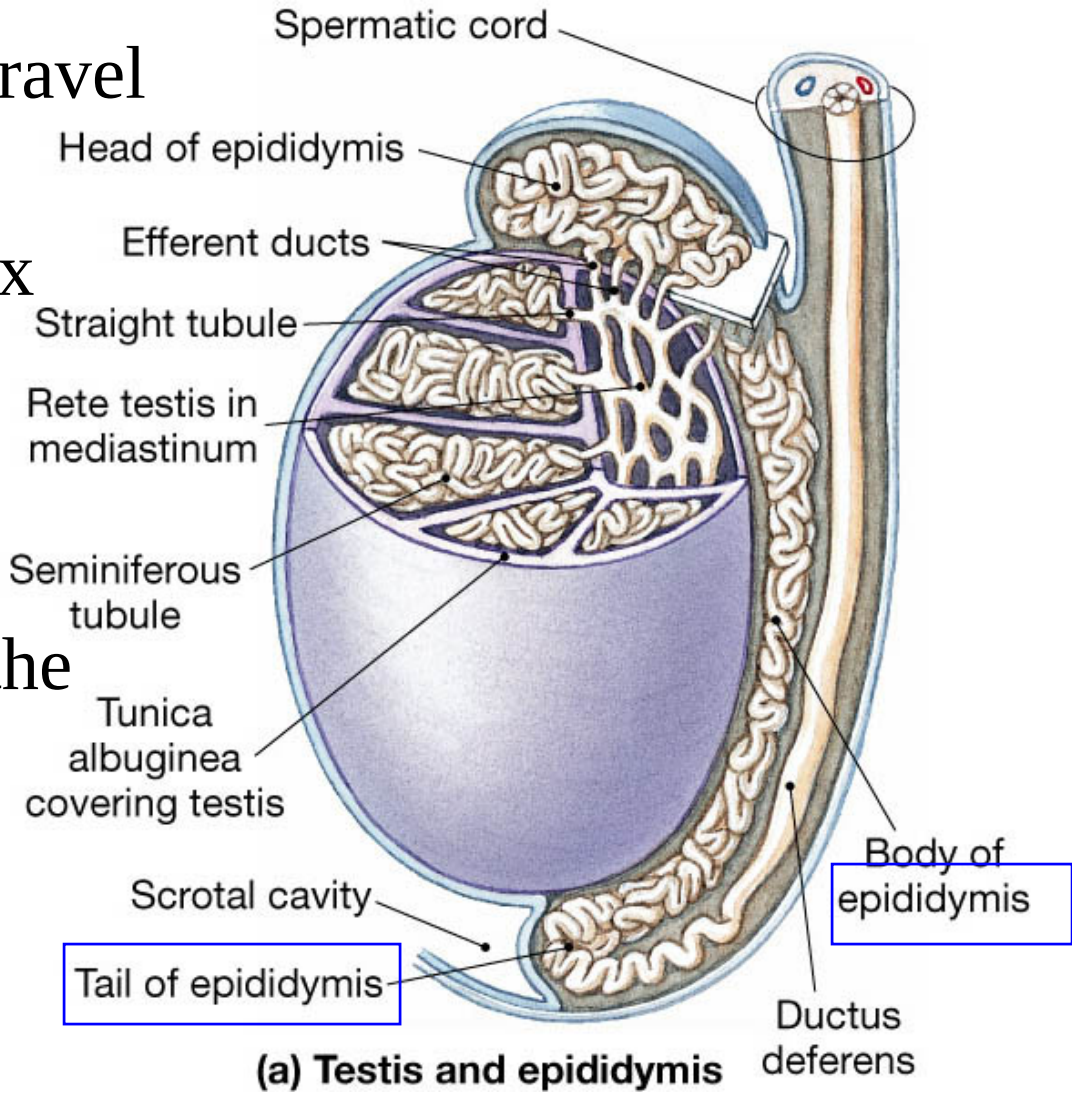


Fig 27.5

(d) Wall of seminiferous tubule

Male reproductive tract

- The pathway the sperm travel to exit the body
- Along the way sperm mix with secretions from the accessory glands
- The first major organ is the epididymis



- Epididymis
- Facilitates functional development of the sperm and stores sperm
- Degrades damaged sperm

- Ductus deferens-sperm can be stored for months

- Urethra-release sperm outside of the body
  - Part of the urinary & reproductive systems

Accessory glands

- Seminal vesicles, Prostate gland, Bulbourethral glands
- Produce secretions that make up the majority of semen volume
- Sympathetic nervous systems controls release

- These secretions:
- Activate the sperm-the flagella become functional
- Provide nutrients for the sperm cells
- Proving pH buffers for the semen
  - The urethra and the vagina are acidic environments

Seminal vesicles

- Makes up 60% of semen volume
- Fluid contains high levels of sugar to provide nutrients to sperms cells
- Slighty alkaline to neutralize vaginal secretions
- Secretions are released into the ejaculatory duct

Prostate gland

- Makes up 30% of semen volume
- Fluid is a milky solution that contains several enzymes
- Seminalplasmin secreted to act as antibiotic to prevent urinary tract infections
- Secretions are released into the urethra

Bulbourethral glands

- Makes up 5% of semen volume
- Clear alkaline mucus that is a pH buffer
- lubricates glans penis
- Secretions are released into the urethra

Release of Sperm

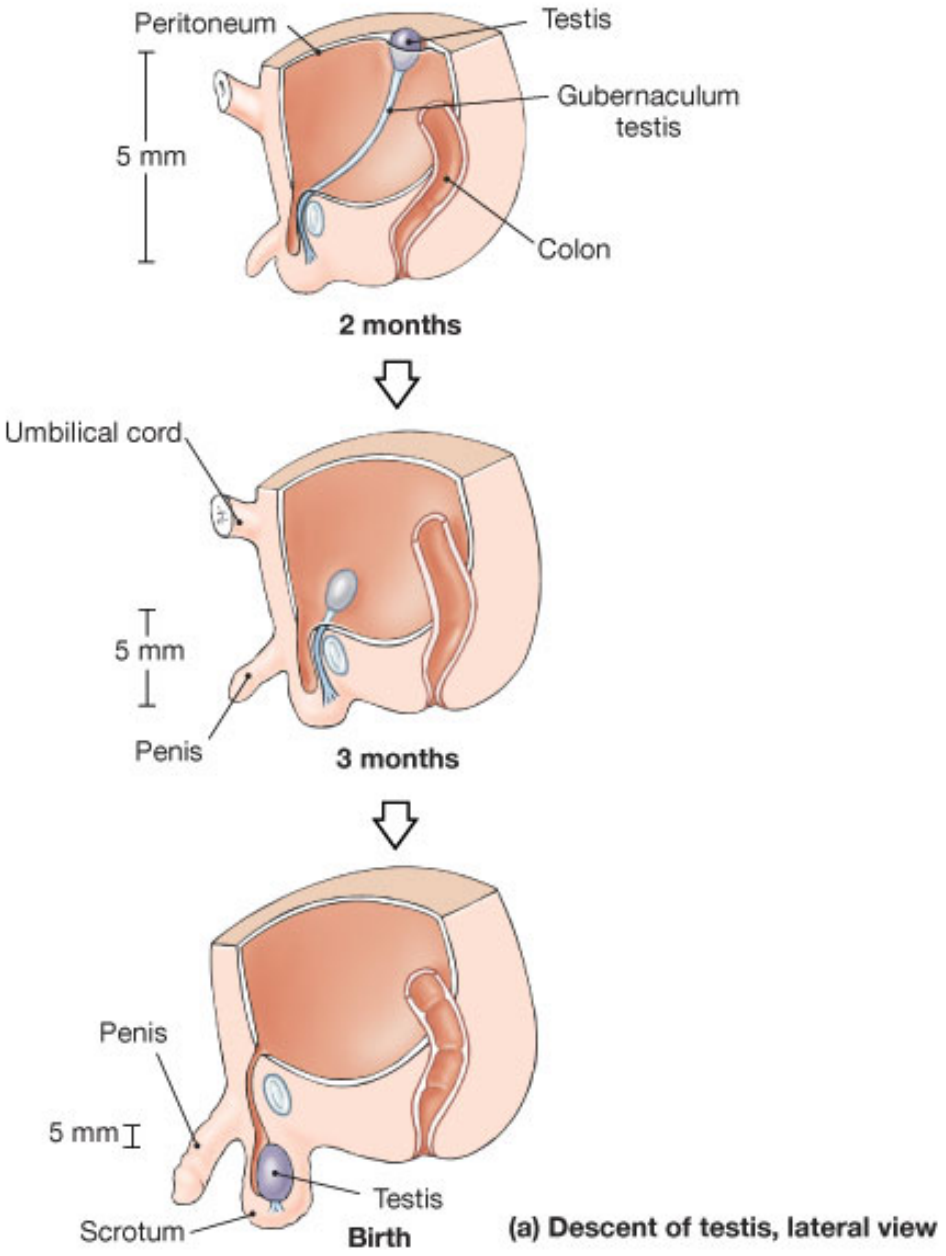
- Spermatocytes in seminiferous tubules
- Straigth tubule
- Rete testis
- Efferent ductules
- Epididymis
- Ductus deferens
- Ejaculatory duct < seminal vessicles
- Prostatic uretha < prostate gland
- Membranous urethra < bulbourethral glands
- Spongy urethra
- Out!

Descent of Testes

- Testes originate within abdominopelvic cavity (near kidneys)
- Gubernaculum testis- very short CT cord attached to testes and anchored in scrotum.
- As fetal development continues, gubernaculums begins to “draw down” testes anteriorly and inferiorly.
- testes descend bringing with them connected vessels, neveres, and ductus deferens

- ALL travel through abdominal wall (inguinal canal) taking part of the wall with it:
  - Tunica vaginalis (serous tunic) = peritoneal membrane
  - Cremaster muscle (suspender muscle) = internal oblique
- testes descent complete by birth (usually)

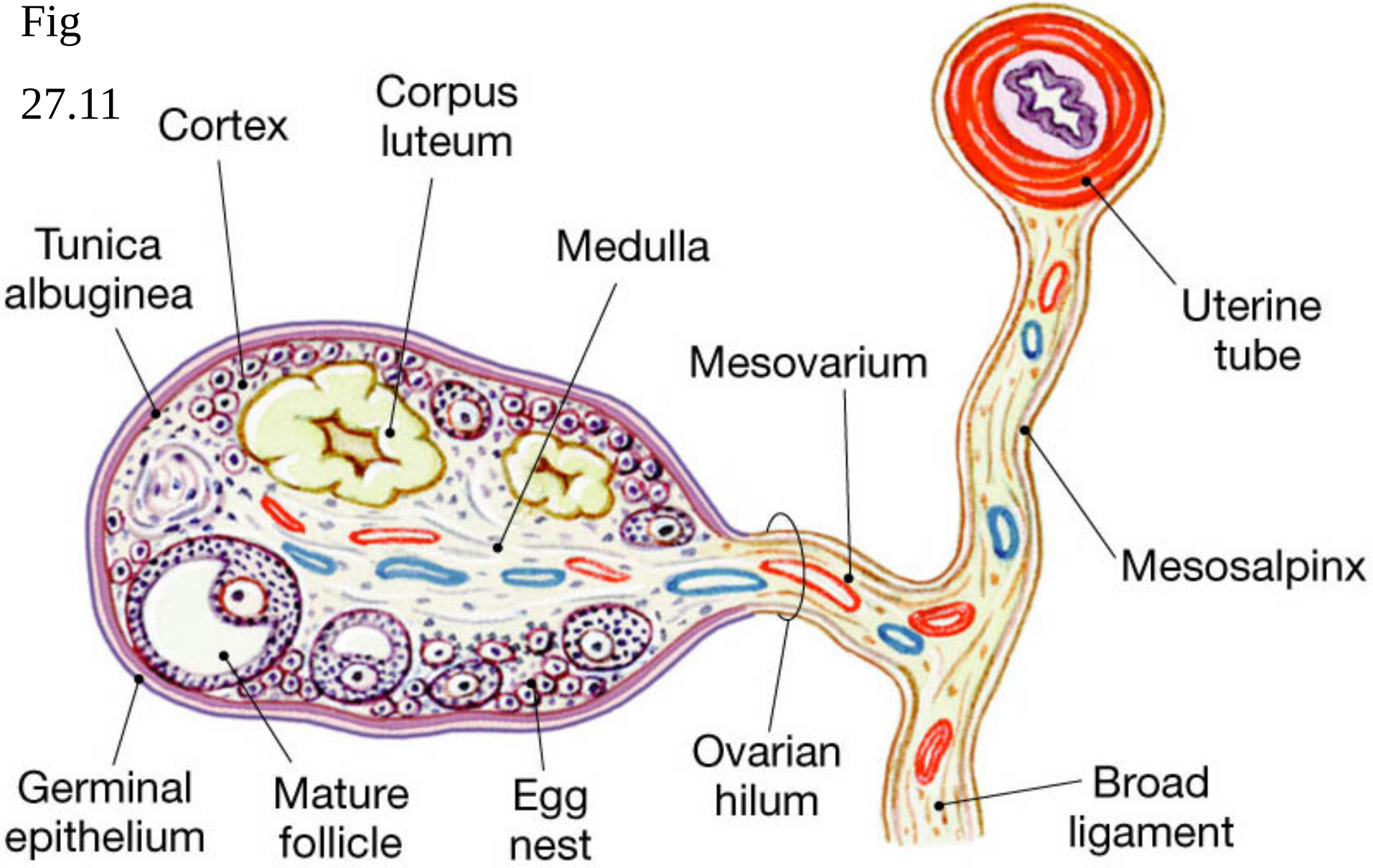
- Diagrammatical sectional view at representative stages of the descent of the testes.



Female reproductive system

Fig

27.11



(b) Ovary and mesenteries, sectional view

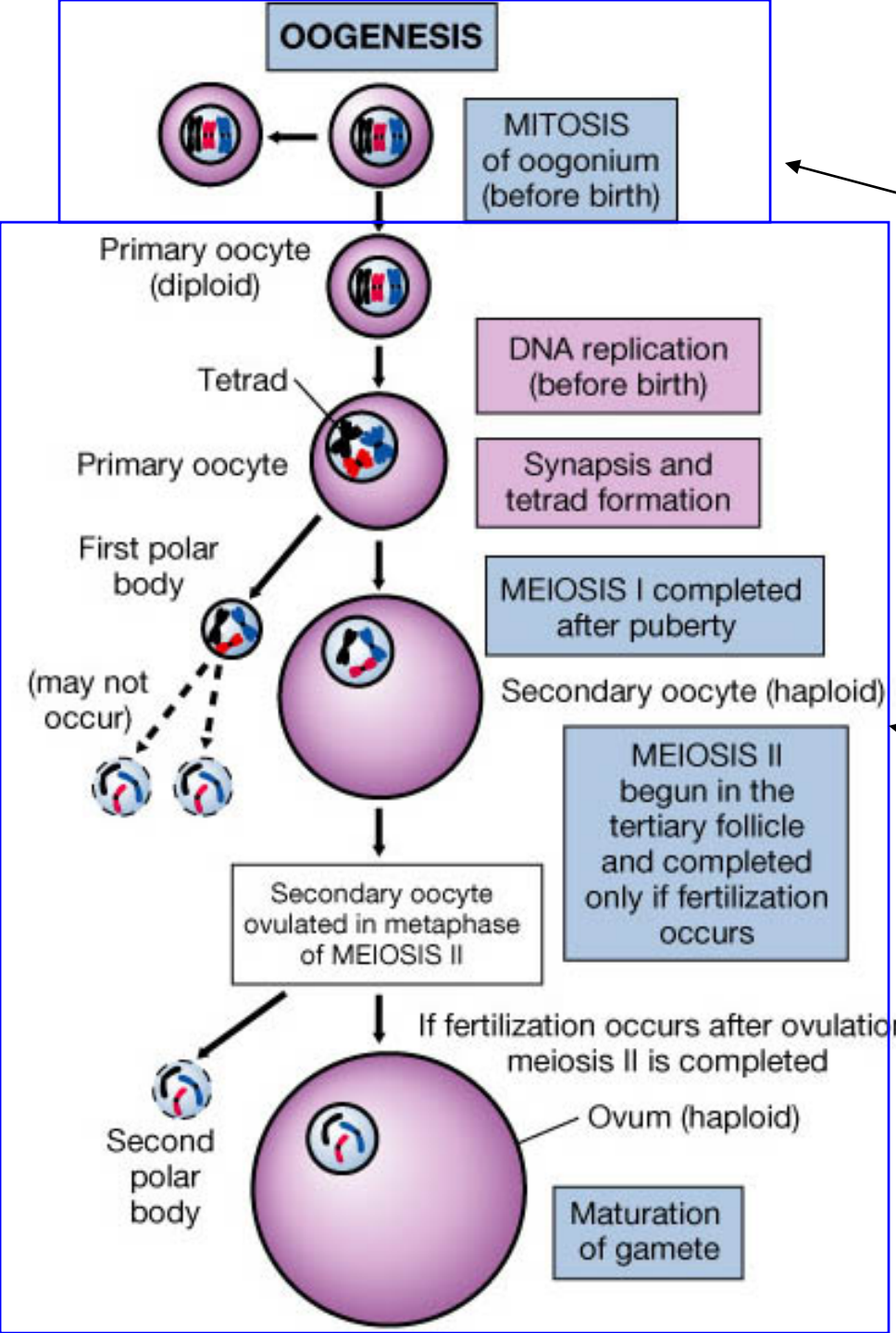


Fig 27.13

Oogenesis:

Oocytes are produced in the ovaries before birth.

