



# **The Male Genital Organs (*Organa Genitalia Virilia*)**

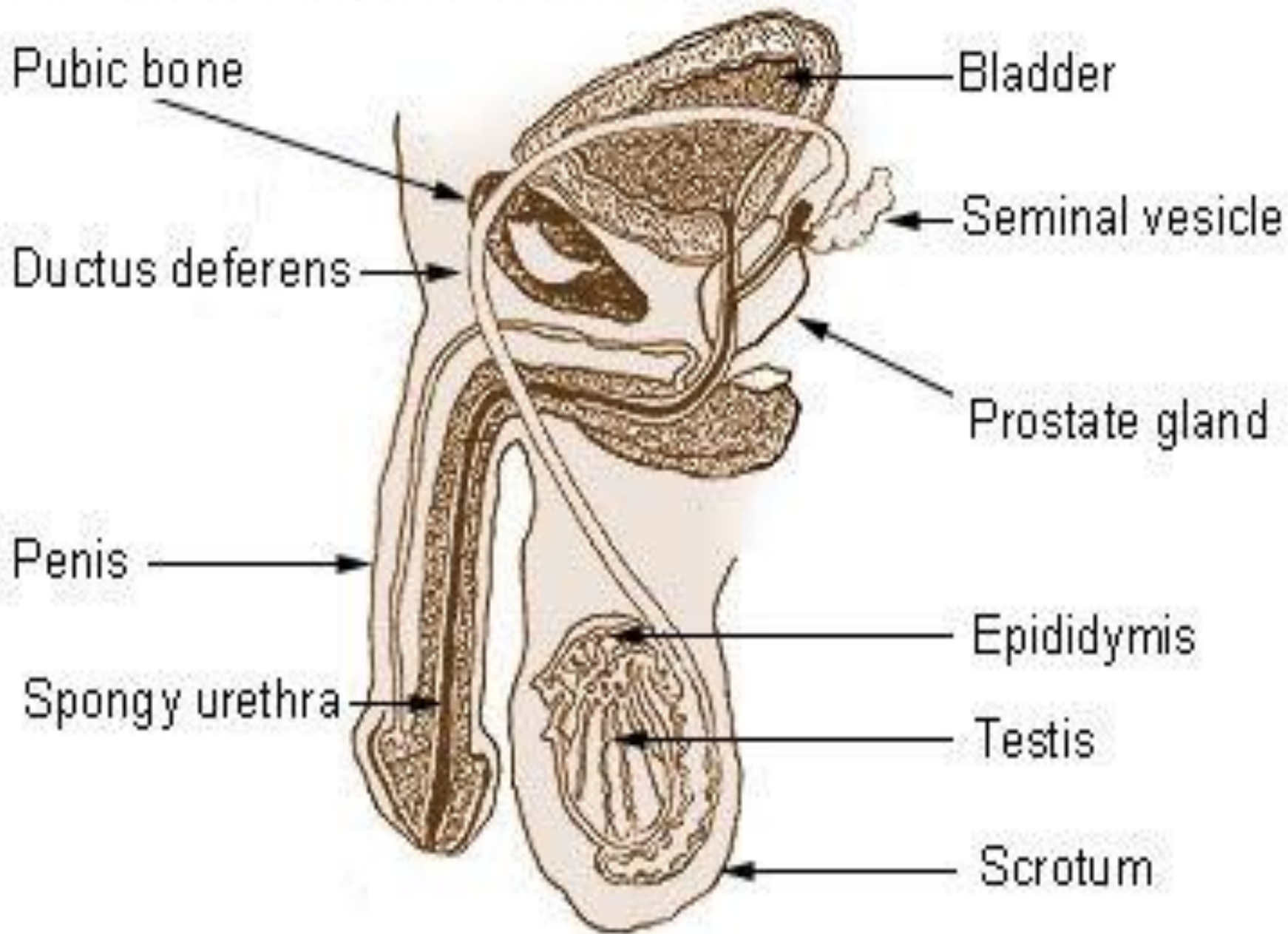
**Lecture no. 11**

**Assoc. Prof. Şişu Alina, MD, PhD**

The male genitals include

- the **testes**,
- the ***ductus deferentes***,
- the ***vesiculæ seminales***,
- the **ejaculatory ducts**,
- and the **penis**, together with the following accessory structures,
- the **prostate** and
- the **bulbourethral glands**.

# Male Reproductive System



# The Testes and their Coverings

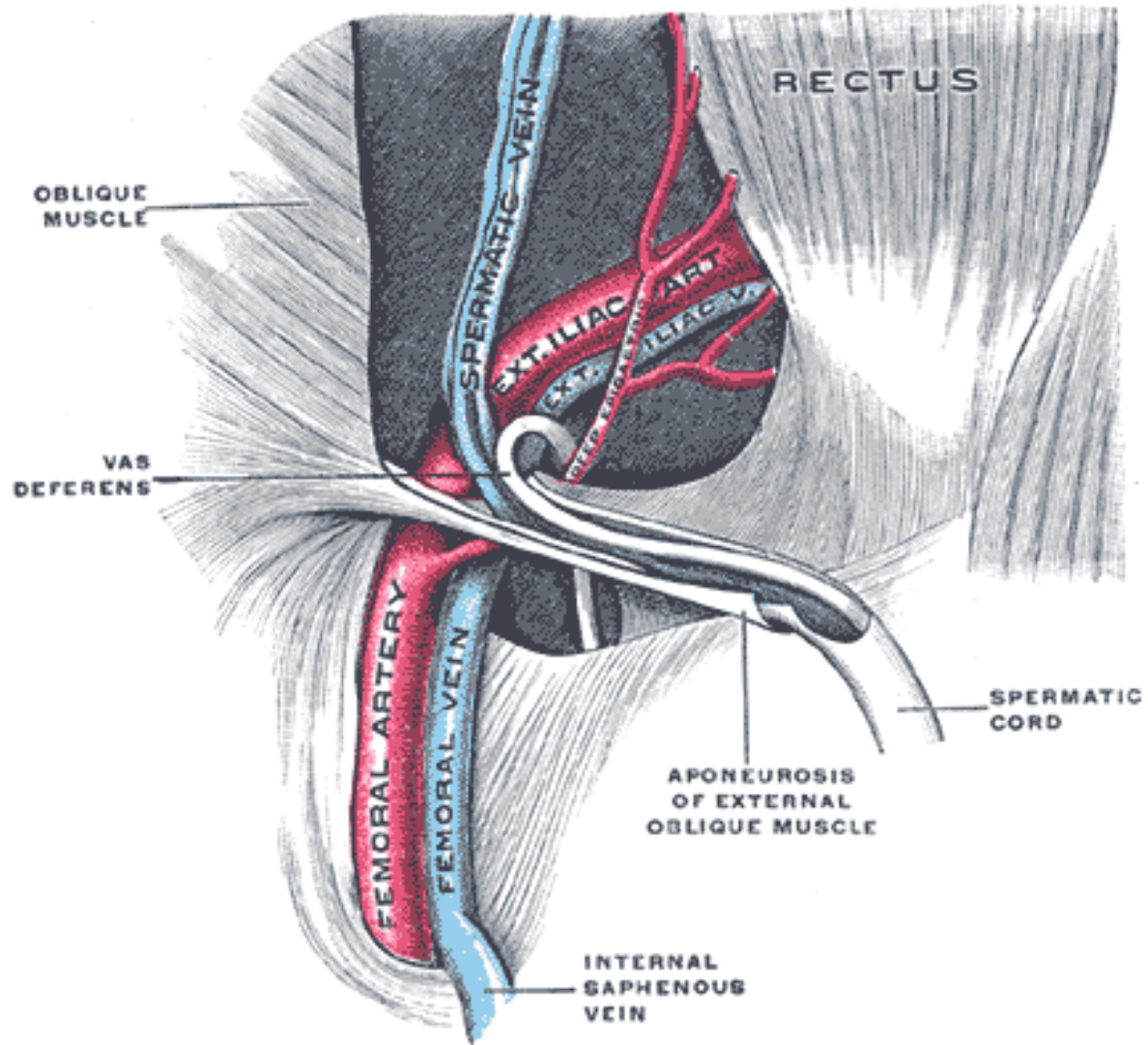
The **testes** are two glandular organs, which secrete the semen; they are suspended in the scrotum by the spermatic cords.