By puberty there are 400,000 oocytes total

During the ovarian cycle the oocyte mature

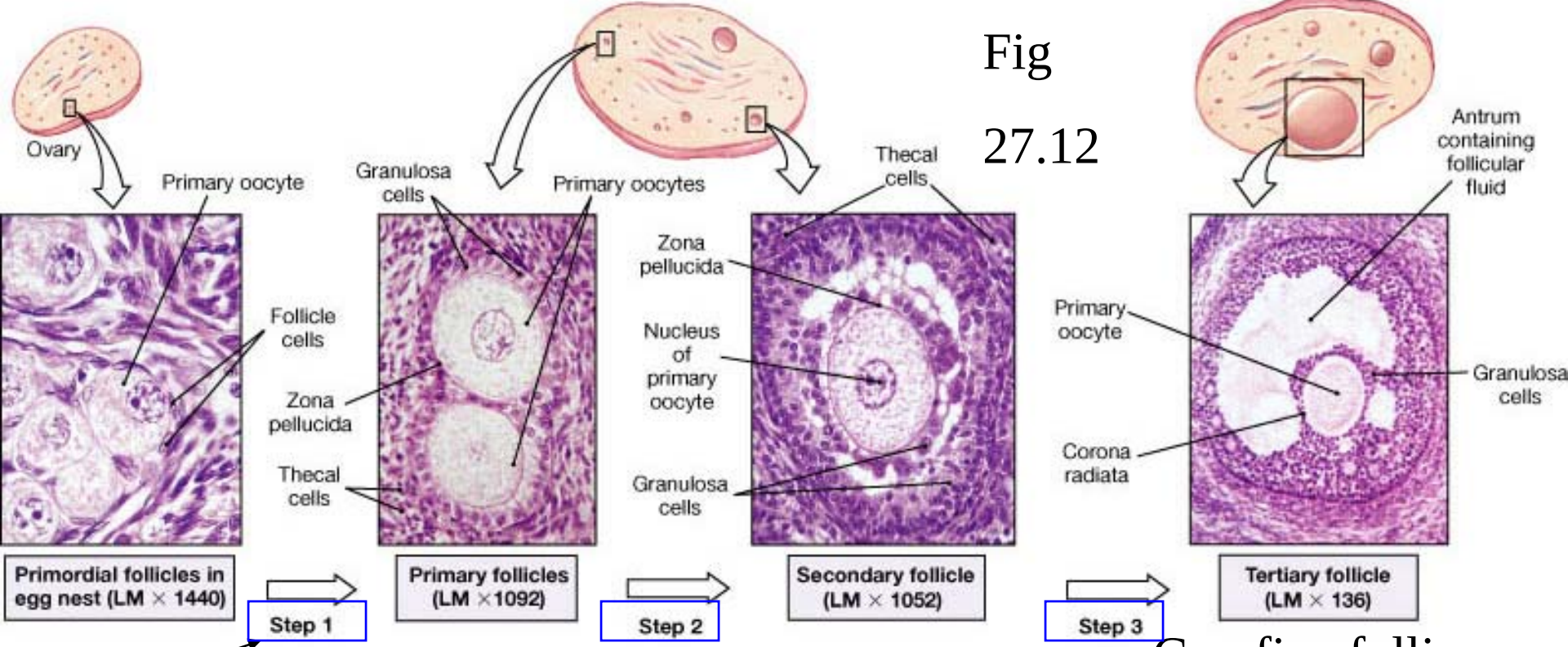
Only about 500 will mature and ovulate during life

Ovarian cycle

- Follicle cells provide nutrients to the oocytes
- Oocytes +follicle cells = follicle

- Development of oocytes occurs within the follicles

Fig 27.12



Graafian follice

Development of the follicle cells that surround the oocytes

Thecal cells produce estrogens

Few primary follicles develop into secondary follicles

Thecal cells produce estrogens

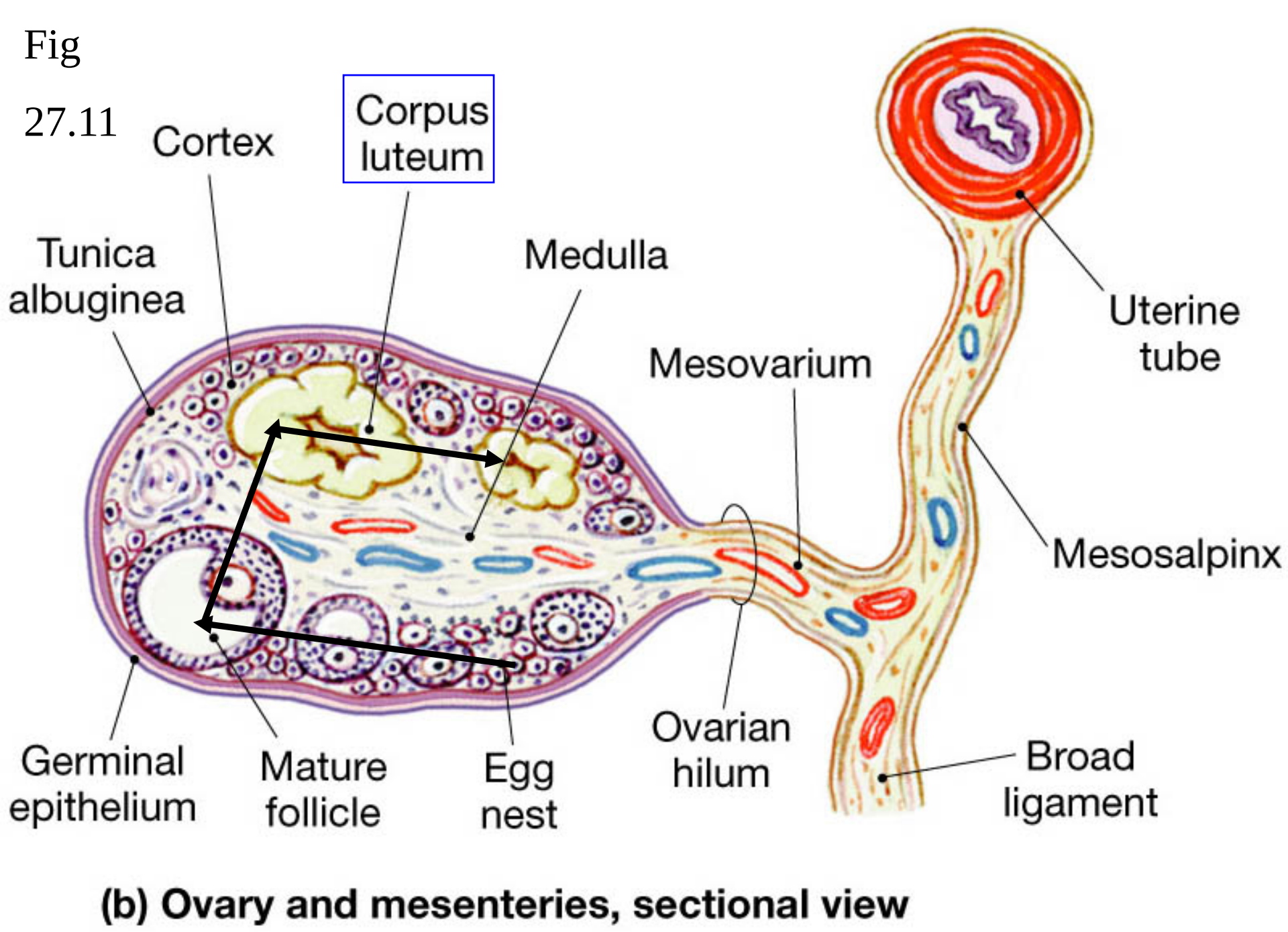
The ovaries usually contain a single secondary follicle destined for further development

Step 4, 5, & 6

- Step 4-**Ovulation-**The oocyte is released from the ovary into the uterine tubes
- Step 5-**Formation of the corpus luteum-**
- The remaining follicle cells for the corpus luteum which produces progesterone & estrogen
- Step 6-**Degradation of the corpus luteum (unless pregnancy occurs)-**
- The corpus luteum degrades into scar tissue and a new ovarian cycle begins

Fig

27.11



(b) Ovary and mesenteries, sectional view

Uterine cycle

- Three phases-
- Menes
- Proliferative phase
- Secretory phase
- Menes-Arteries constrict reducing, blood flow to the endometrium (inner layer of the uterus)
- The tissue of the endometrium and blood from ruptured vessels in the lumen of the uterus

- Proliferative phase-Repair and growth of the endometrium tissue and blood vessels
- Secretory phase-Further development of the endometrium and increased glandular activity

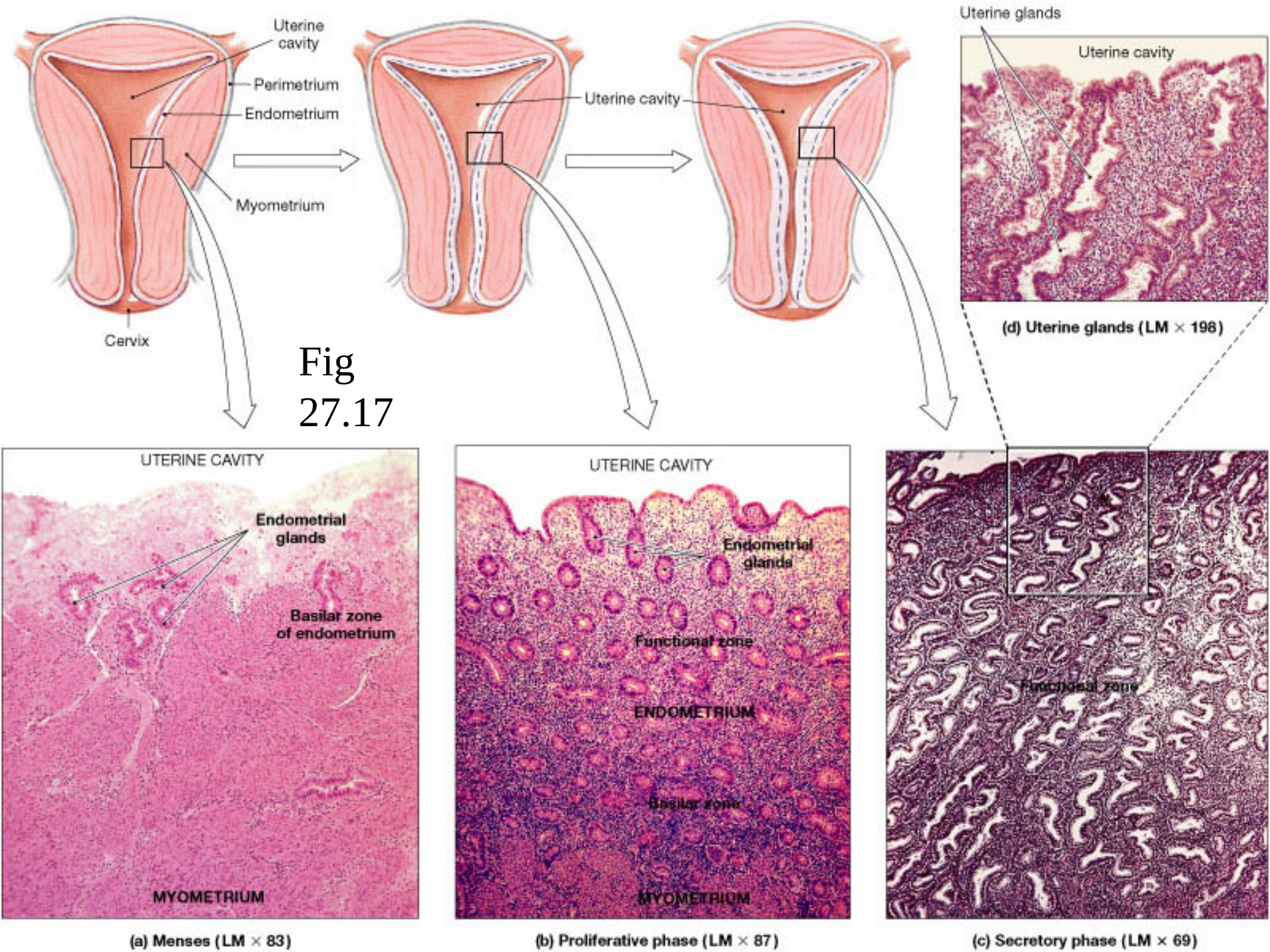

Uterine cavity
Perimetrium
Endometrium
Myometrium
Cervix
Uterine cavity
Uterine glands
Uterine cavity
(d) Uterine glands (LM × 198)
UTERINE CAVITY
Endometrial glands
Basilar zone of endometrium
MYOMETRIUM
(a) Menses (LM × 83)
UTERINE CAVITY
Endometrial glands
Functional zone
ENDOMETRIUM
Basilar zone
MYOMETRIUM
(b) Proliferative phase (LM × 87)
Functional zone
(c) Secretory phase (LM × 69)

Fig 27.17

Hormones

- Anterior pituitary-FSH, LH, & Prolactin
- Follicle stimulating hormone-supports oocyte maturation, stimulates the follicle cells to release estrogen
- Luteinizing hormone-stimulates stimulates ovulation and formation of the corpus luteum
- Prolactin-stimulates production of breast milk

- Thecal of the ovaries release estrogen
- Estrogen -
- Stimulates growth of the uterine of the endometrium
- Maintain accessory organs & glands of the reproductive tract
- Influences secondary sexual characteristics

- The corpus luteum releases Progesterone & Estrogen
- Progesterone-
- Prepares the uterus for development of the embryo

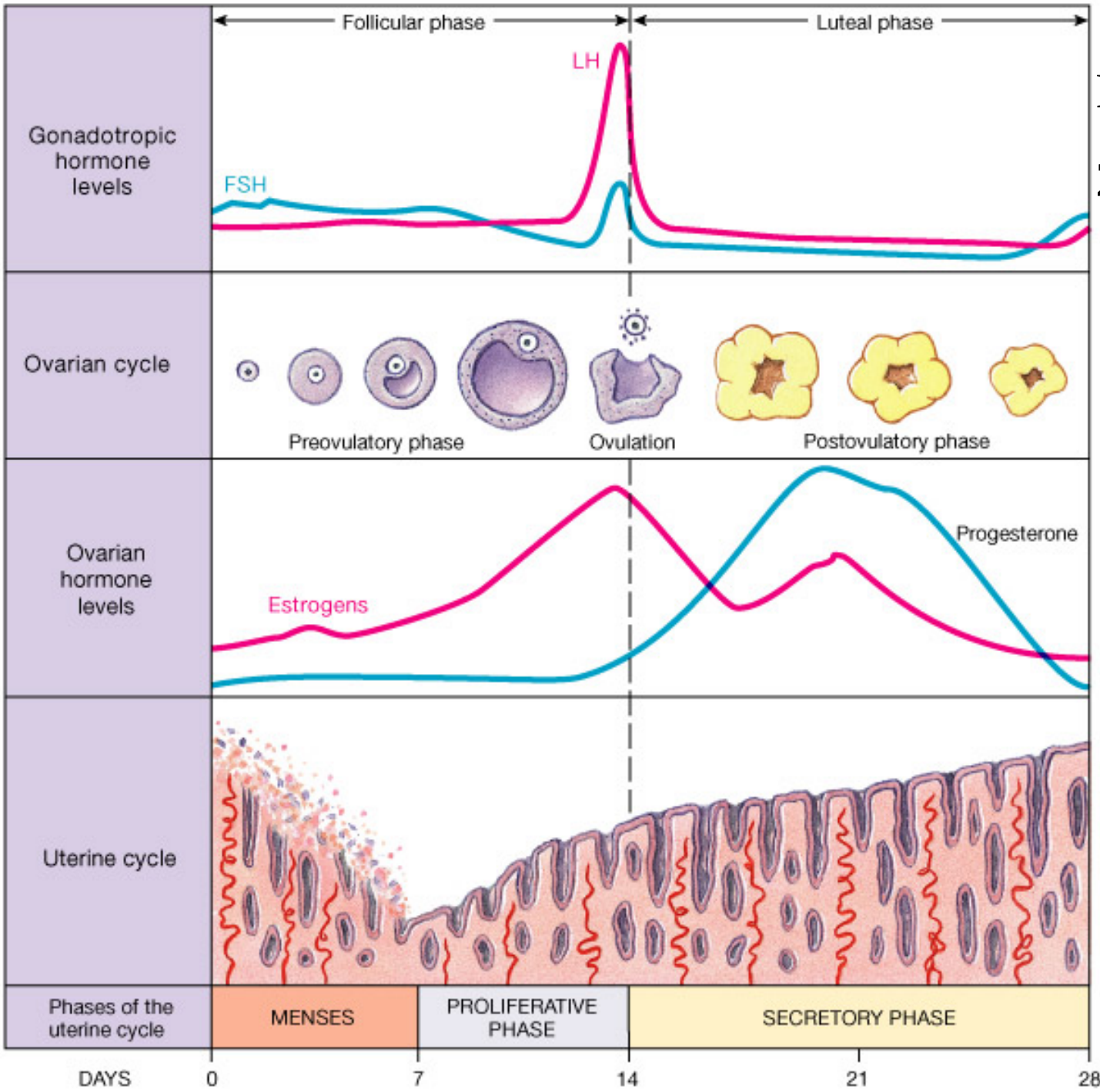

Follicular phase
Luteal phase
Gonadotropic hormone levels
LH
FSH
Ovarian cycle
Preovulatory phase
Ovulation
Postovulatory phase
Ovarian hormone levels
Progesterone
Estrogens
Uterine cycle
Phases of the uterine cycle
MENSES
PROLIFERATIVE PHASE
SECRETORY PHASE
DAYS
0
7
14
21
28

Fig 27.18

FYI

- If no method of birth control is used there is a 85% chance of a pregnancy within in a year

- Total abstinence-the only 100% effective method
- Surgical sterilization-vasectomy & tubal ligation, 99.6%
- Hormonal methods-inhibits ovulation, 99.6%
- Methods to block implantation- Intrauterine device, 99.2%
- Barrier methods-block entry of sperm to the uterus, 80%
- Spermatocides-kills sperm, 74%
- Periodic abstinence, 77%

- Abortion-induced miscarriage, surgical procedure

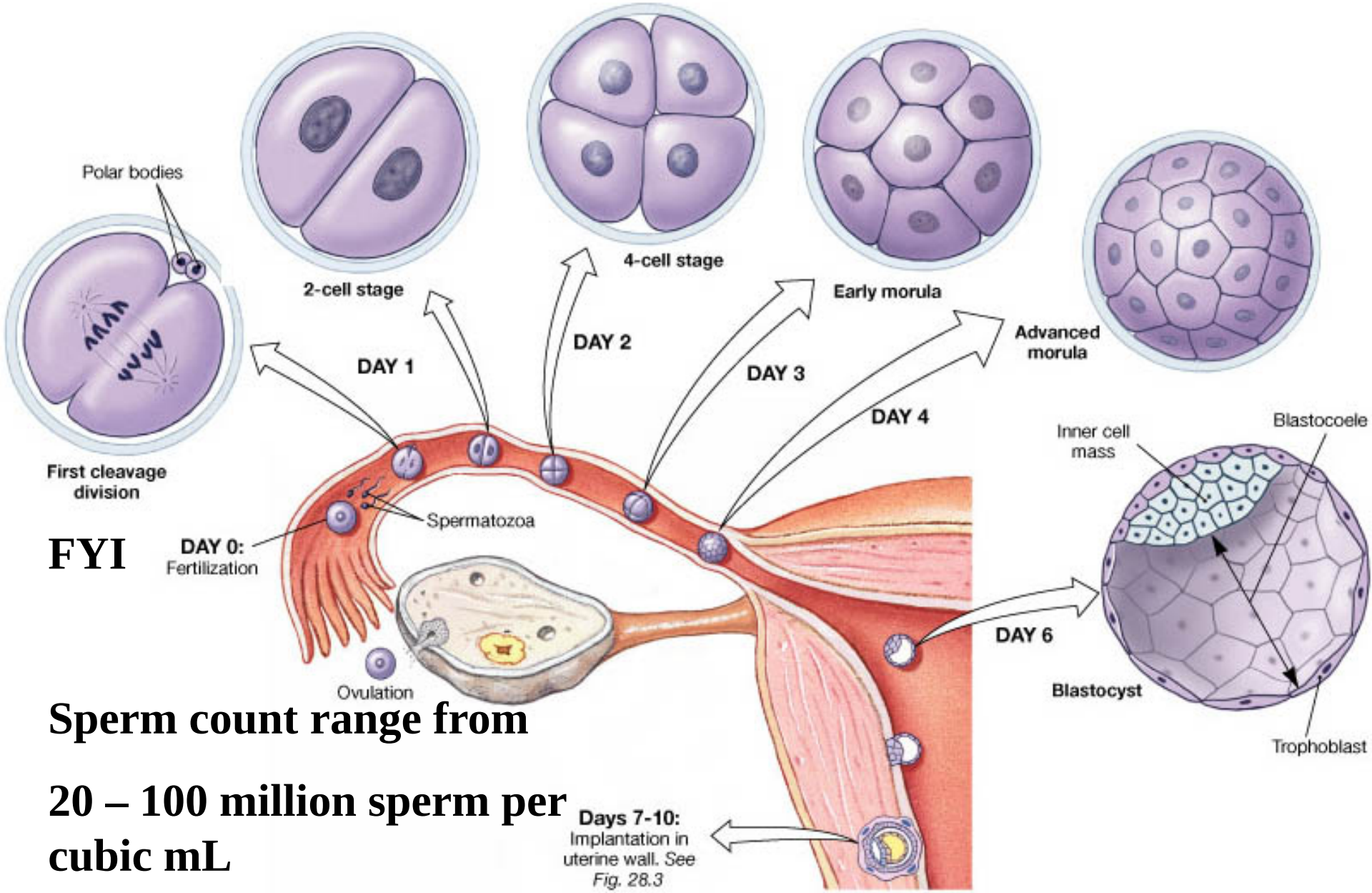
Sexually Transmitted Infection prevention

- If you are born of uninfected parents and abstain from sexual activity, your chances of acquiring STI are remote.

- The risk of catching the more serious STIs can be reduced by using condoms during vaginal or anal sex.

- Latex condoms are an effective barrier against HIV and the viruses and bacteria that cause major STIs
- Some STIs, like herpes and wart virus, can spread through any skin-to-skin contact

If fertilization does occur…

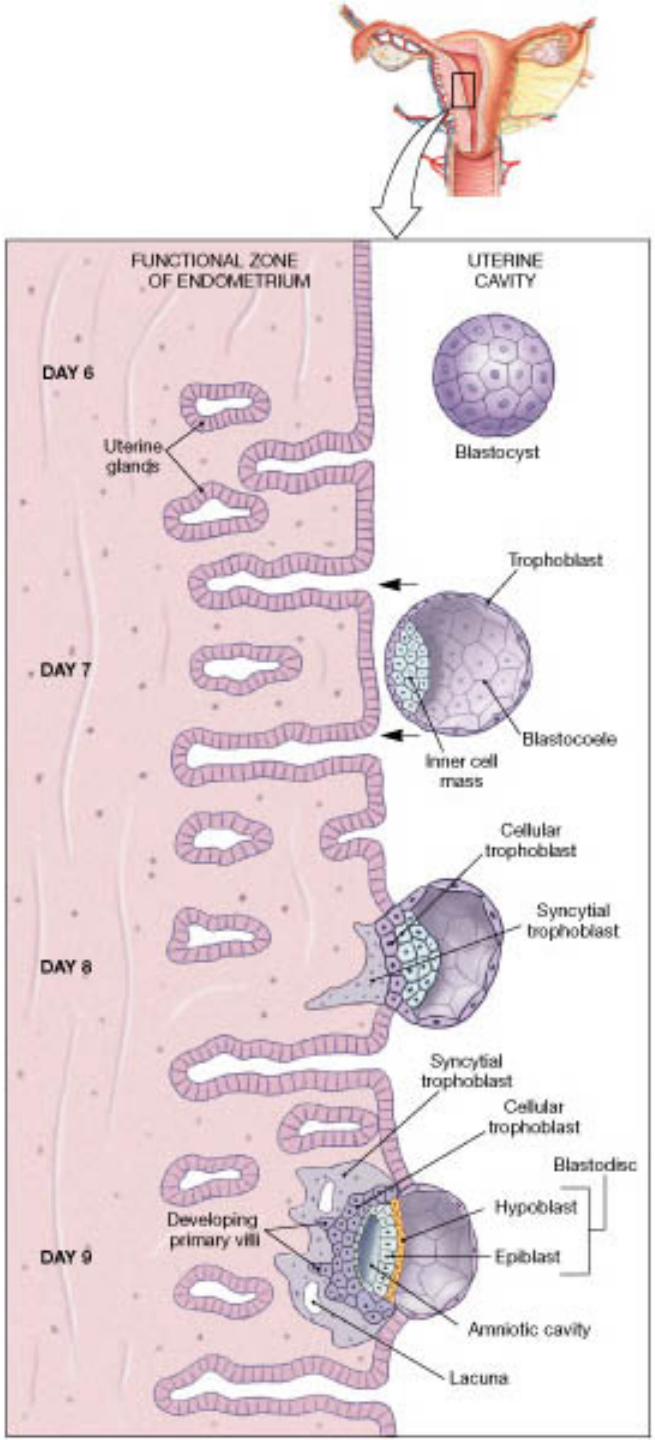


FYI

Sperm count range from

20 – 100 million sperm per cubic mL

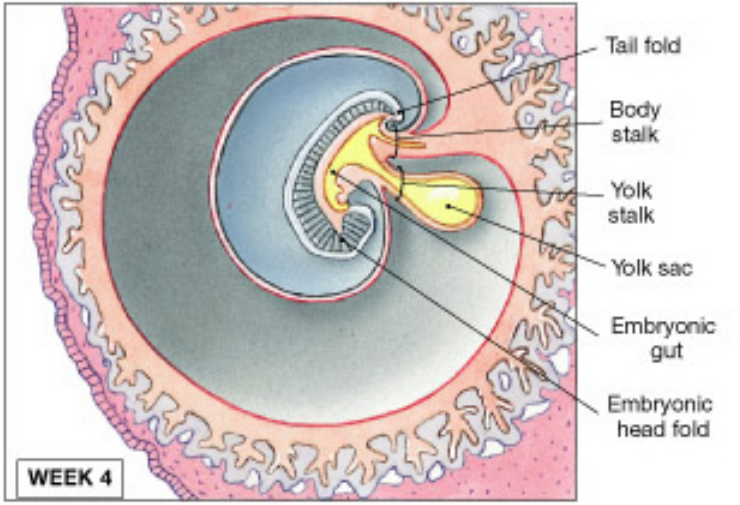
FYI



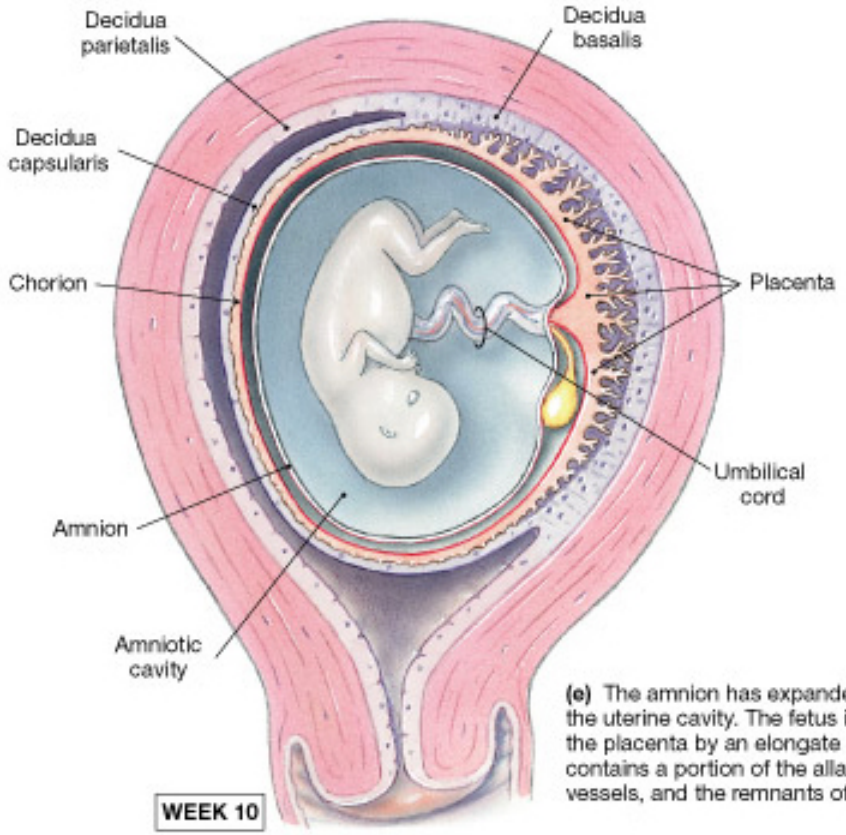
FYI

•Intrauterine device

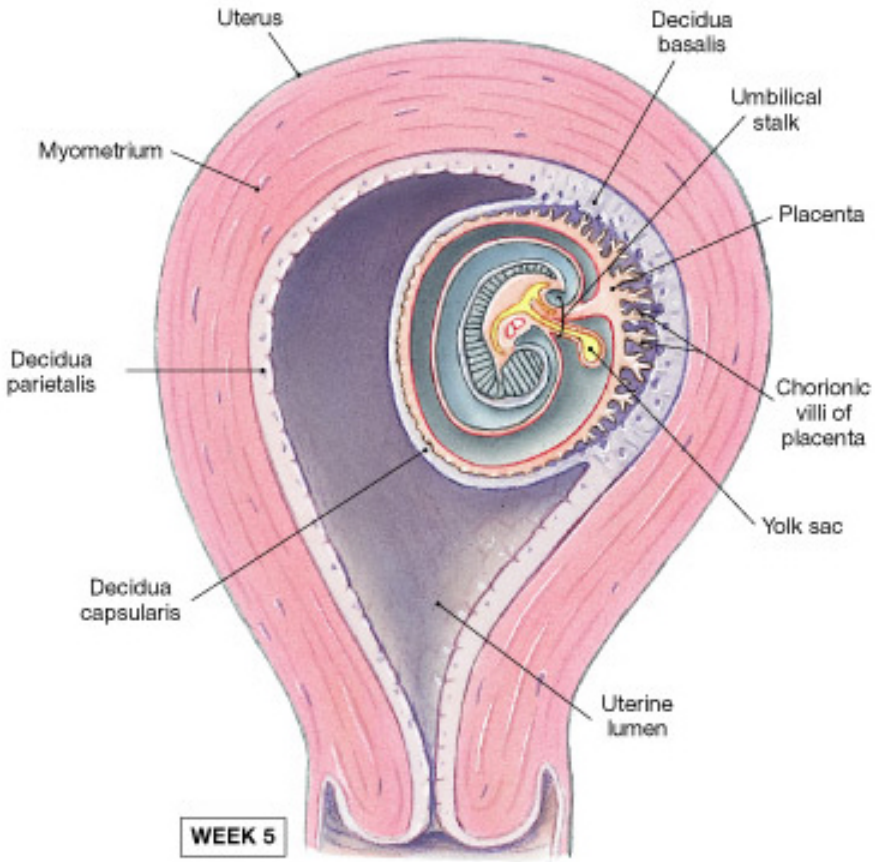
FYI



(c) The embryo now has a head fold and a tail fold. Constriction of the connection between the embryo and the surrounding trophoblast constricts the yolk stalk and body stalk.

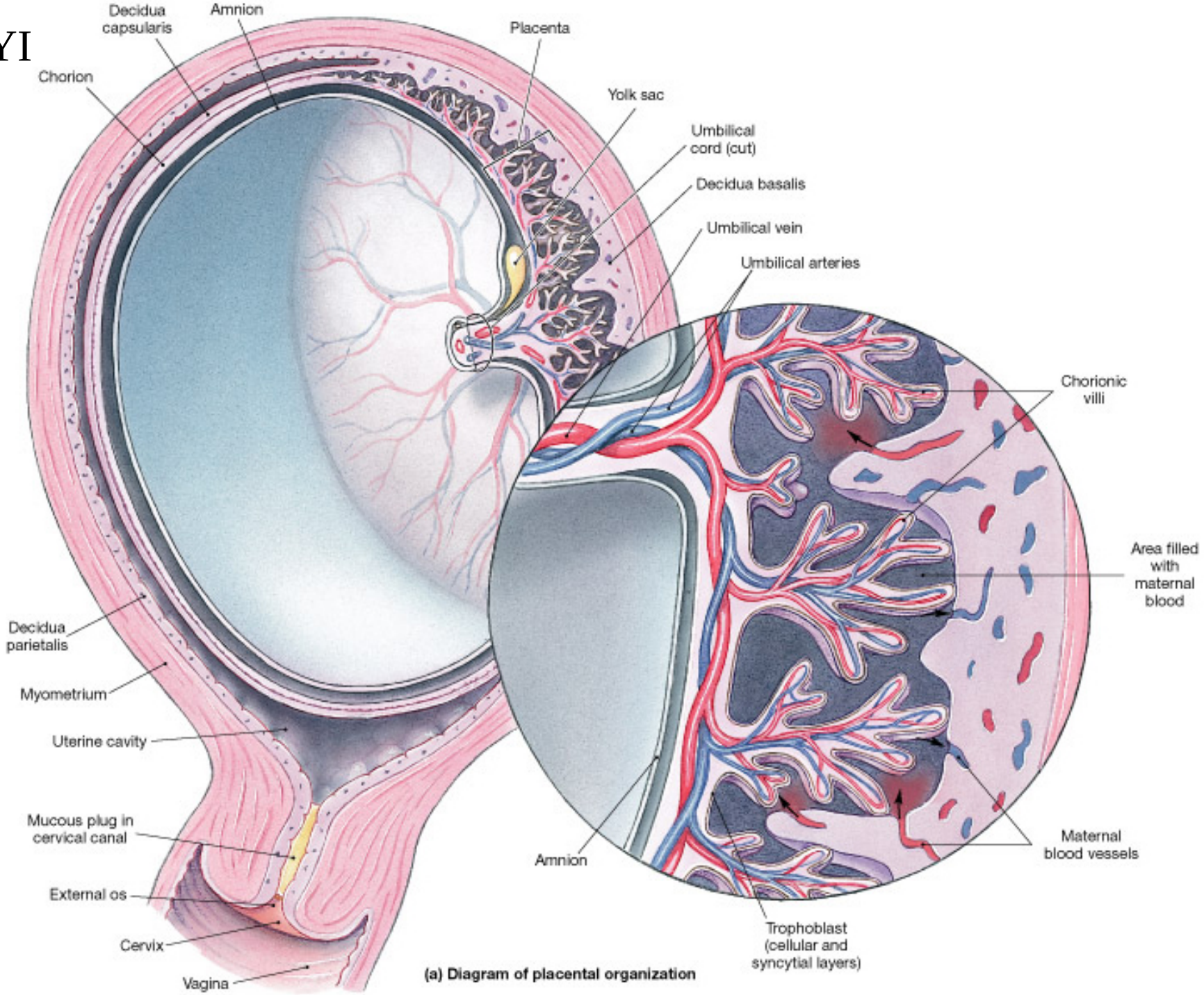


(e) The amnion has expanded greatly, filling the uterine cavity. The fetus is connected to the placenta by an elongate umbilical cord that contains a portion of the allantois, blood vessels, and the remnants of the yolk stalk.



(d) The developing embryo and extraembryonic membranes bulge into the uterine cavity. The trophoblast pushing out into the uterine lumen remains covered by endometrium, but no longer participates in nutrient absorption and embryo support. The embryo moves away from the placenta, and the body stalk and yolk stalk fuse to form an umbilical stalk.