At an early period of foetal life the testes are contained in the abdominal cavity, behind the peritoneum.

Before birth they descend to the inguinal canal, along which they pass with the spermatic cord, and, emerging at the subcutaneous inguinal ring, they descend into the scrotum, becoming invested in their course by coverings derived from the serous, muscular, and fibrous layers of the abdominal walls, as well as by the scrotum.

# The Spermatic Cord (*funiculus spermaticus*)

- extends from the abdominal inguinal ring, where the structures of which it is composed converge, to the back part of the testis.
- In the abdominal wall the cord passes obliquely along the inguinal canal, lying at first beneath the *Obliquus internus*, and upon the *fascia transversalis*; but nearer the pubis, it rests upon the inguinal and lacunar ligaments, having the aponeurosis of the *Obliquus externus* in front of it, and the inguinal falx behind it.
- It then escapes at the subcutaneous ring, and descends nearly vertically into the scrotum.
- The left cord is rather longer than the right, consequently the left testis hangs somewhat lower than its fellow.



# Structure of the Spermatic Cord

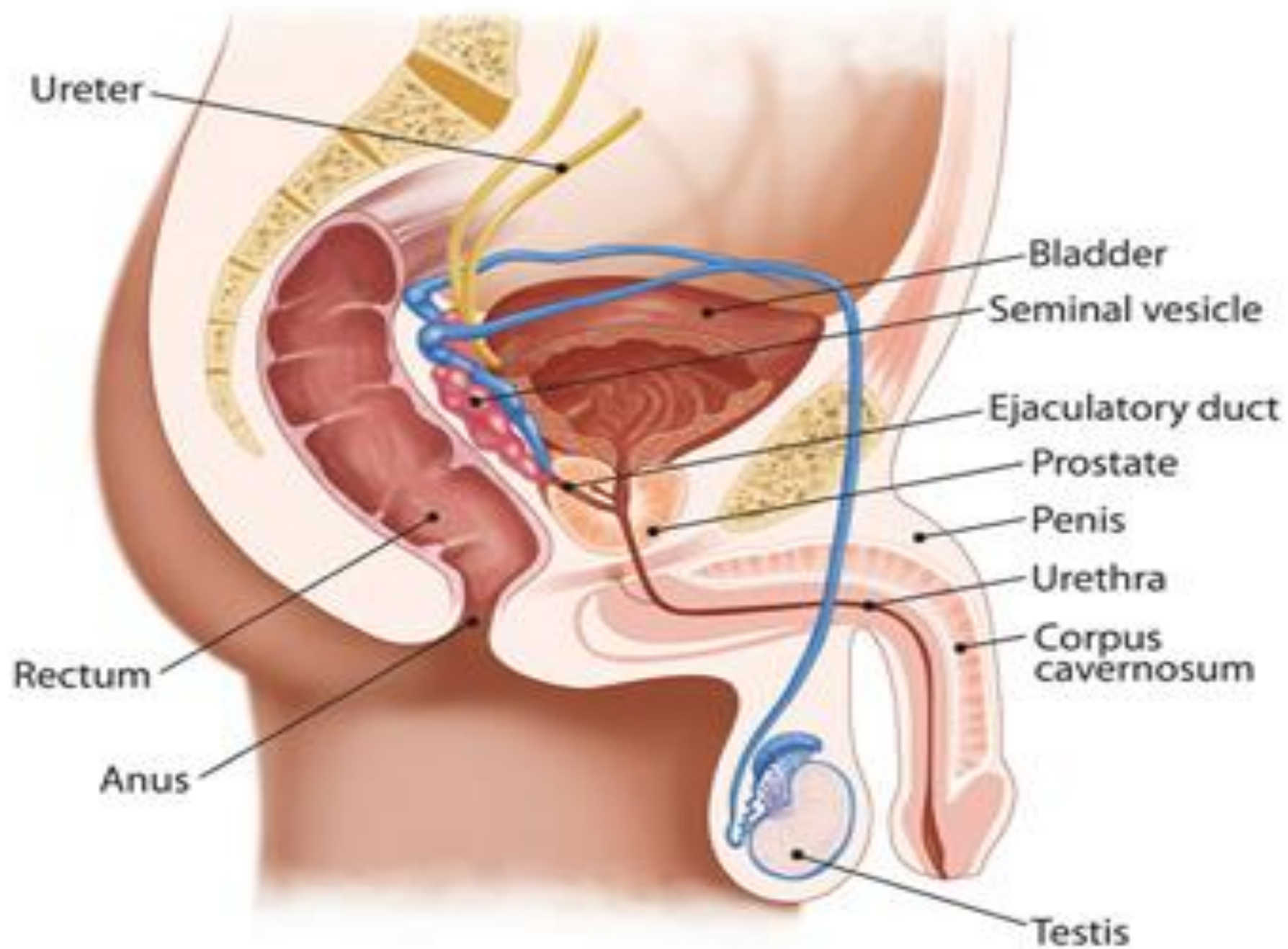
- The spermatic cord is composed of arteries, veins, lymphatics, nerves, and the excretory duct of the testis.
- These structures are connected together by areolar tissue, and invested by the layers brought down by the testis in its descent.
- The **arteries of the cord** are: *the internal and external spermatics; and the artery to the ductus deferens.*

- The *internal spermatic artery*, a branch of the abdominal aorta, escapes from the abdomen at the abdominal inguinal ring, and accompanies the other constituents of the spermatic cord along the inguinal canal and through the subcutaneous inguinal ring into the scrotum.
- It then descends to the testis, and, becoming tortuous, divides into several branches, two or three of which accompany the *ductus deferens* and supply the *epididymis*, anastomosing with the artery of the *ductus deferens*: the others supply the substance of the testis.

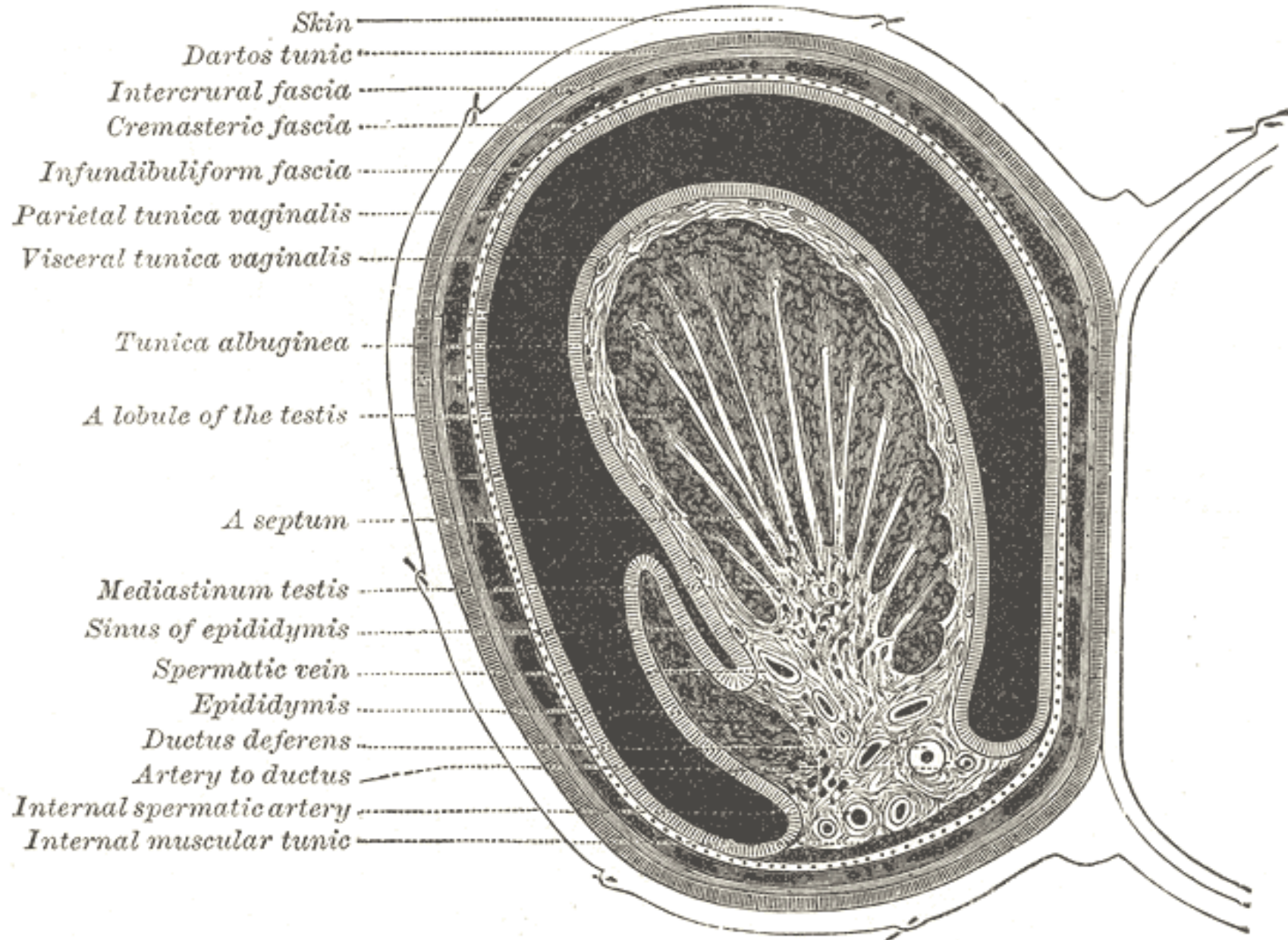


- The external spermatic artery is a branch of the inferior epigastric artery.
- It accompanies the spermatic cord and supplies the coverings of the cord, anastomosing with the internal spermatic artery.
- The *artery of the ductus deferens*, a branch of the superior vesical, is a long, slender vessel, which accompanies the ductus deferens, ramifying upon its coats, and anastomosing with the internal spermatic artery near the testis.

- The **spermatic veins** emerge from the back of the testis, and receive tributaries from the epididymis: they unite and form a convoluted plexus, **the plexus pampiniformis**, which forms the chief mass of the cord; the vessels composing this plexus are very numerous, and ascend along the cord in front of the ductus deferens; below the subcutaneous inguinal ring they unite to form three or four veins, which pass along the inguinal canal, and, entering the abdomen through the abdominal inguinal ring, coalesce to form two veins.
- These again unite to form a single vein, which opens on the right side into the inferior vena cava, at an acute angle, and on the left side into the left renal vein, at a right angle.



- The **coverings of the testes** are, the
- Skin
- Scrotum.
- Cremaster muscle.
- Dartos tunic
- Infundibuliform fascia.
- Intercrural fascia.
- Tunica vaginalis.





# **The *Tunica Vaginalis* (*tunica vaginalis propria testis*)**

- is the serous covering of the testis.
- It is a pouch of serous membrane, derived from the *saccus vaginalis* of the peritoneum, which in the foetus preceded the descent of the testis from the abdomen into the scrotum.
- After its descent, that portion of the pouch which extends from the abdominal inguinal ring to near the upper part of the gland becomes obliterated; the lower portion remains as a shut sac, which invests the surface of the testis, and is reflected on to the internal surface of the scrotum; hence it may be described as consisting of a visceral and a parietal lamina.

- **The visceral lamina (*lamina visceralis*)** covers the greater part of the testis and epididymis, connecting the latter to the testis by means of a distinct fold.
- From the posterior border of the gland it is reflected on to the internal surface of the scrotum.
- **The parietal lamina (*lamina parietalis*)** is far more extensive than the visceral, extending upward for some distance in front and on the medial side of the cord, and reaching below the testis.
- The inner surface of the *tunica vaginalis* is smooth, and covered by a layer of endothelial cells.
- The interval between the visceral and parietal *laminæ* constitutes the cavity of the *tunica vaginalis*.

- ***The Tunica Albuginea*** is the fibrous covering of the *testis*.
- It is a dense membrane, of a bluish-white color, composed of bundles of white fibrous tissue which interlace in every direction.
- It is covered by the *tunica vaginalis*, except at the points of attachment of the epididymis to the testis, and along its posterior border, where the spermatic vessels enter the gland.
- It is applied to ***the tunica vasculosa*** over the glandular substance of the testis, and, at its posterior border, is reflected into the interior of the gland, forming an incomplete vertical septum, called the ***mediastinum testis (corpus Highmori)***.