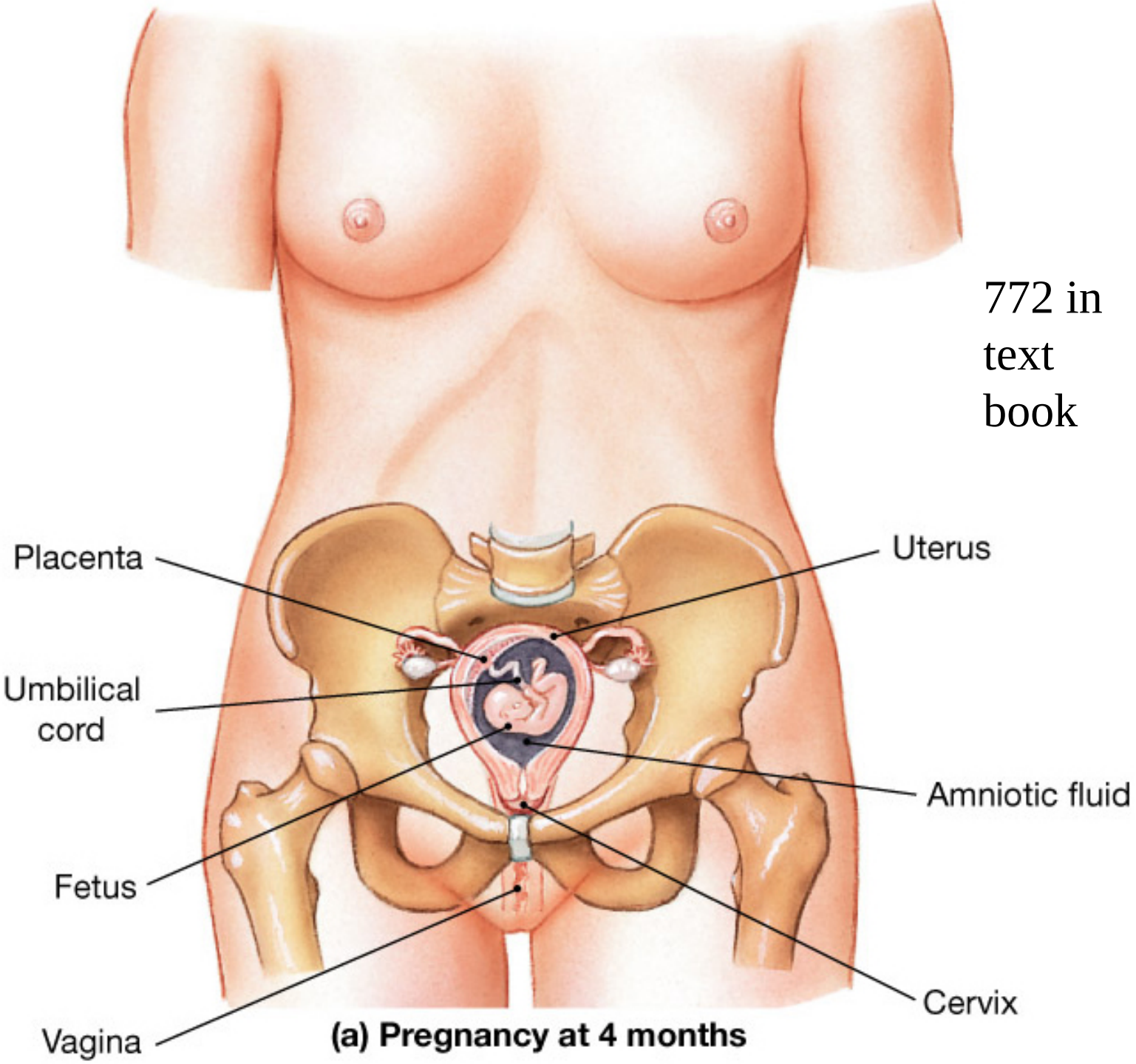
FYI



(a) Diagram of placental organization

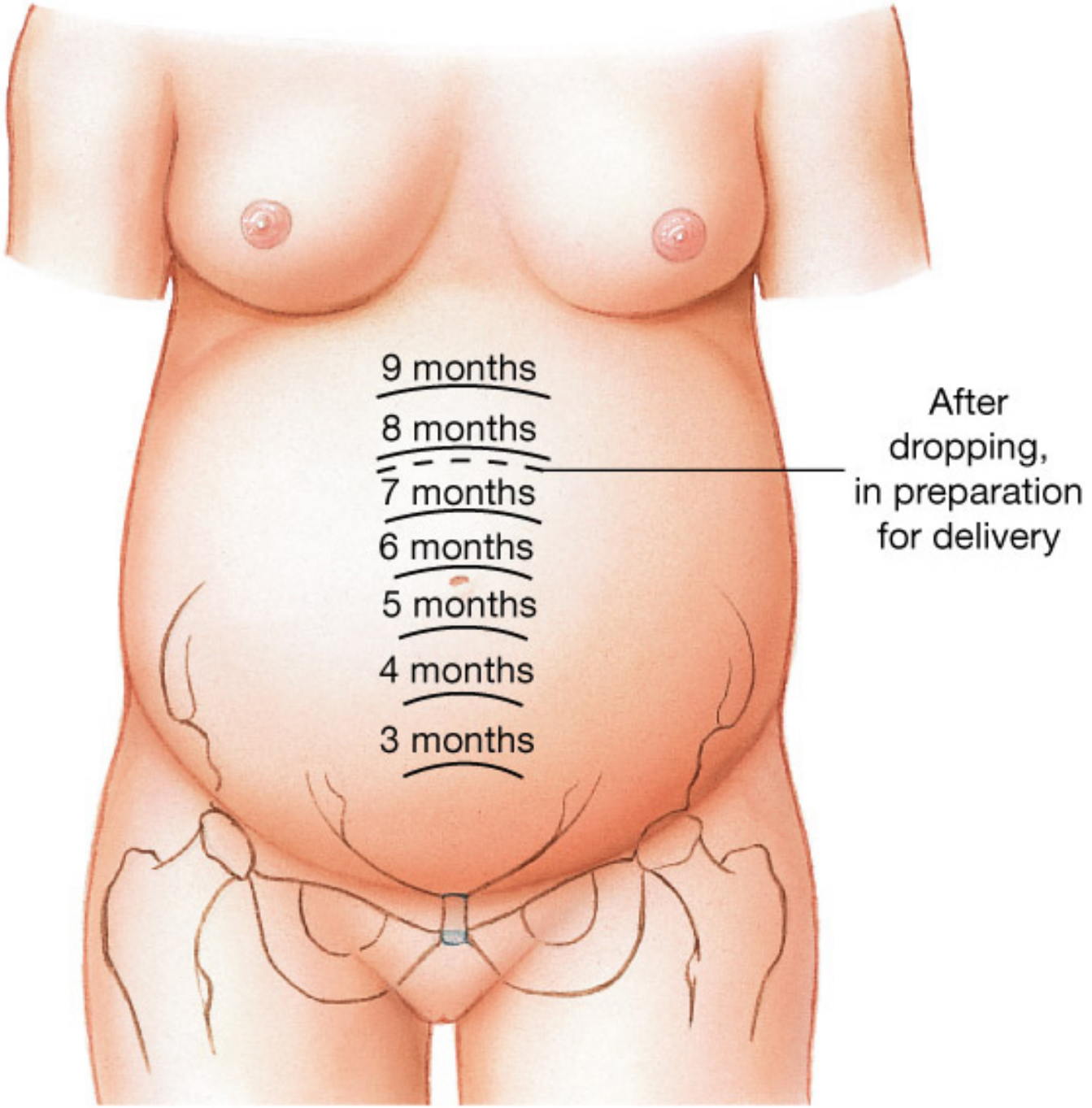
FYI

772 in text book



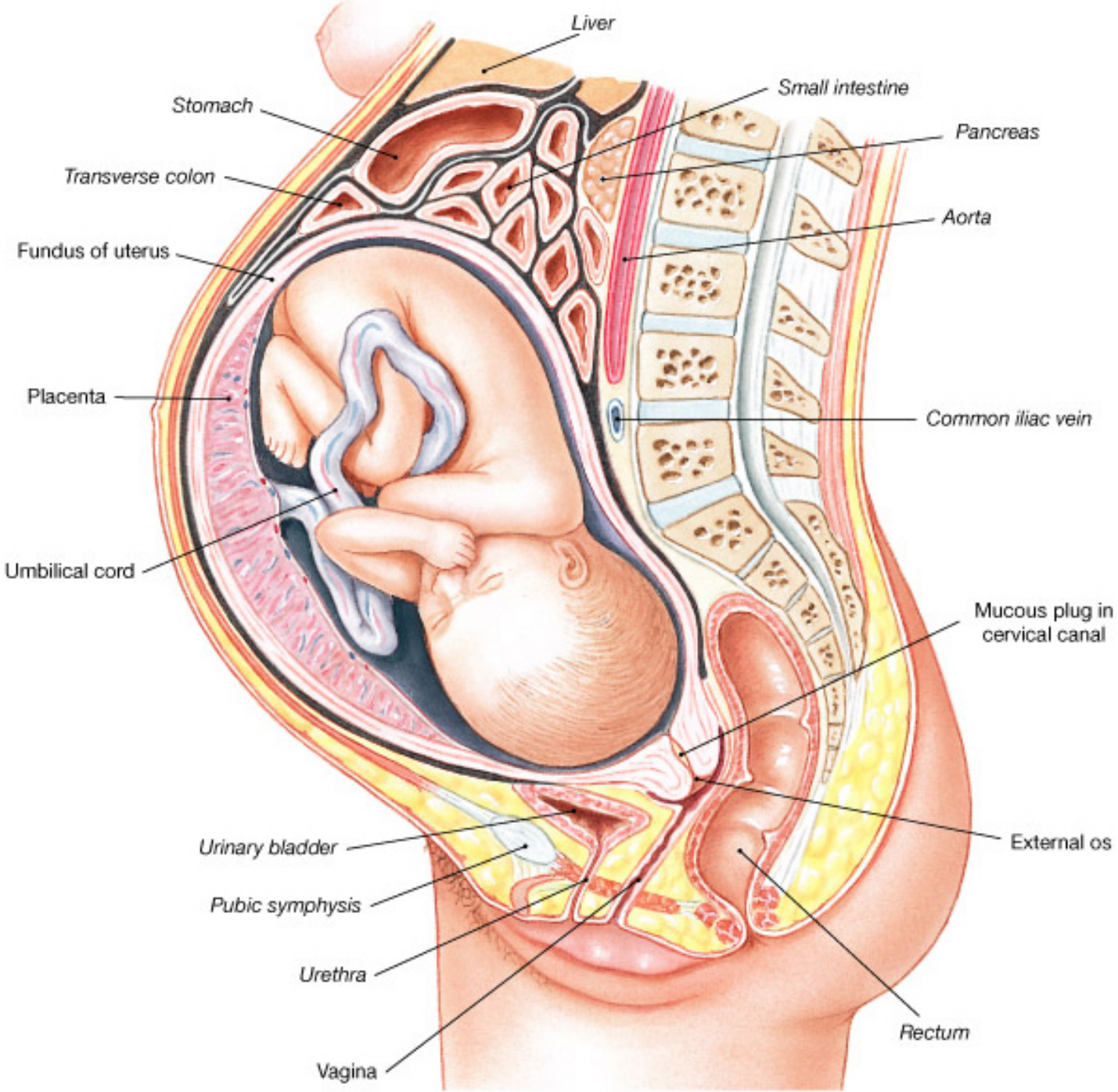
(a) Pregnancy at 4 months

FYI

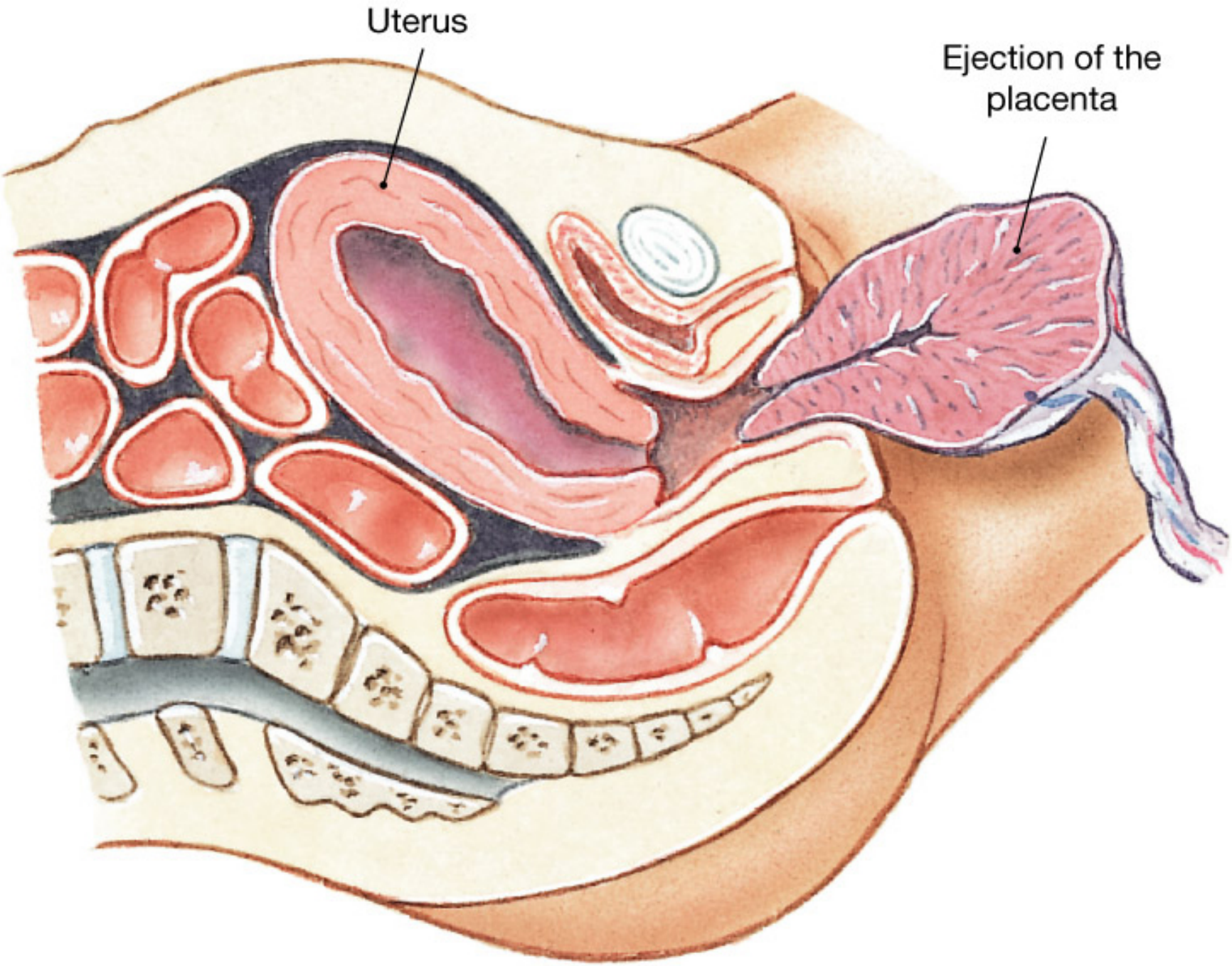


(b) Pregnancy at 3-9 months

FYI



(c) Pregnancy at full term

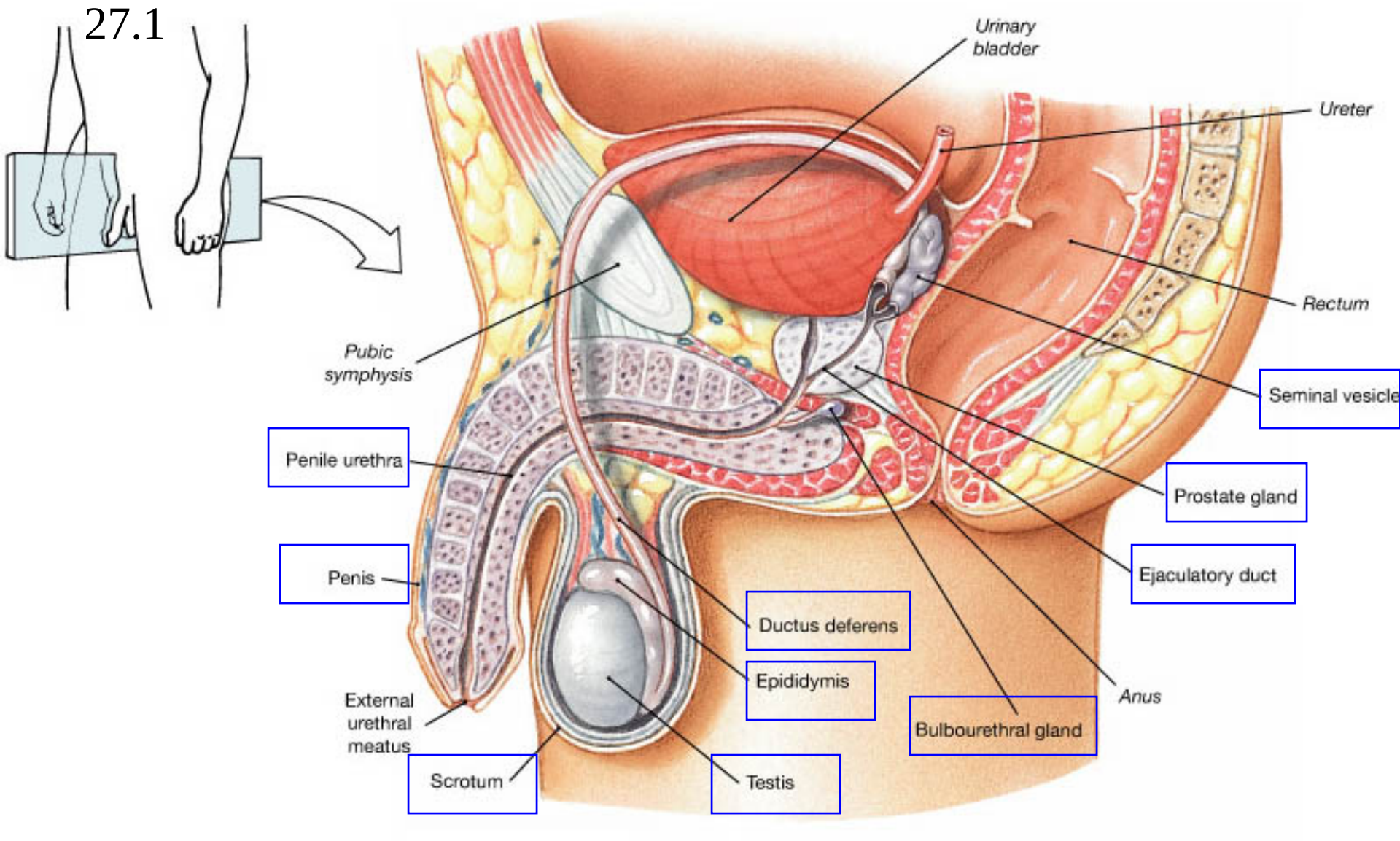


(c) Placental stage

- Break

Fig

27.1


Urinary bladder
Ureter
Rectum
Pubic symphysis
Seminal vesicle
Penile urethra
Prostate gland
Penis
Ejaculatory duct
Ductus deferens
Epididymis
Anus
External urethral meatus
Bulbourethral gland
Scrotum
Testis