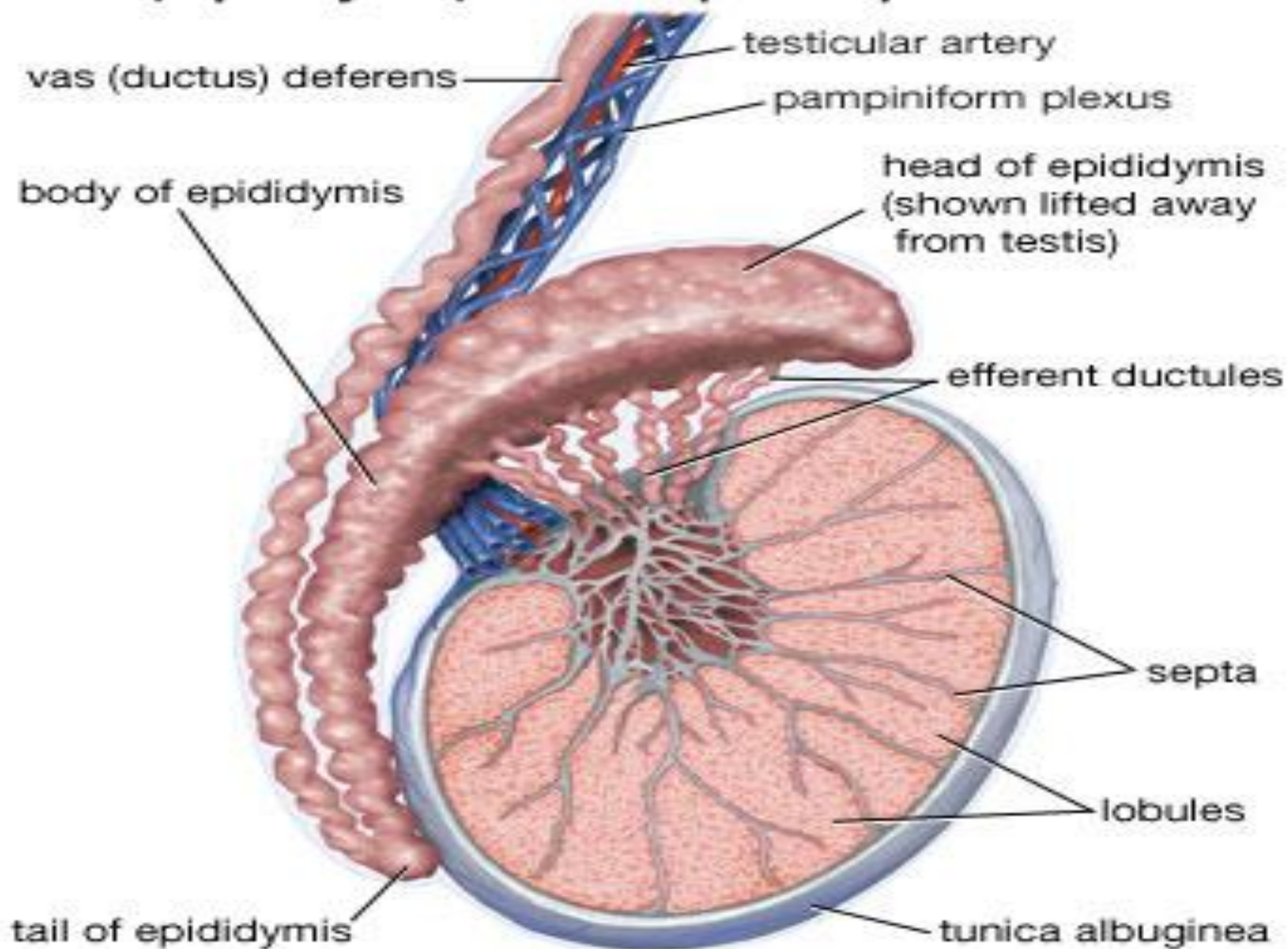


- **The *Tunica Vasculosa*** is the vascular layer of the testis, consisting of a plexus of bloodvessels, held together by delicate areolar tissue.
- It clothes the inner surface of the *tunica albuginea* and the different septa in the interior of the gland, and therefore forms an internal investment to all the spaces of which the gland is composed.

# Structure

- The glandular structure of the testis consists of numerous lobules.
- Their number, in a single testis, is estimated 250- 400.
- They differ in size according to their position, those in the middle of the gland being larger and longer.
- The lobules are conical in shape, the base being directed toward the circumference of the organ, the apex toward the mediastinum.
- Each lobule is contained in one of the intervals between the fibrous septa which extend between the *mediastinum testis* and the *tunica albuginea*, and consists of from one to three, or more, minute convoluted tubes, the *tubuli seminiferi*.
- They are supported by loose connective tissue which contains here and there groups of “interstitial cells” containing yellow pigment granules.

## Testis, epididymis, and vas (ductus) deferens



- The tubules are pale in color in early life, but in old age they acquire a deep yellow tinge from containing much fatty matter.
- Each tubule consists of a basement layer formed of laminated connective tissue containing numerous elastic fibers with flattened cells between the layers and covered externally by a layer of flattened epithelioid cells.
- Within the basement membrane are epithelial cells arranged in several irregular layers, which are not always clearly separated, but which may be arranged in three different groups.
- Among these cells may be seen the *spermatozoa* in different stages of development.
- (1) Lining the basement membrane and forming the outer zone is a layer of cubical cells, with small nuclei; some of these enlarge to become spermatogonia.

- The nuclei of some of the **spermatogonia** may be seen to be in process of indirect division (karyokinesis), and in consequence of this daughter cells are formed, which constitute the second zone.
- (2) Within this first layer is to be seen a number of larger polyhedral cells, with clear nuclei, arranged in two or three layers; these are the **intermediate cells or spermatocytes**.
- Most of these cells are in a condition of karyokinetic division, and the cells which result from this division form those of the next layer, the **spermatoblasts or spermatids**.
- (3) The third layer of cells consists of the **spermatoblasts or spermatids**, and each of these, without further subdivision, becomes a **spermatozoon**.
- The spermatids are small polyhedral cells, the nucleus of each of which contains half the usual number of chromosomes.
- In addition to these three layers of cells others are seen, which are termed the supporting cells (cells of *Sertoli*).
- They are elongated and columnar, and project inward from the basement membrane toward the lumen of the tube.
- As development of the spermatozoa proceeds the latter group themselves around the inner extremities of the supporting cells.

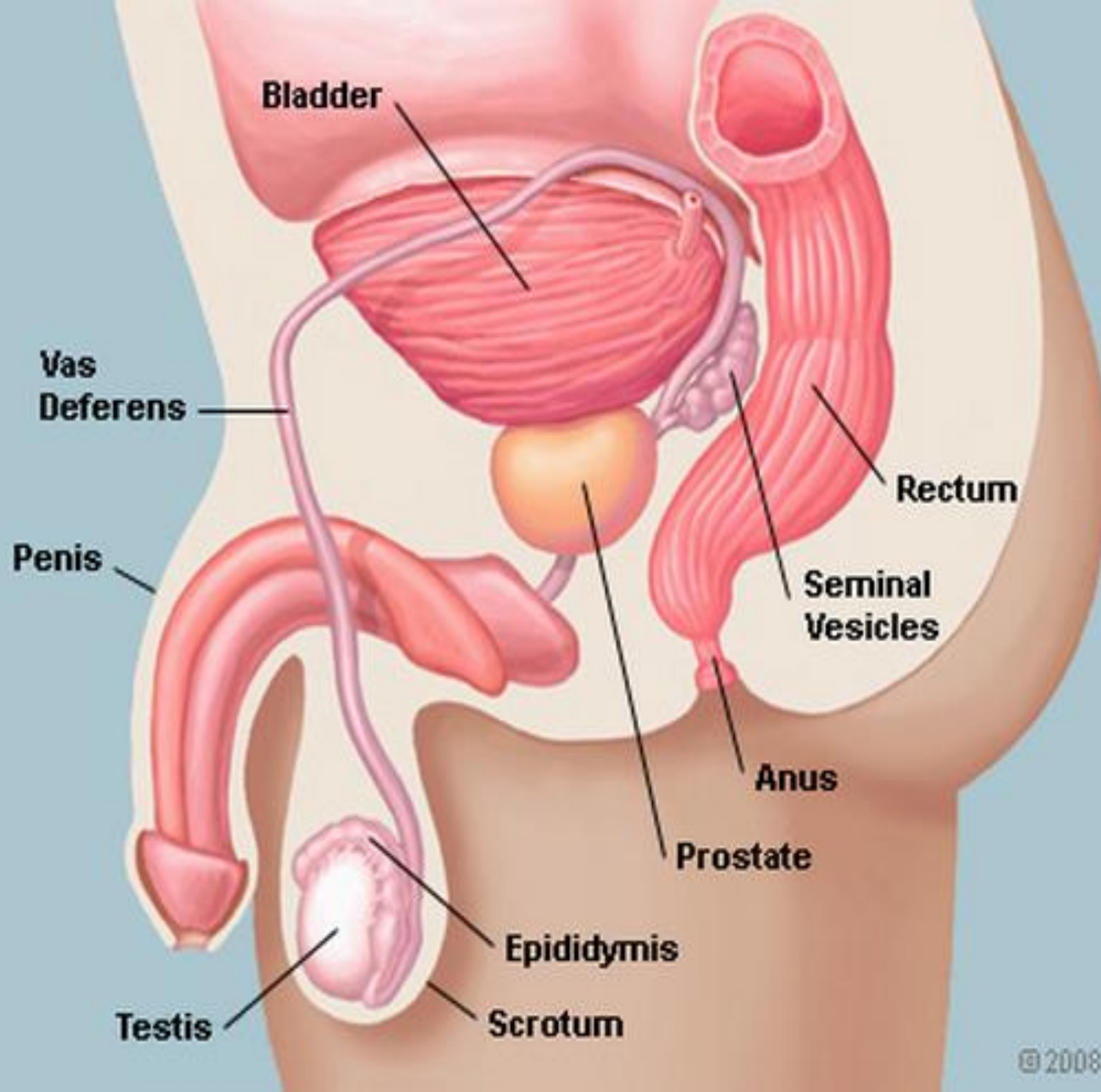
- In the apices of the lobules, the tubules become less convoluted, assume a nearly straight course, and unite together to form from twenty to thirty larger ducts, of about 0.5 mm. in diameter, and these, from their straight course, are called *tubuli recti*.
- The ***tubuli recti*** enter the fibrous tissue of the mediastinum, and pass upward and backward, forming, in their ascent, a close net-work of anastomosing tubes which are merely channels in the fibrous stroma, lined by flattened epithelium, and having no proper walls; this constitutes the ***rete testis***.
- At the upper end of the mediastinum, the vessels of the *rete testis* terminate in from twelve to fifteen or twenty ducts, the ***ductuli efferentes***; they perforate the *tunica albuginea*, and carry the seminal fluid from the testis to the epididymis.