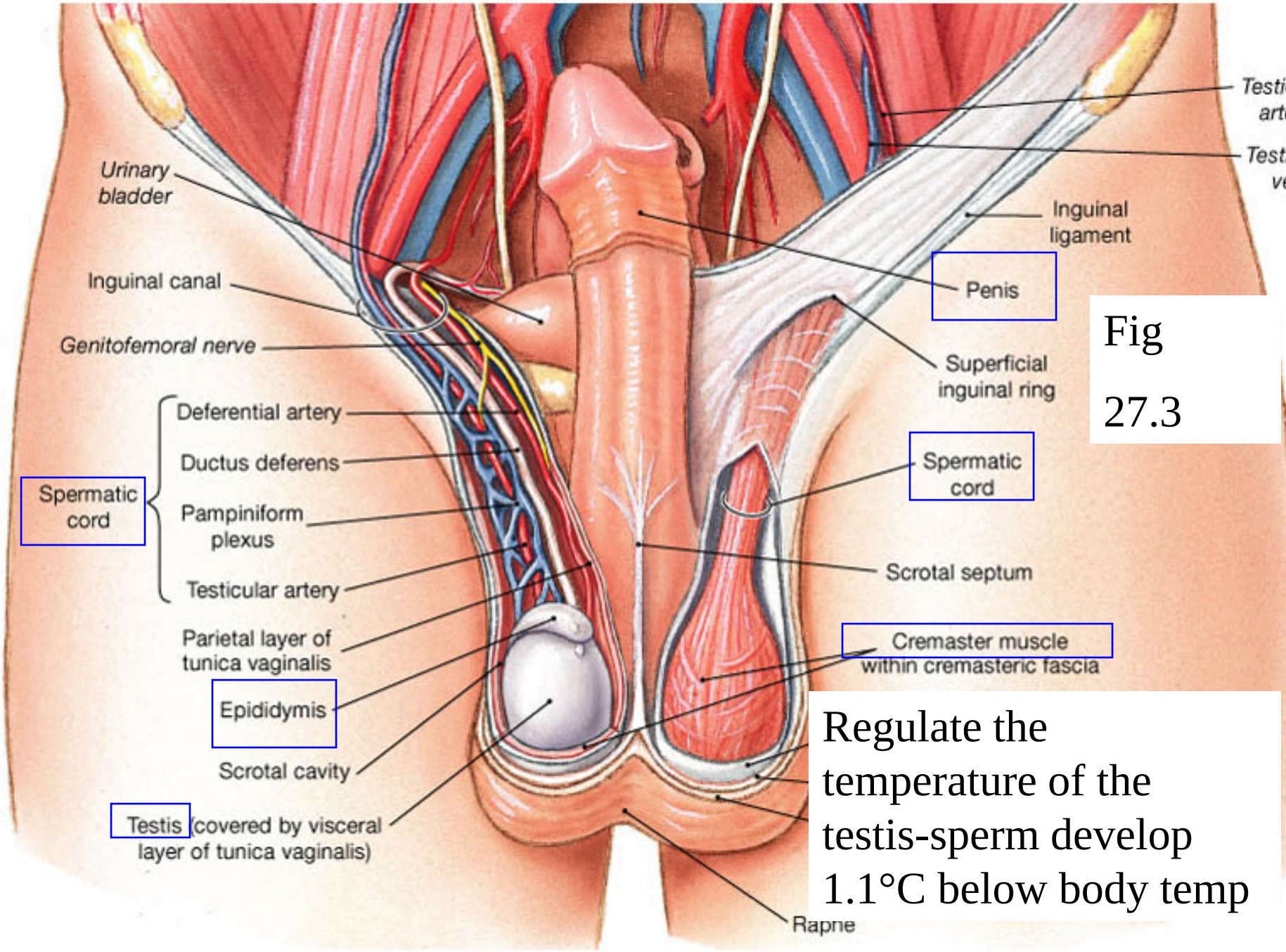
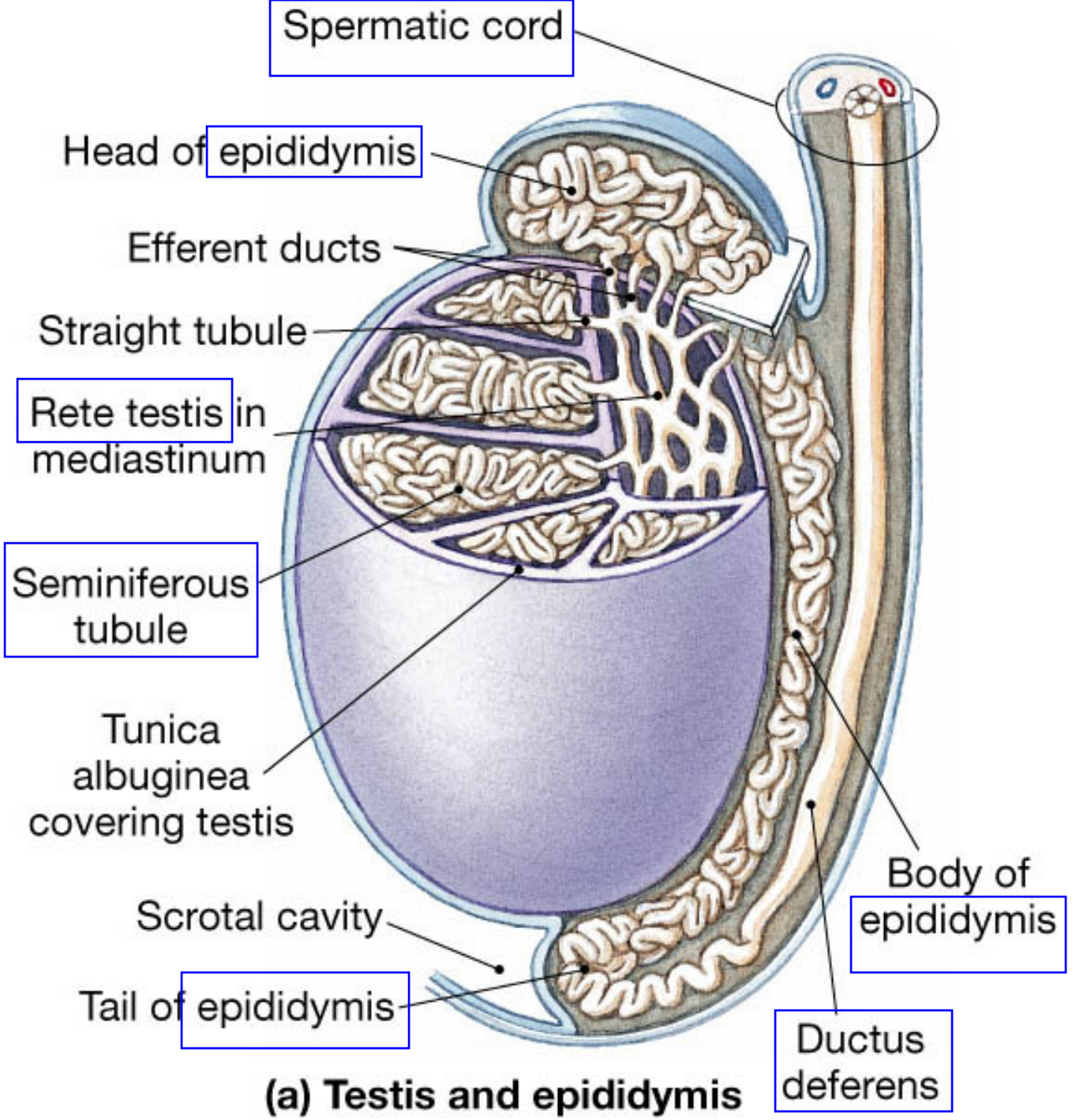


Fig 27.3

Regulate the temperature of the testis-sperm develop 1.1°C below body temp

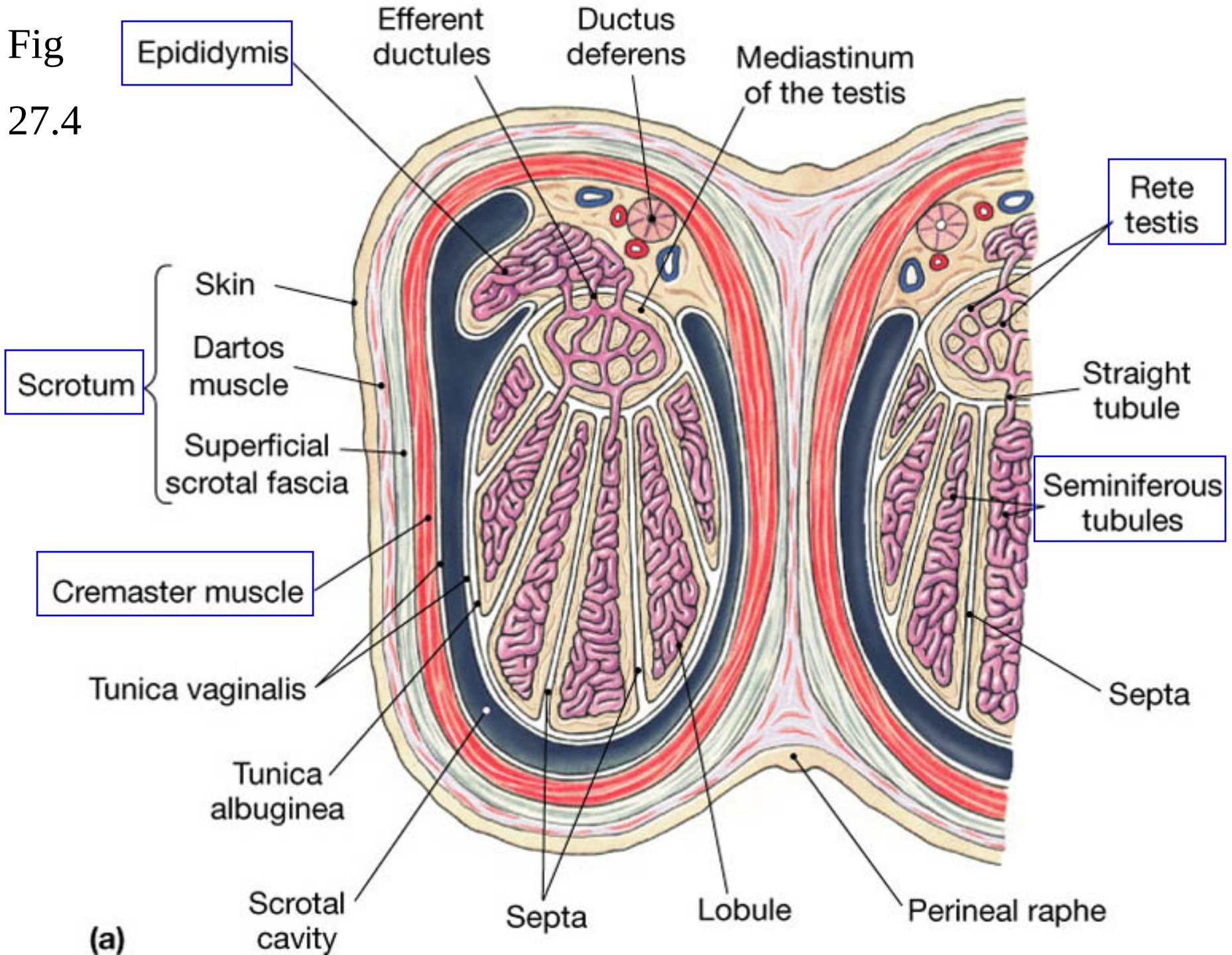
Fig

27.7



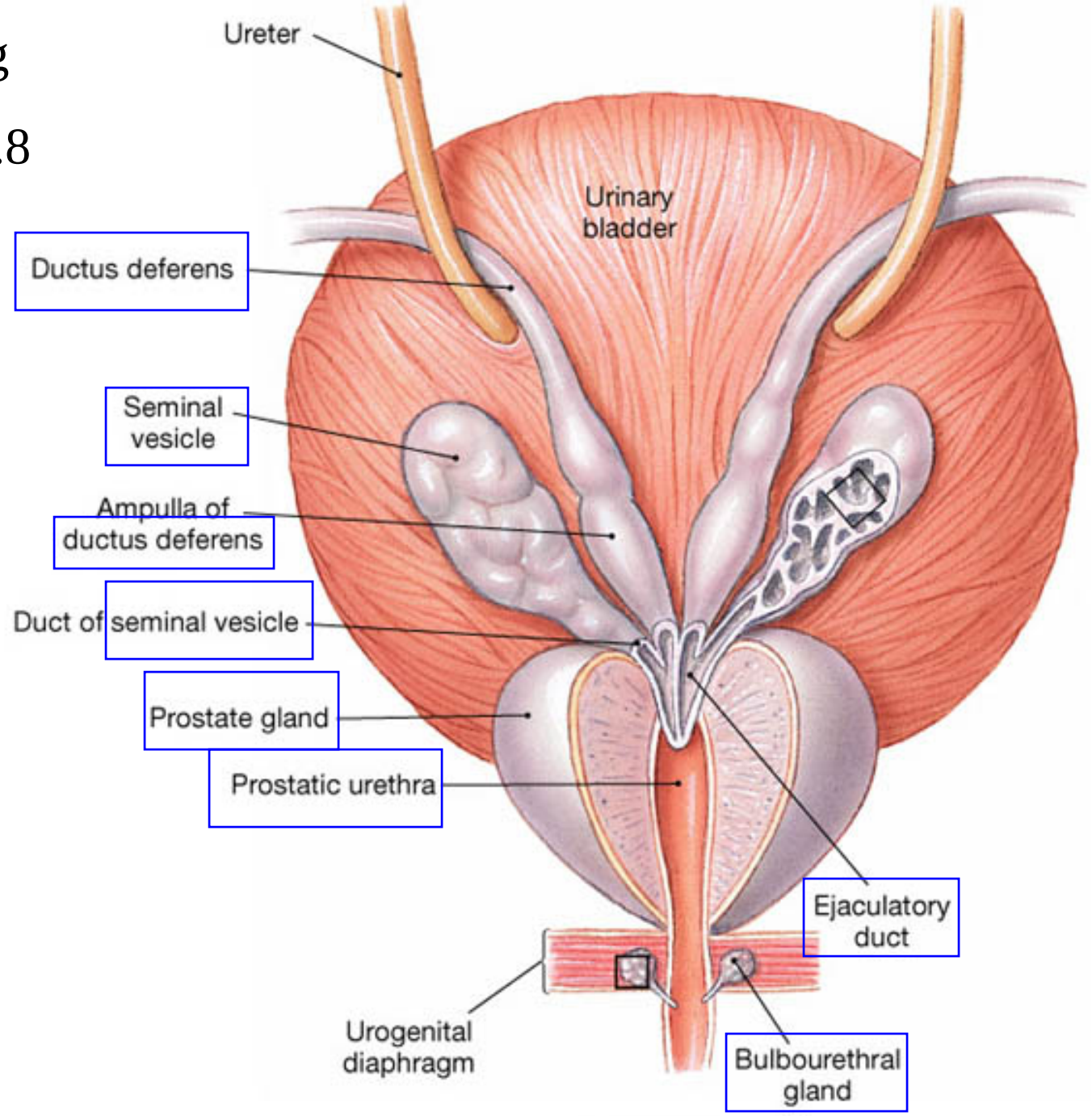
(a) Testis and epididymis

Fig 27.4


Epididymis
Efferent ductules
Ductus deferens
Mediastinum of the testis
Rete testis
Skin
Scrotum
Dartos muscle
Superficial scrotal fascia
Straight tubule
Seminiferous tubules
Cremaster muscle
Tunica vaginalis
Septa
Tunica albuginea
Scrotal cavity
Septa
Lobule
Perineal raphe
(a)

Fig

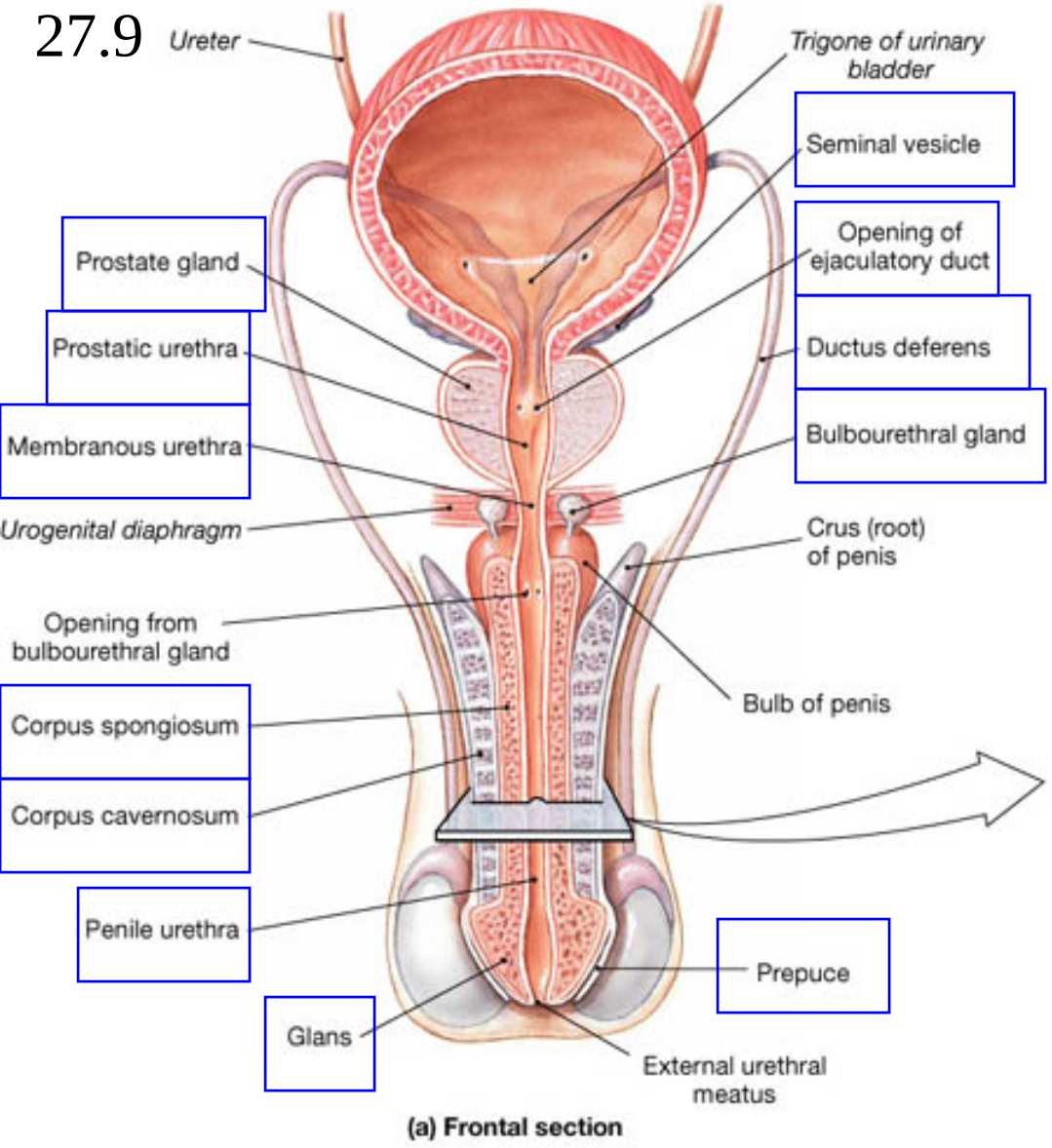
27.8



(a) Posterior view

Fig

27.9


Ureter
Trigone of urinary bladder
Seminal vesicle
Prostate gland
Opening of ejaculatory duct
Prostatic urethra
Ductus deferens
Membranous urethra
Bulbourethral gland
Urogenital diaphragm
Crus (root) of penis
Opening from bulbourethral gland
Bulb of penis
Corpus spongiosum
Corpus cavernosum
Penile urethra
Prepuce
Glans
External urethral meatus
(a) Frontal section

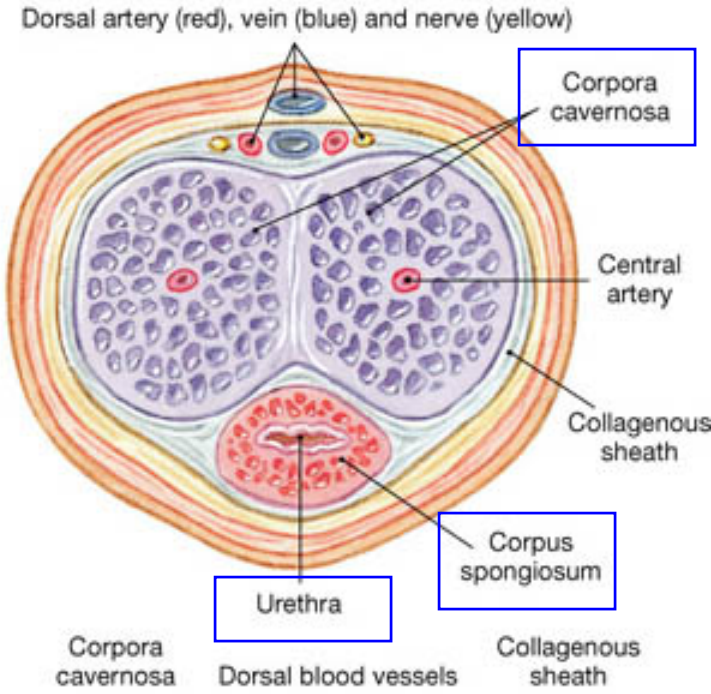
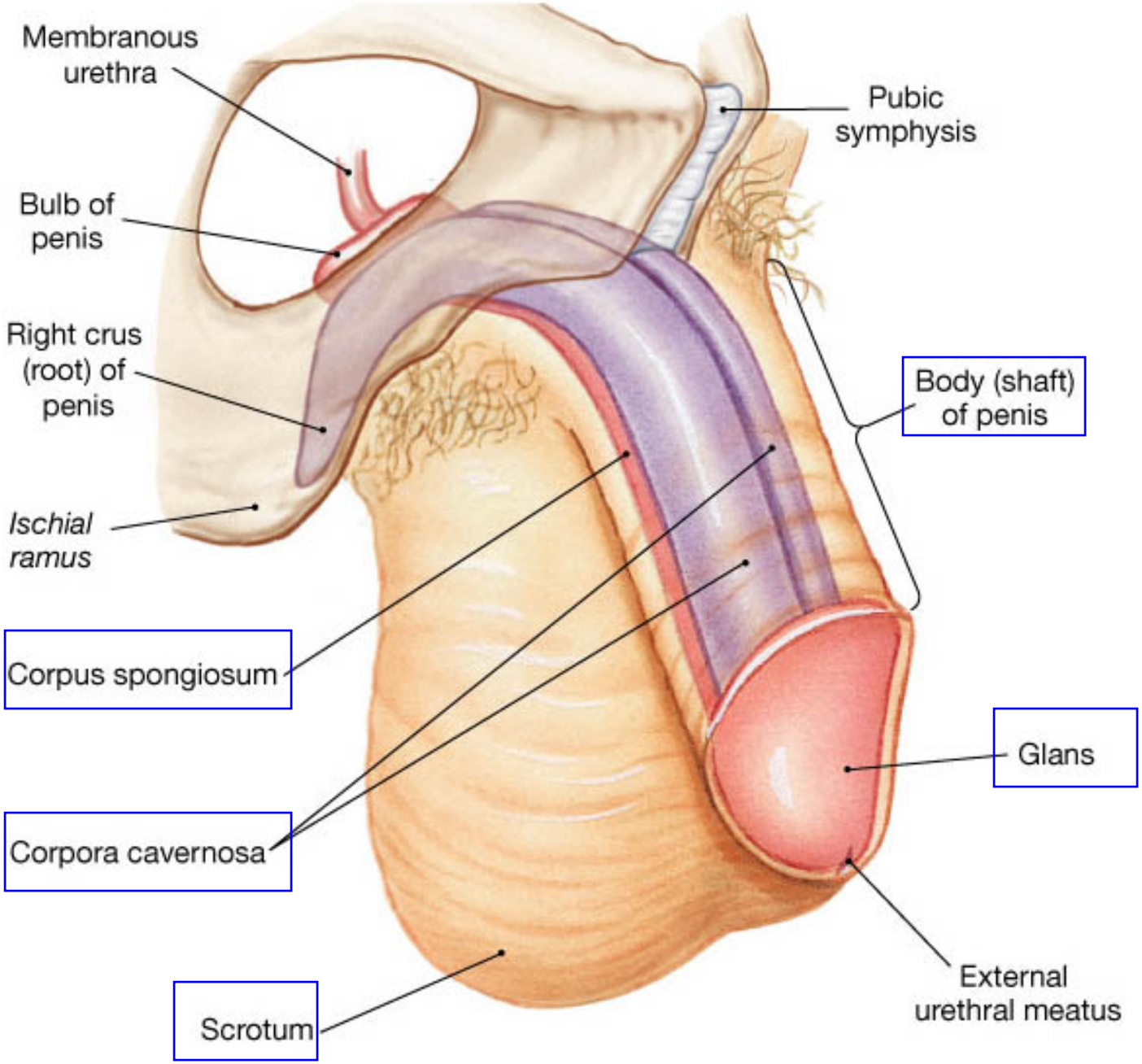

Dorsal artery (red), vein (blue) and nerve (yellow)
Corpora cavernosa
Central artery
Collagenous sheath
Corpus spongiosum
Urethra
Corpora cavernosa
Dorsal blood vessels
Collagenous sheath