- Their course is at first straight; they then become enlarged, and exceedingly convoluted, and form a series of conical masses, the ***coni vasculosi***, which together constitute the head of the epididymis.
- Each cone consists of a single convoluted duct, the diameter of which gradually decreases from the testis to the epididymis.
- Opposite the bases of the cones the efferent vessels open at narrow intervals into a single duct, which constitutes, by its complex convolutions, the body and tail of the epididymis.
- The convolutions are held together by fine areolar tissue, and by bands of fibrous tissue.



- **Peculiarities**
- The testis, developed in the lumbar region, may be arrested or delayed in its transit to the scrotum (*cryptorchism*).
- It may be retained in the abdomen; or it may be arrested at the abdominal inguinal ring, or in the inguinal canal; or it may just pass out of the subcutaneous inguinal ring without finding its way to the bottom of the scrotum.
- When retained in the abdomen it gives rise to no symptoms, other than the absence of the testis from the scrotum; but when it is retained in the inguinal canal it is subjected to pressure and may become inflamed and painful.
- The retained testis is probably functionally useless; so that a man in whom both testes are retained (*anorchism*) is sterile, though he may not be impotent. The absence of one testis is termed *monorchism*.





# The Scrotum

- is a cutaneous pouch which contains the testes and parts of the spermatic cords.
- It is divided on its surface into two lateral portions by a ridge or **raphé**, which is continued forward to the under surface of the penis, and backward, along the middle line of the perineum to the anus.
- The scrotum consists of two layers, the **integument** and the **dartos tunic**.
- The **Integument** is very thin, of a brownish color, and generally thrown into folds or rugæ.
- The **Dartos Tunic** (*tunica dartos*) is a thin layer of non-striped muscular fibers, continuous, around the base of the scrotum, with the two layers of the superficial fascia of the groin and the perineum; it sends inward a septum, which divides the scrotal pouch into two cavities for the testes.

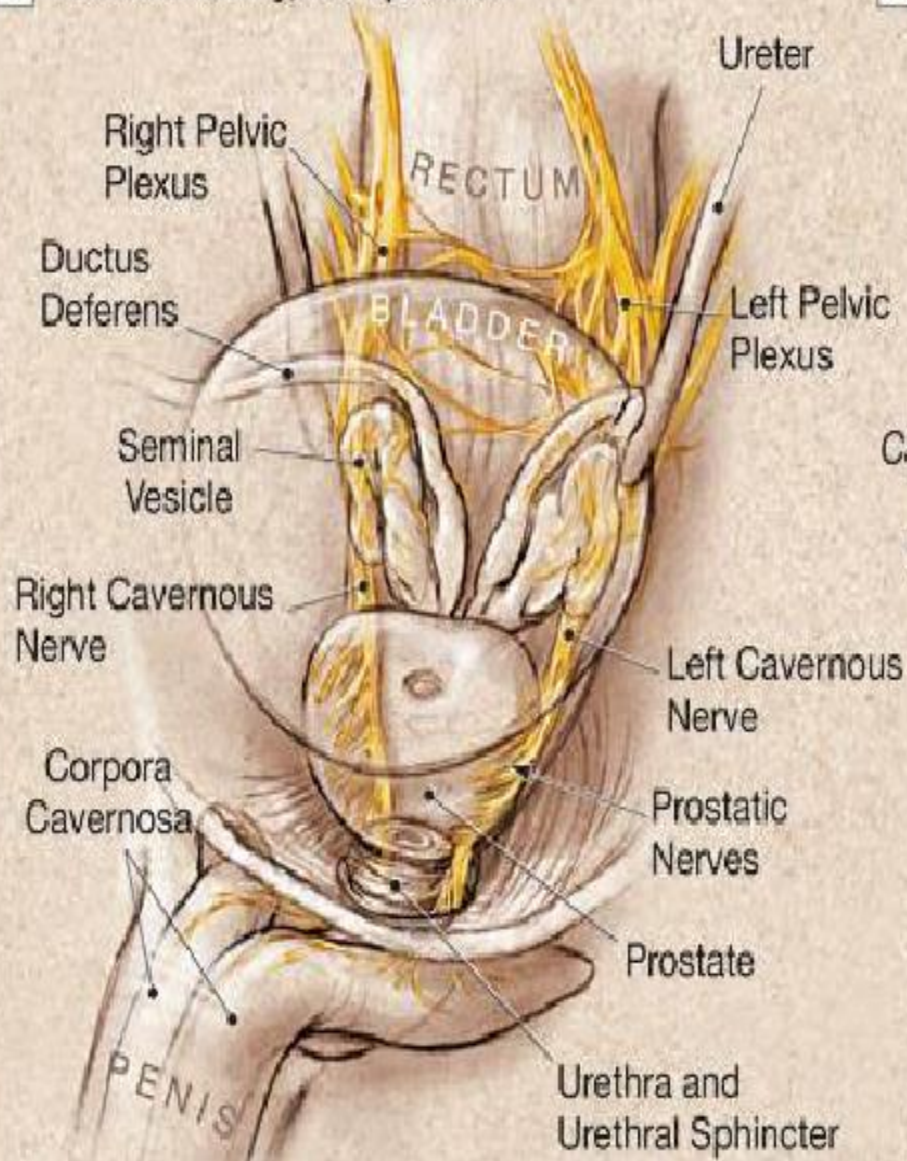
The **epididymis** consists of a central portion or **body**; an upper enlarged extremity, the **head** (*globus major*); and a lower pointed extremity,

the **tail** (*globus minor*), which is continuous with the ***ductus deferens (vas deferens)***, the **duct of the testis**.

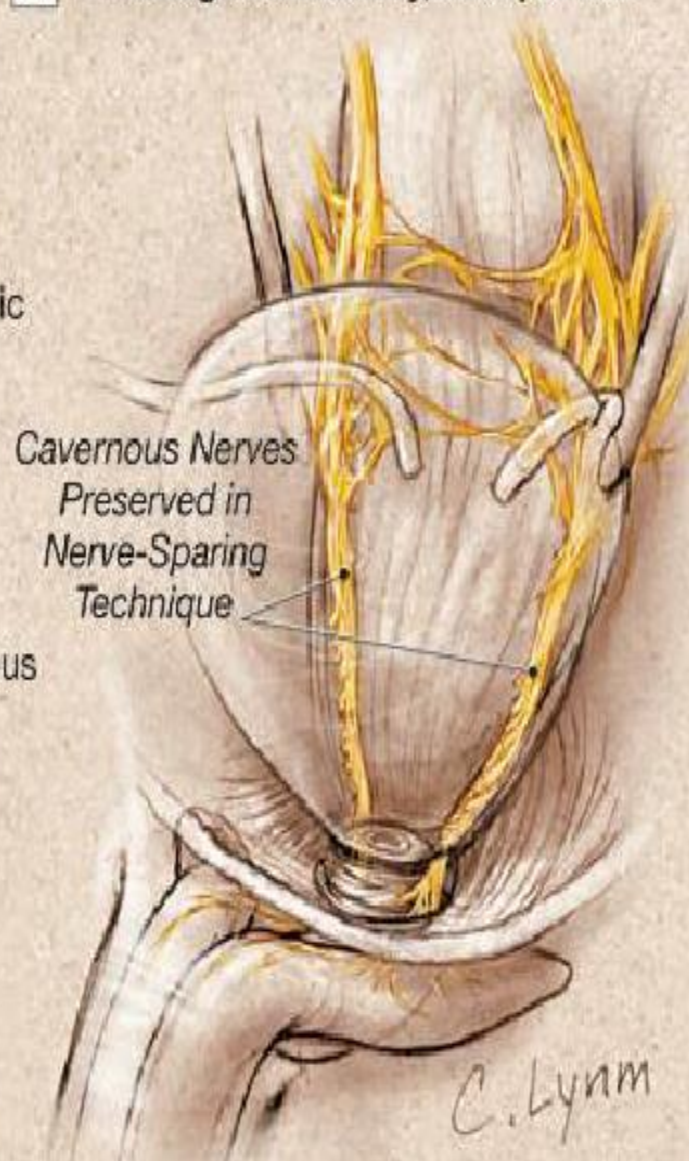
The head is intimately connected with the upper end of the testis by means of the efferent *ductules* of the gland;