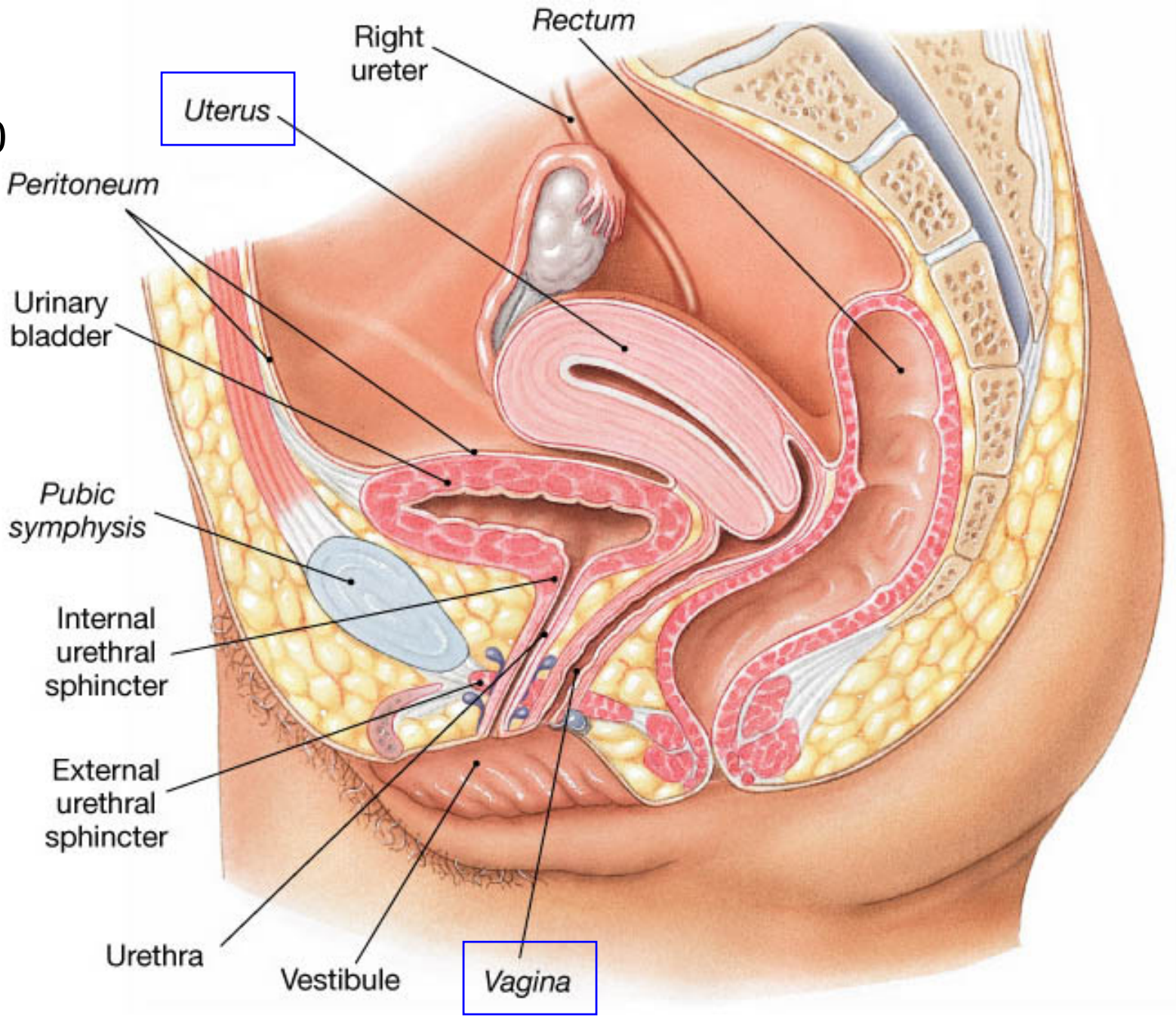
Fig 27.9



(c) Oblique lateral view

Fig

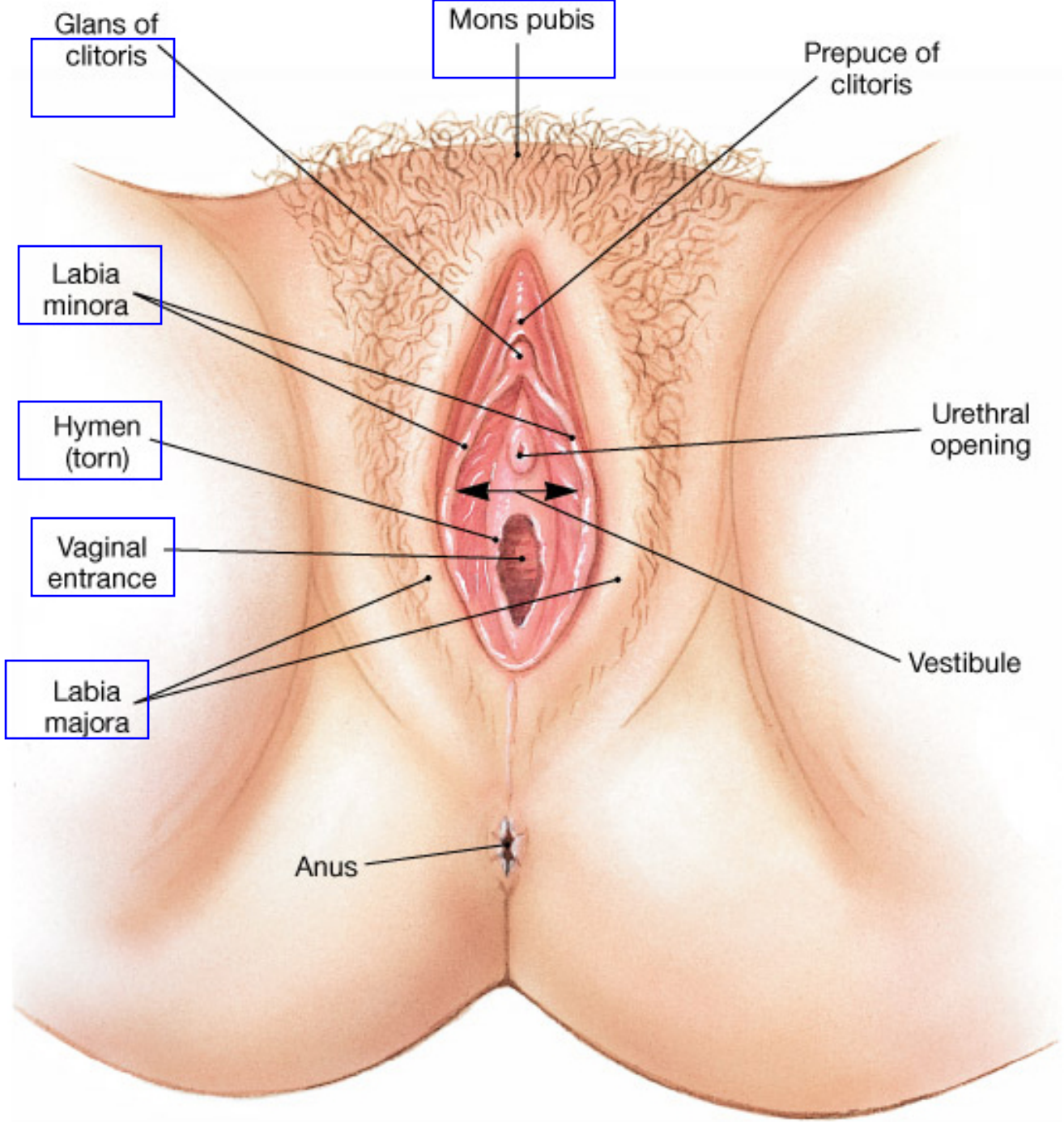
27.10



(b) Female pelvis, sagittal section

Fig

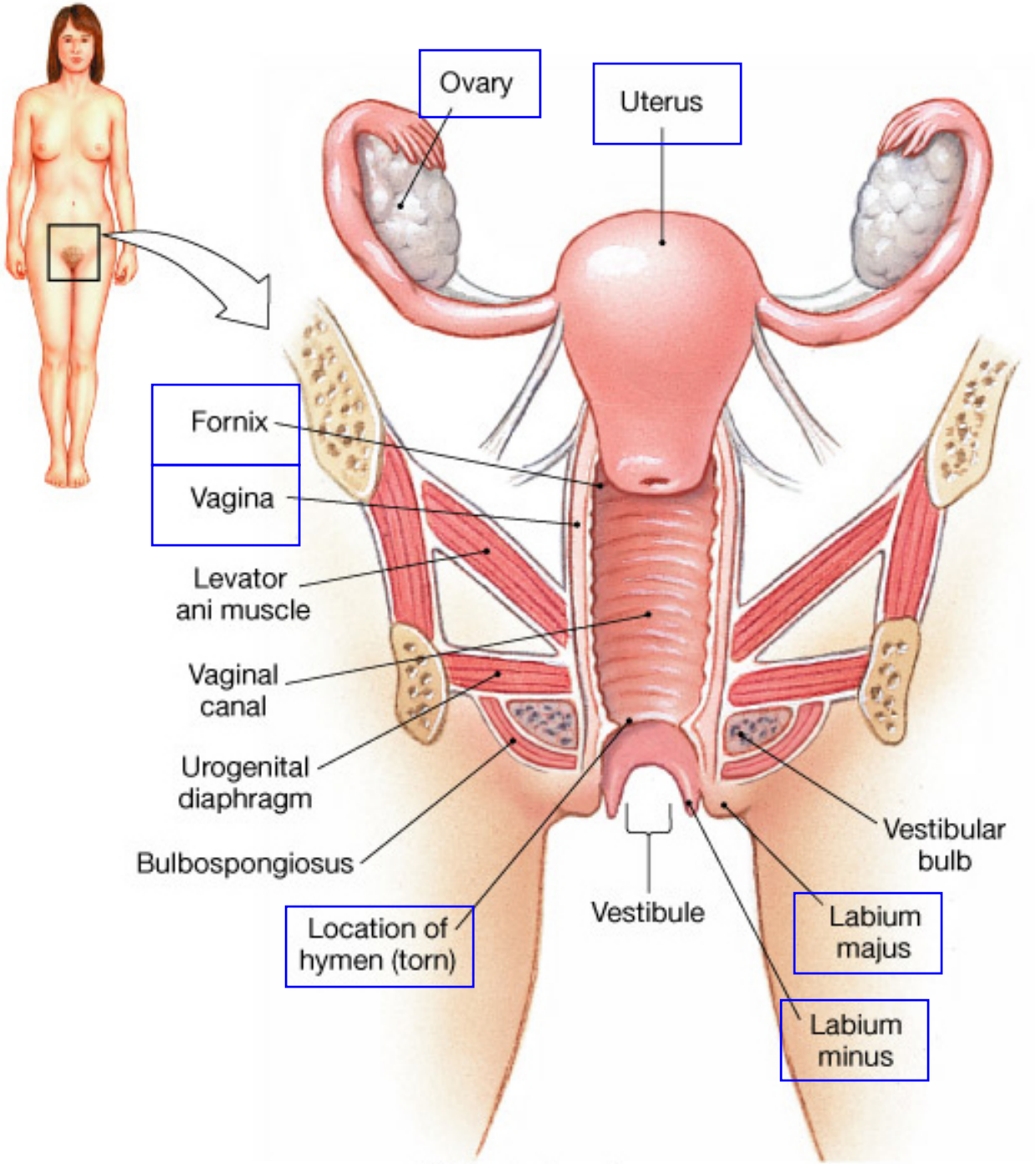
27.20



(a) Inferior view

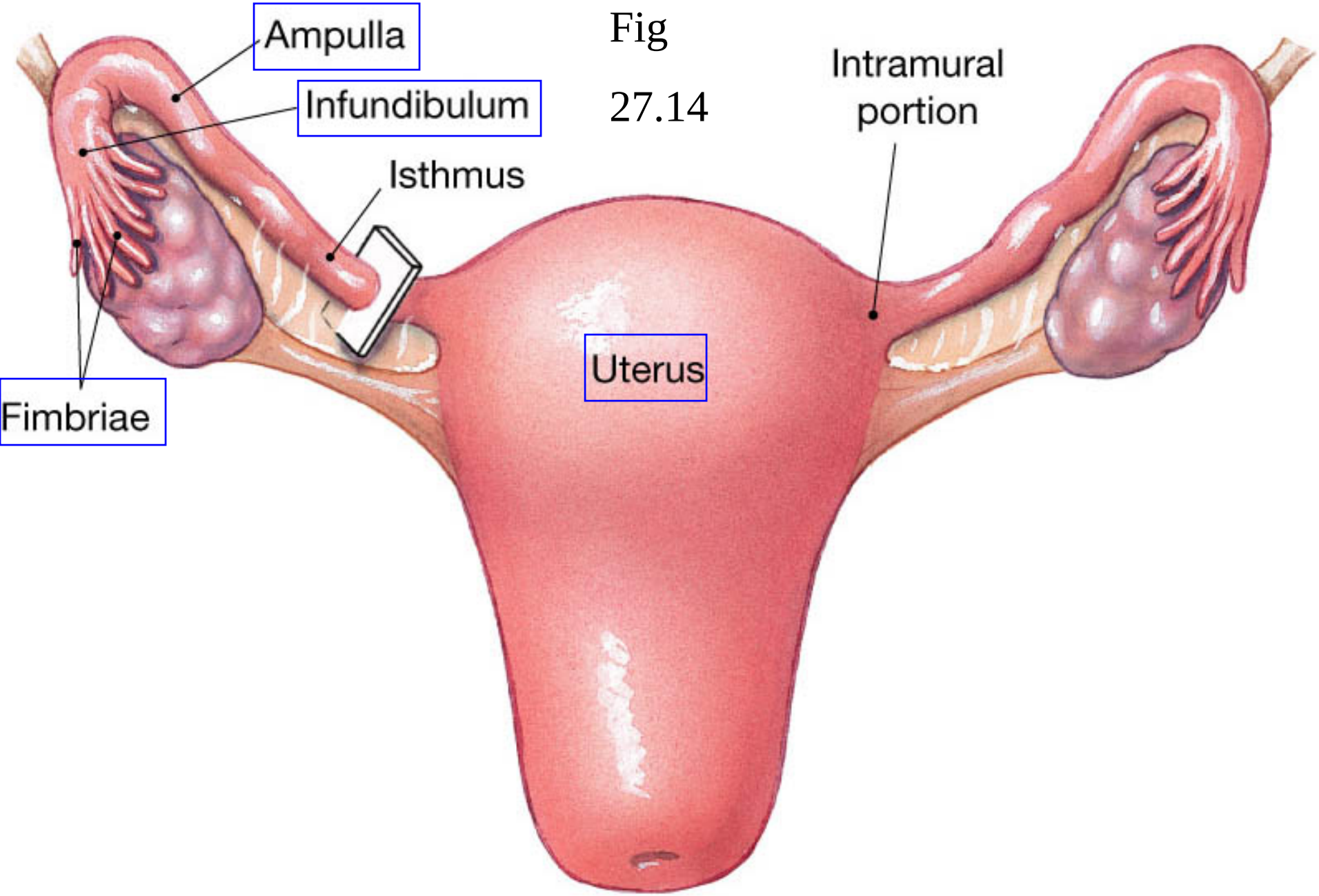
Fig

27.20



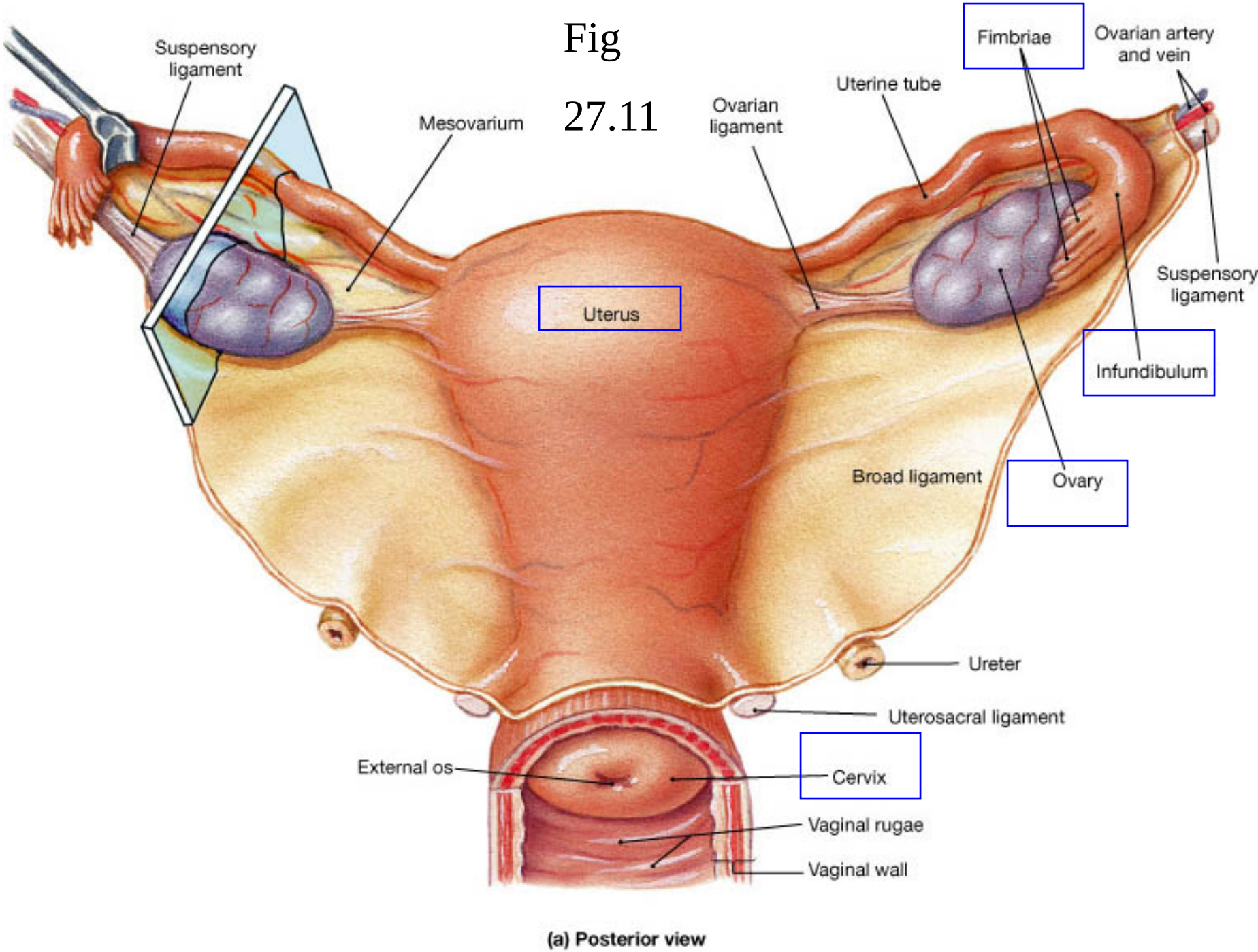
(b) Frontal section

Fig 27.14



(a) Posterior view

Fig 27.11



(a) Posterior view

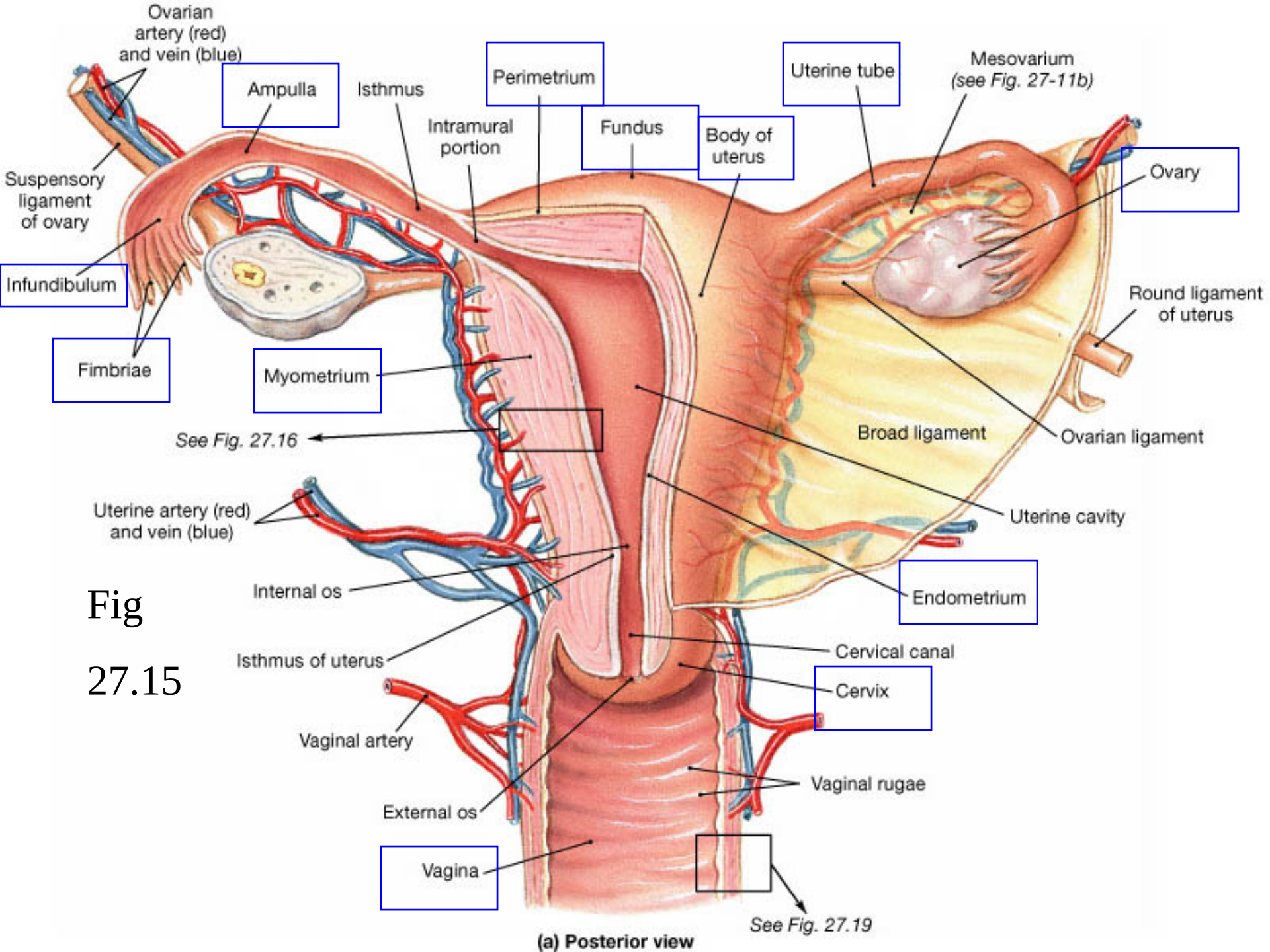
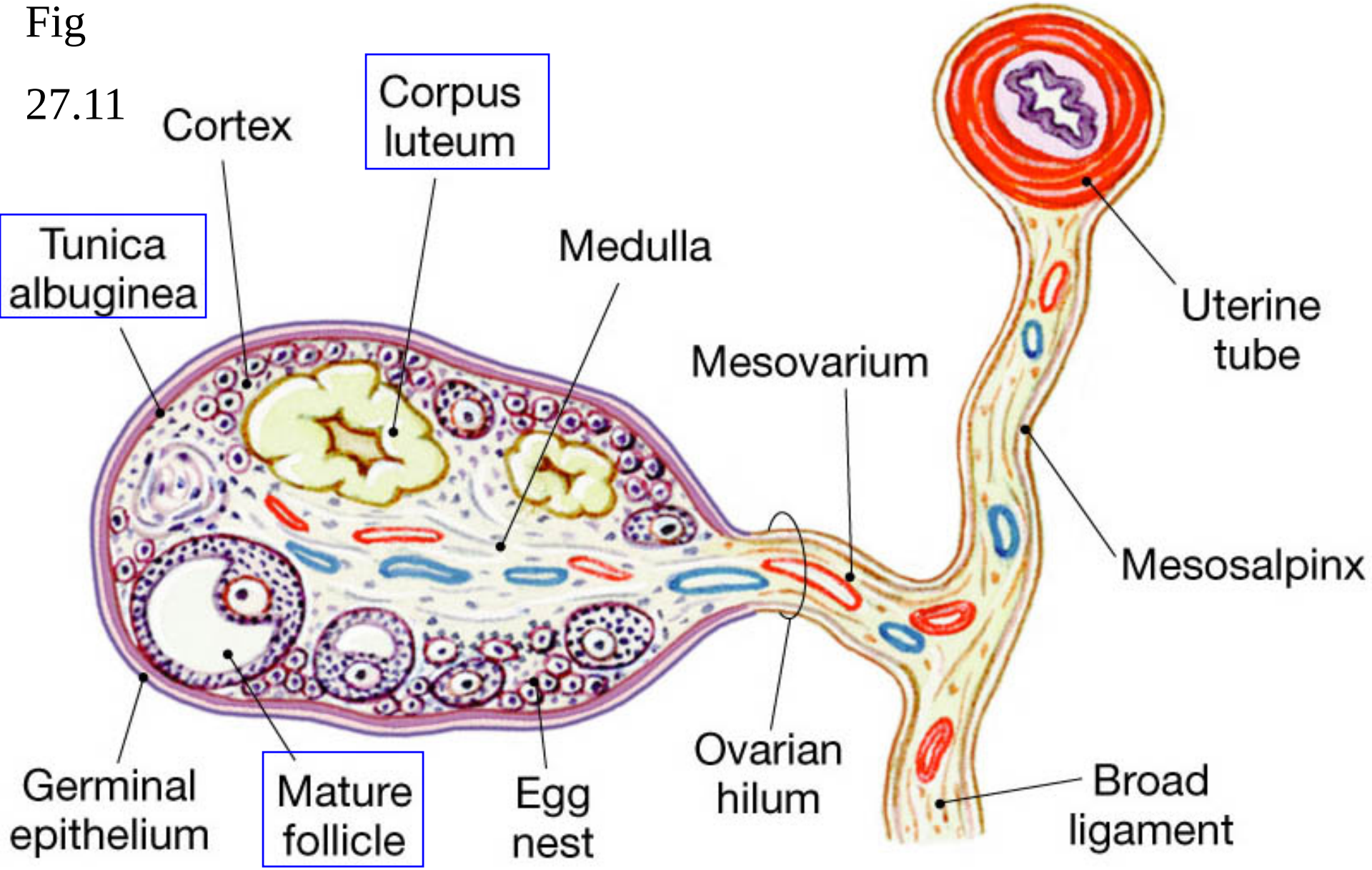

Ovarian artery (red) and vein (blue)
Ampulla
Isthmus
Perimetrium
Uterine tube
Mesovarium (see Fig. 27-11b)
Intramural portion
Fundus
Body of uterus
Suspensory ligament of ovary
Ovary
Infundibulum
Round ligament of uterus
Fimbriae
Myometrium
See Fig. 27.16
Broad ligament
Ovarian ligament
Uterine artery (red) and vein (blue)
Uterine cavity
Internal os
Endometrium
Isthmus of uterus
Cervical canal
Cervix
Vaginal artery
Vaginal rugae
External os
Vagina
See Fig. 27.19
(a) Posterior view