the tail is connected with the lower end by cellular tissue, and a reflection of the *tunica vaginalis*.

**B** Basic Anatomy, Oblique View

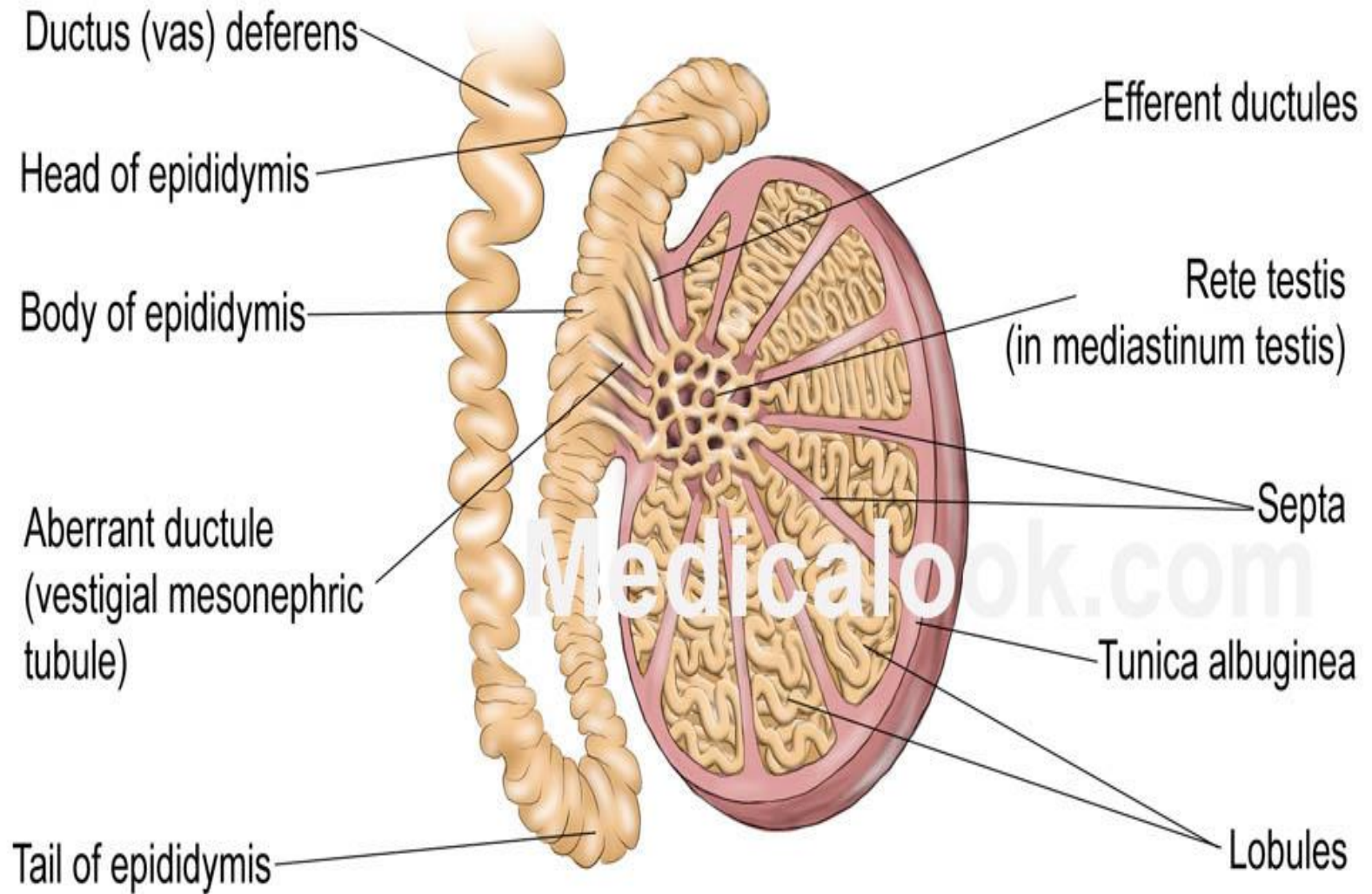


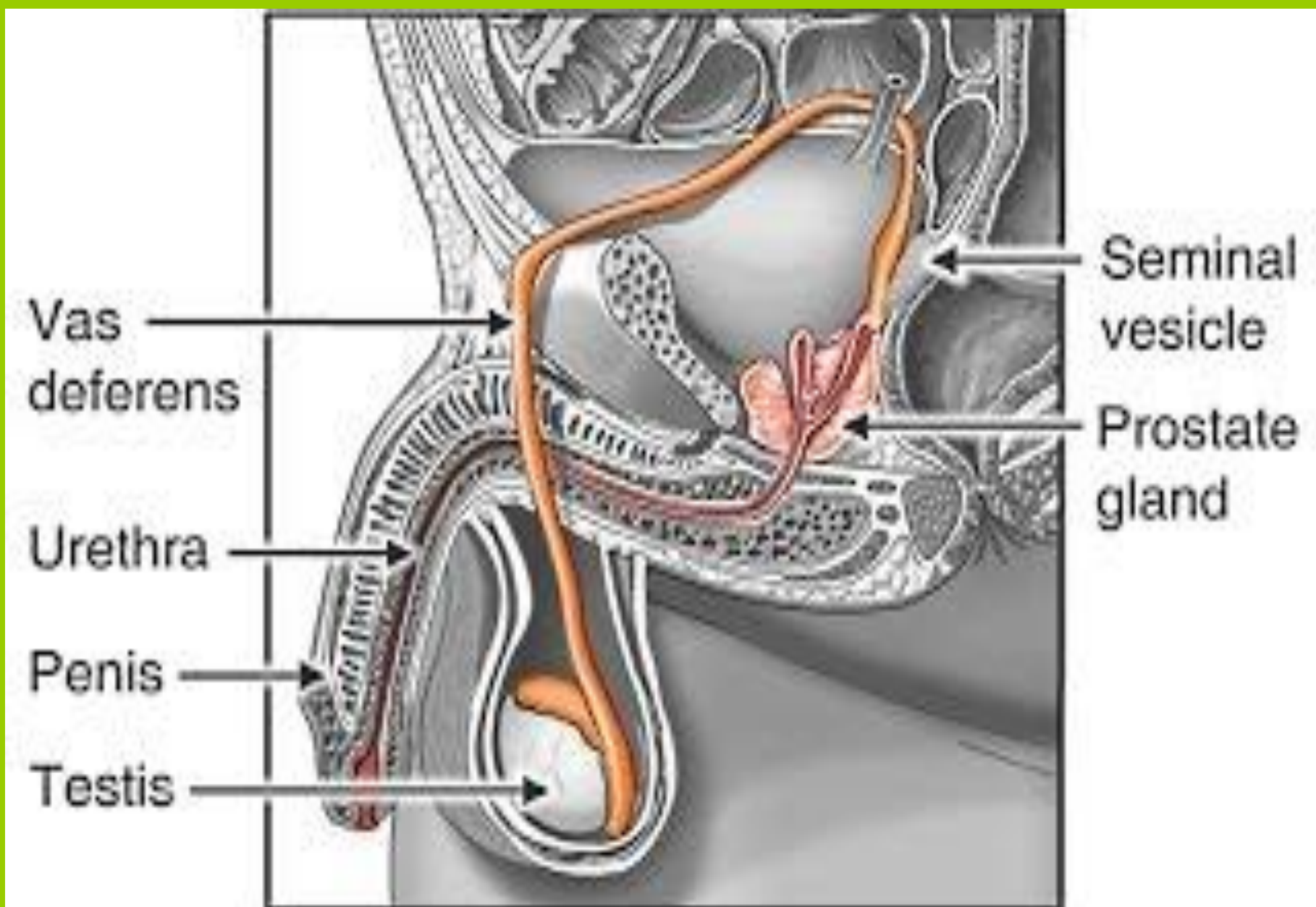
**C** Postsurgical Anatomy, Oblique View