Fig 27.15

Fig

27.11



(b) Ovary and mesenteries, sectional view

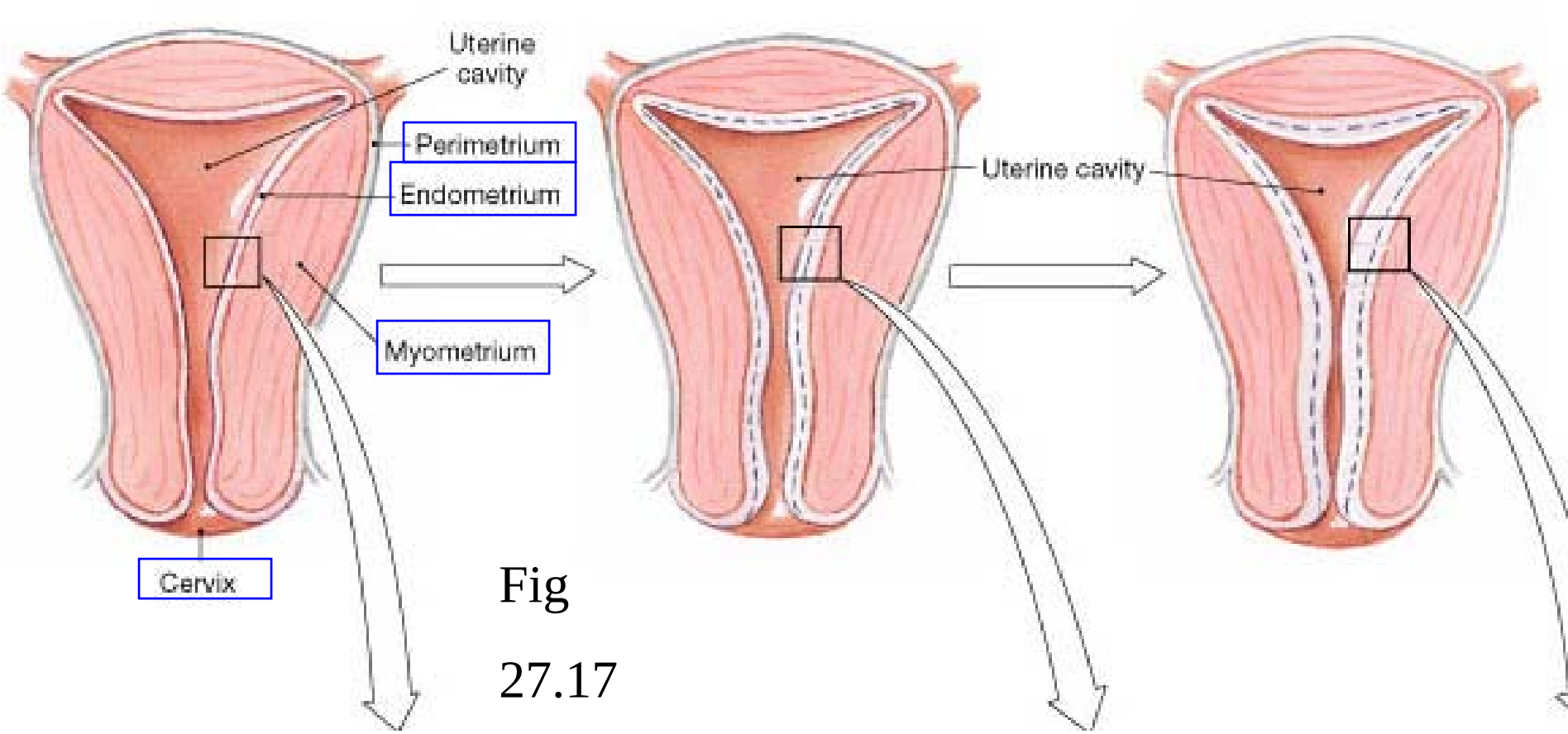
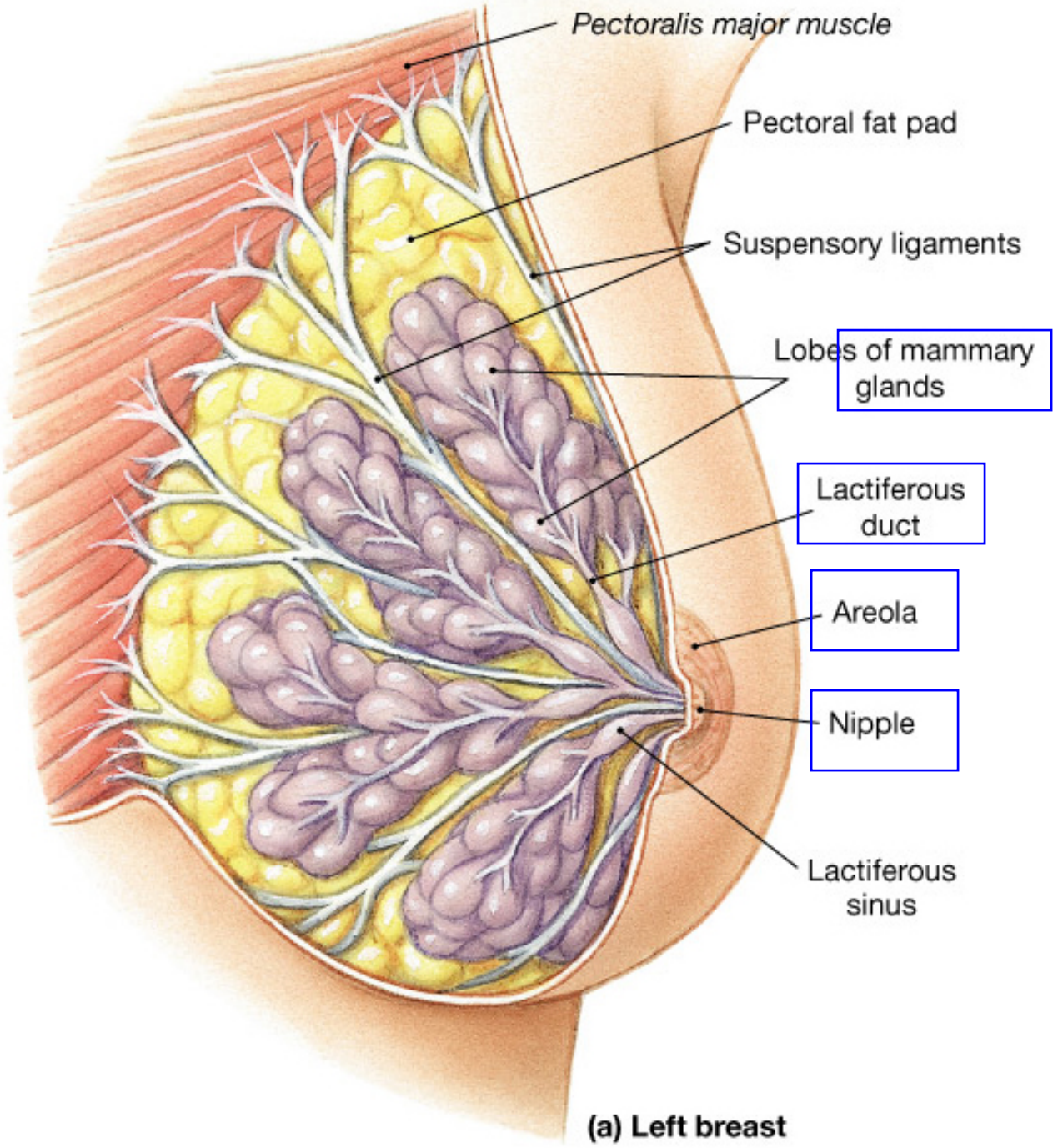
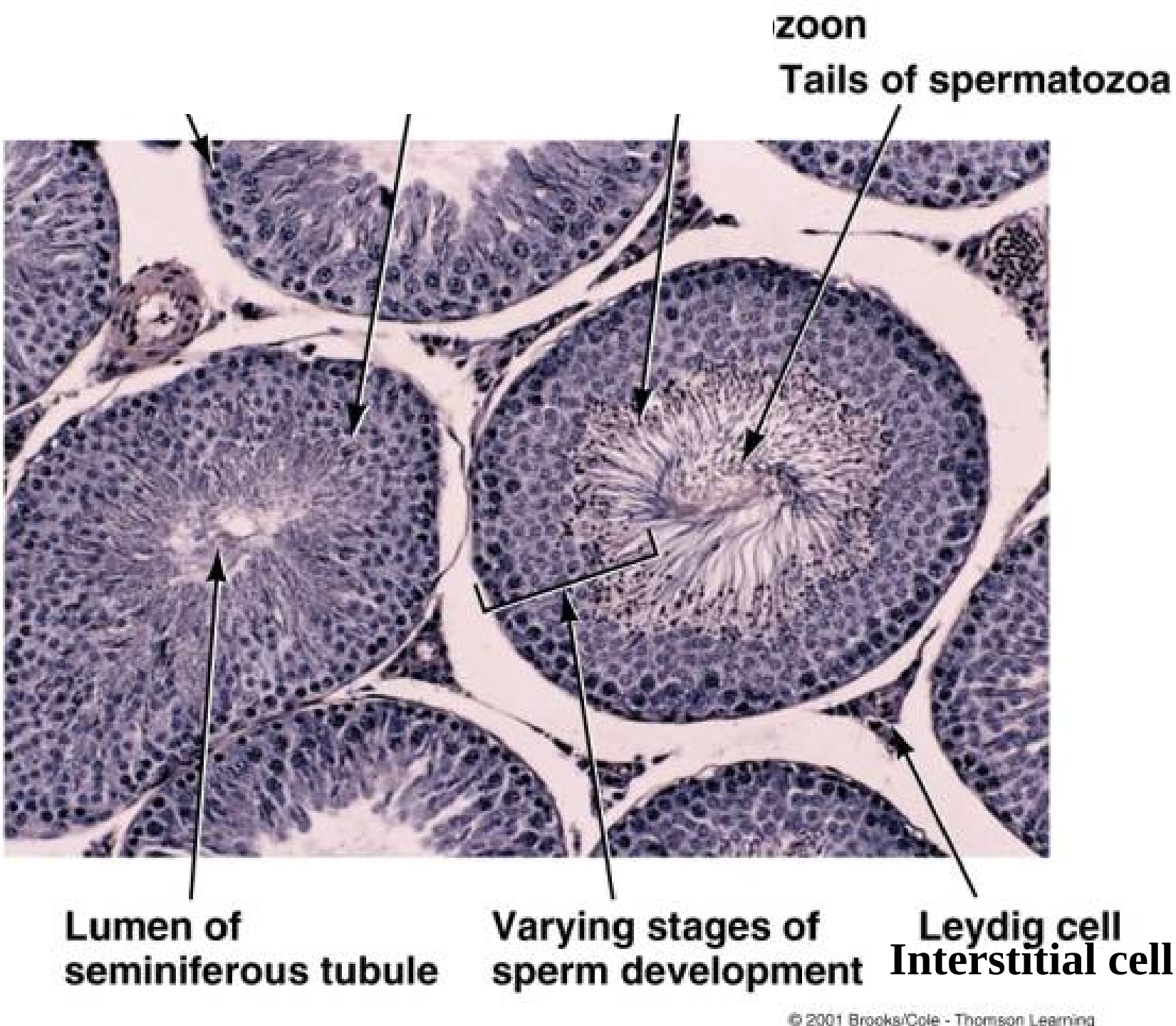

Uterine cavity
Perimetrium
Endometrium
Myometrium
Cervix
Uterine cavity

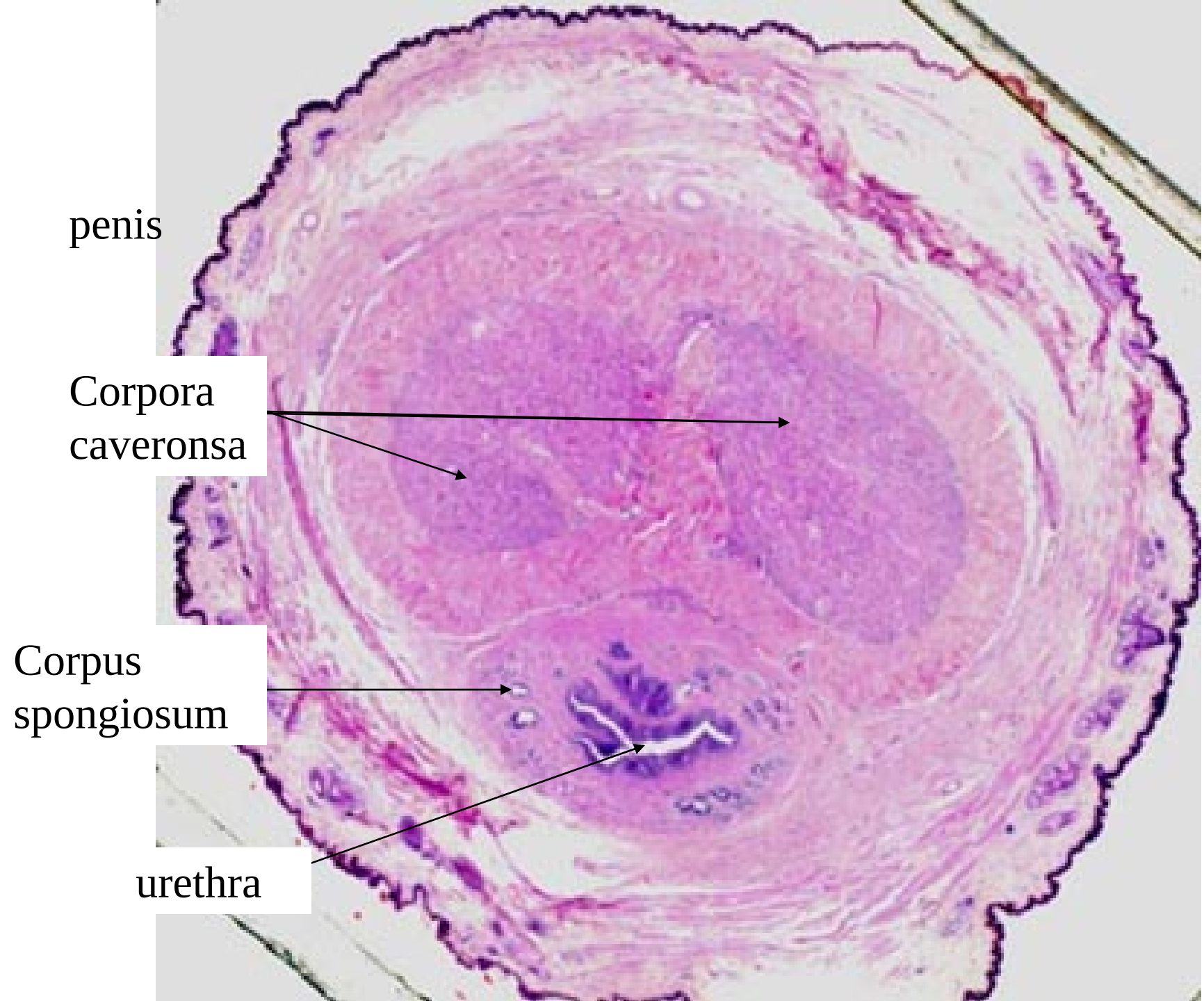
Fig 27.17

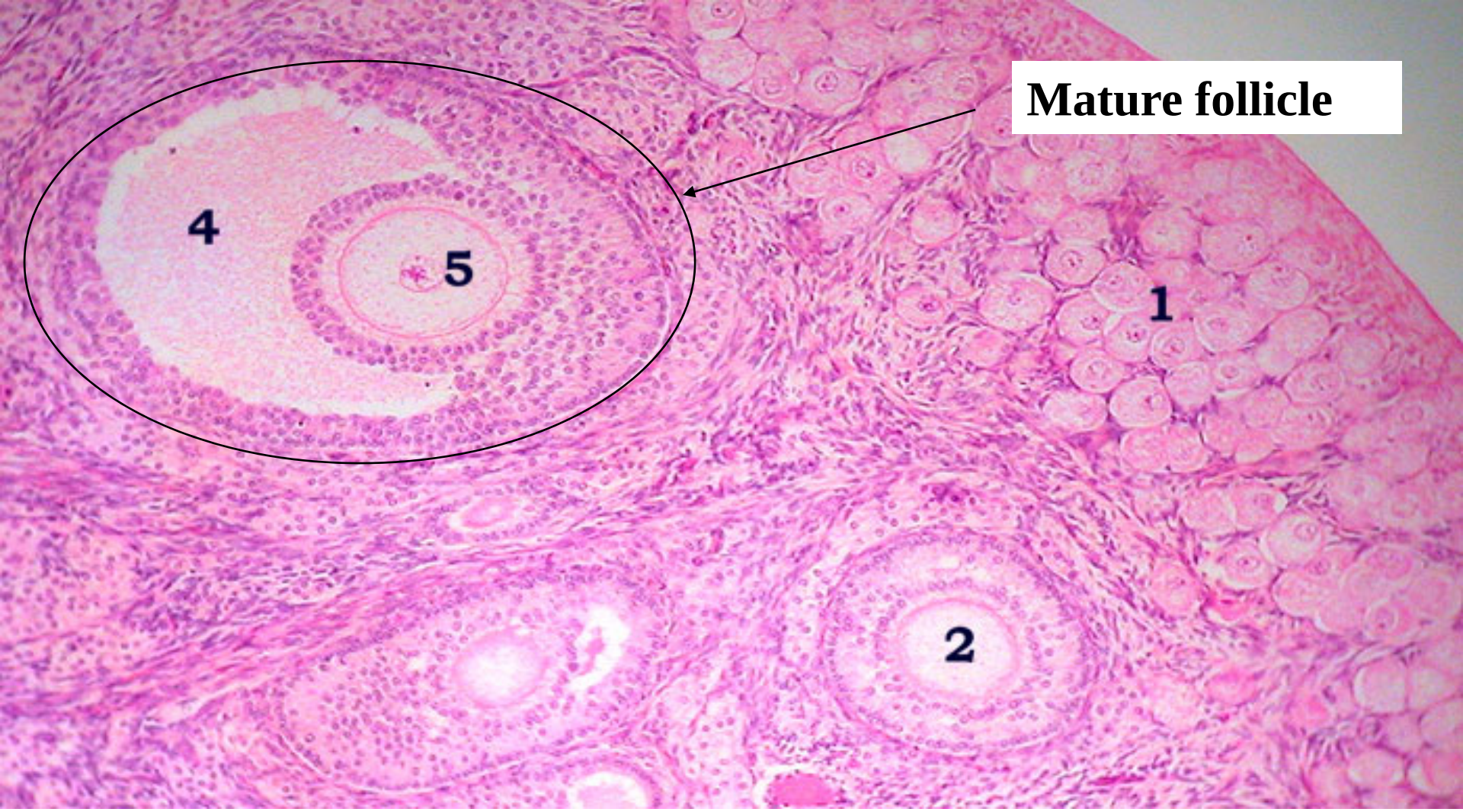
Fig

27.21


Pectoralis major muscle
Pectoral fat pad
Suspensory ligaments
Lobes of mammary glands
Lactiferous duct
Areola
Nipple
Lactiferous sinus
(a) Left breast




penis
Corpora caveronsa
Corpus spongiosum
urethra



2-primary follicle 5-oocyte