- The testis is invested by three tunics:  
the ***tunica vaginalis***,
- ***tunica albuginea***,
- and ***tunica vasculosa***.





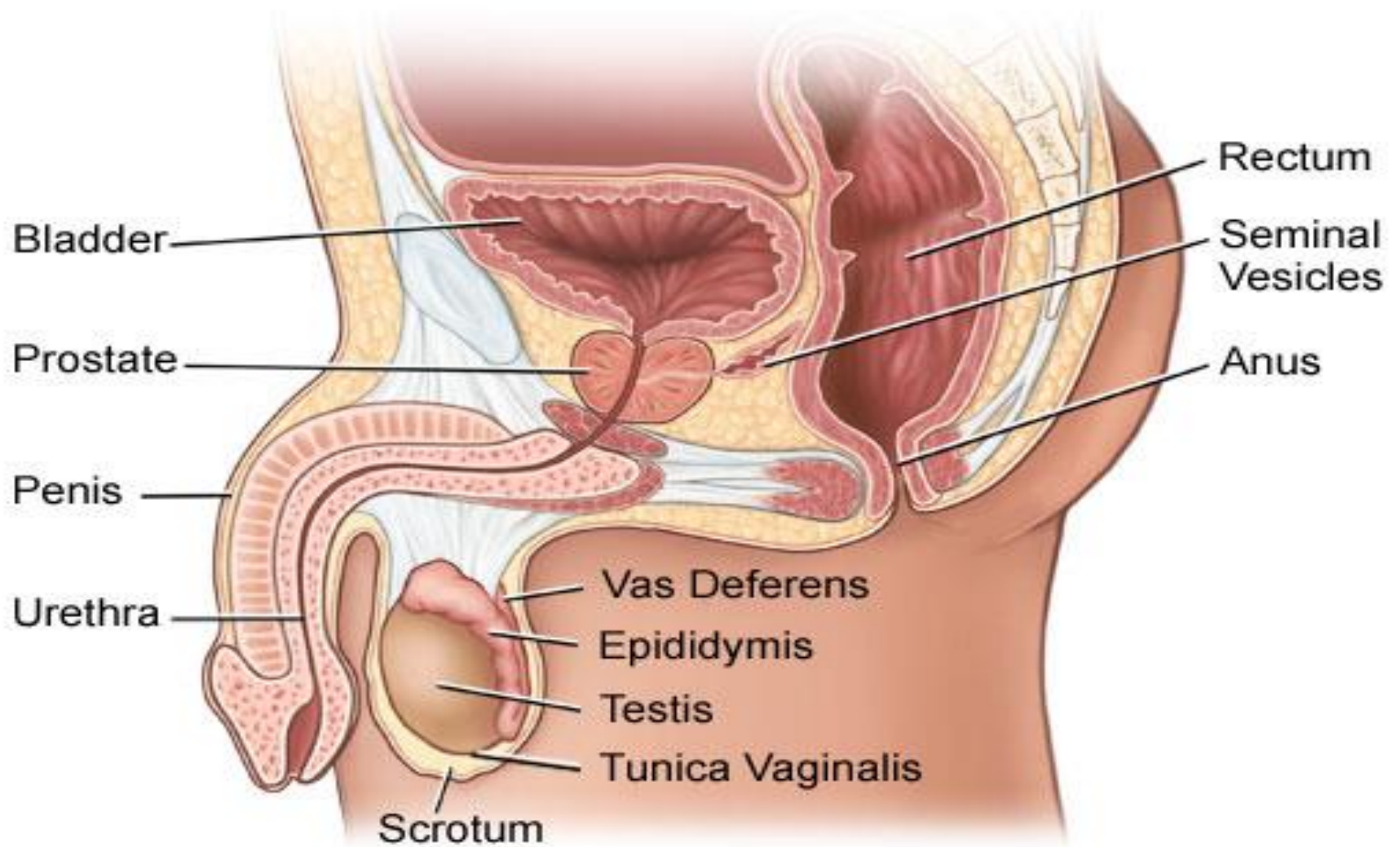
# The *Ductus Deferens* (*Vas Deferens*; *Seminal Duct*)

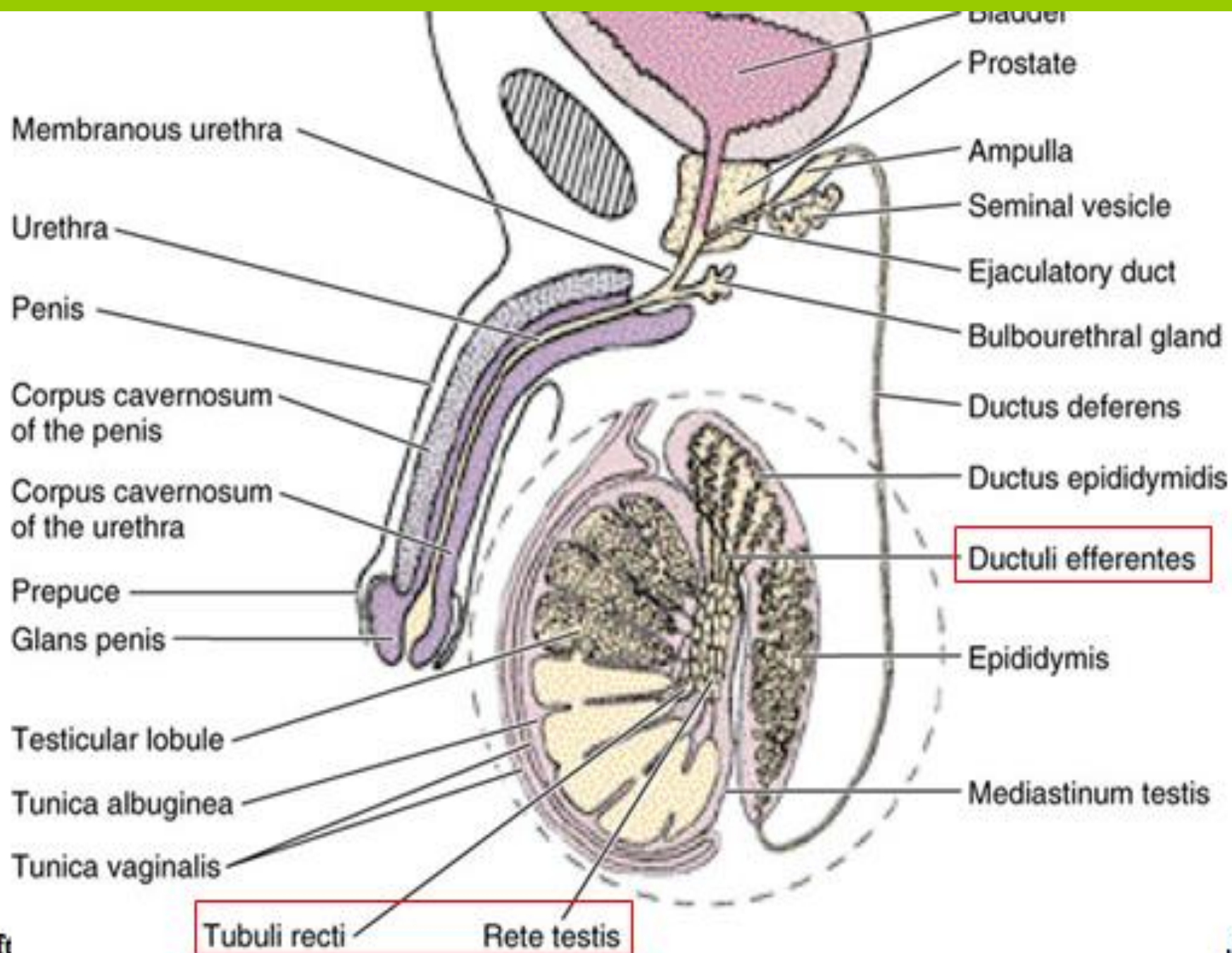
- The ***ductus deferens***, the excretory duct of the testis, is the continuation of the canal of the *epididymis*.
- Commencing at the lower part of the tail of the epididymis it is at first very tortuous, but gradually becoming less twisted it ascends along the posterior border of the testis and medial side of the *epididymis*, and, as a constituent of the spermatic cord, traverses the inguinal canal to the abdominal inguinal ring.
- It is next directed backward and slightly downward, and, crossing the external iliac vessels obliquely, enters the pelvic cavity, where it lies between the peritoneal membrane and the lateral wall of the pelvis, and descends on the medial side of the obliterated umbilical artery and the obturator nerve and vessels.



- It then crosses in front of the ureter, and, reaching the medial side of this tube, bends to form an acute angle, and runs medialward and slightly forward between the fundus of the urinary bladder and the upper end of the seminal vesicle.
- Reaching the medial side of the seminal vesicle, it is directed downward and medialward in contact with it, gradually approaching the opposite *ductus*.
- Here it lies between the fundus of the bladder and the rectum, where it is enclosed, together with the seminal vesicle, in a sheath derived from the rectovesical portion of the endopelvic fascia.
- Lastly, it is directed downward to the base of the prostate, where it becomes greatly narrowed, and is joined at an acute angle by the duct of the seminal vesicle to form the ejaculatory duct, which traverses the prostate behind its middle lobe and opens into the prostatic portion of the urethra, close to the orifice of the prostatic utricle.

## Male Reproductive Tract





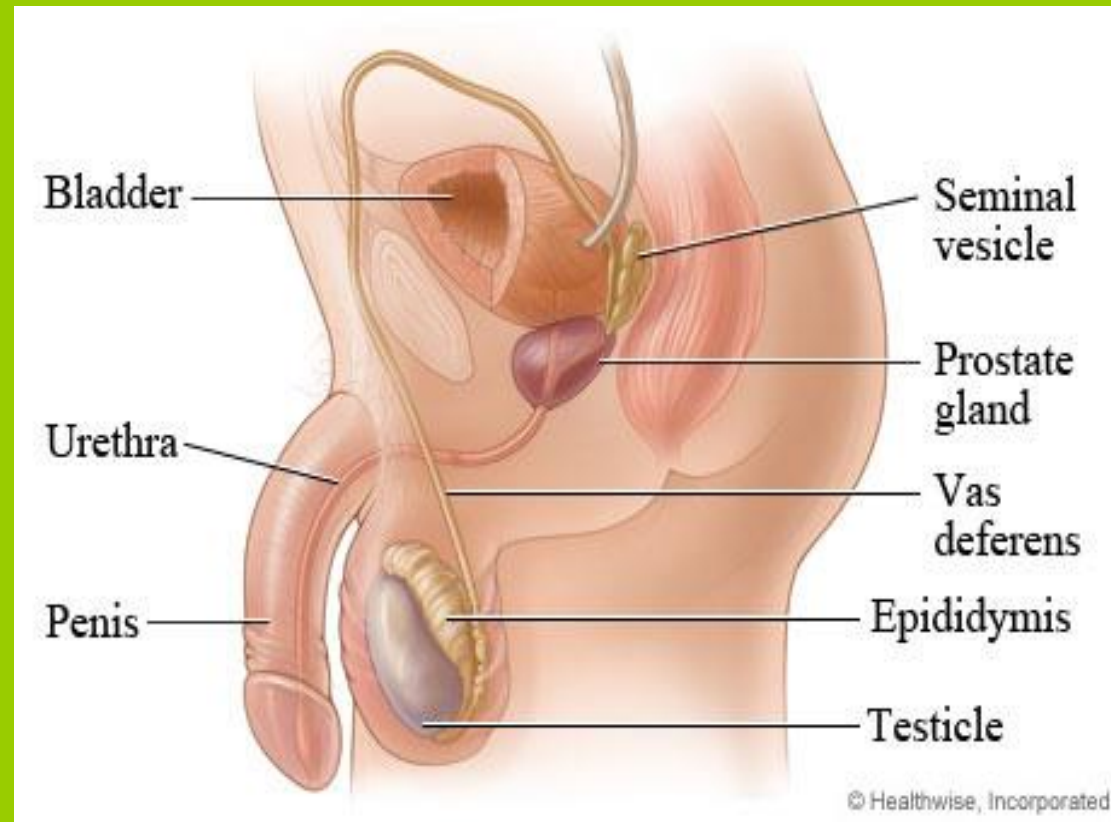
- **Structure**
- The *ductus deferens* consists of three coats:
- (1) an **external** or **areolar coat**;
- (2) a **muscular coat** which in the greater part of the tube consists of two layers of unstriped muscular fiber: an outer, longitudinal in direction, and an inner, circular; but in addition to these, at the commencement of the ductus, there is a third layer, consisting of longitudinal fibers, placed internal to the circular stratum, between it and the mucous membrane;
- (3) an **internal** or **mucous coat**, which is pale, and arranged in longitudinal folds.

- The *ductus deferens* presents a hard and cord-like sensation to the fingers, and is of cylindrical form; its walls are dense, and its canal is extremely small.
- At the fundus of the bladder it becomes enlarged and tortuous, and this portion is termed the ***ampulla***.
- A small triangular area of the fundus of the bladder, between the ductus deferentes laterally and the bottom of the rectovesical excavation of peritoneum above, is in contact with the rectum.



# *The Vesiculæ Seminales* (Seminal Vesicles)

- The *vesiculæ seminales* are two lobulated membranous pouches, placed between the fundus of the urinary bladder and the rectum, serving as reservoirs for the semen, and secreting a fluid to be added to the secretion of the testes.



- Each sac is somewhat pyramidal in form, the broad end being directed backward, upward and lateralward.
- The **anterior surface** is in contact with the fundus of the bladder, extending from near the termination of the ureter to the base of the prostate.
- The **posterior surface** rests upon the rectum, from which it is separated by the rectovesical fascia.
- The **upper extremities** of the two vesicles diverge from each other, and are in relation with the *ductus deferentes* and the terminations of the ureters, and are partly covered by peritoneum.
- The **lower extremities** are pointed, and converge toward the base of the prostate, where each joins with the corresponding *ductus deferens* to form the ejaculatory duct.
- Along the medial margin of each vesicle runs the ampulla of the *ductus deferens*.

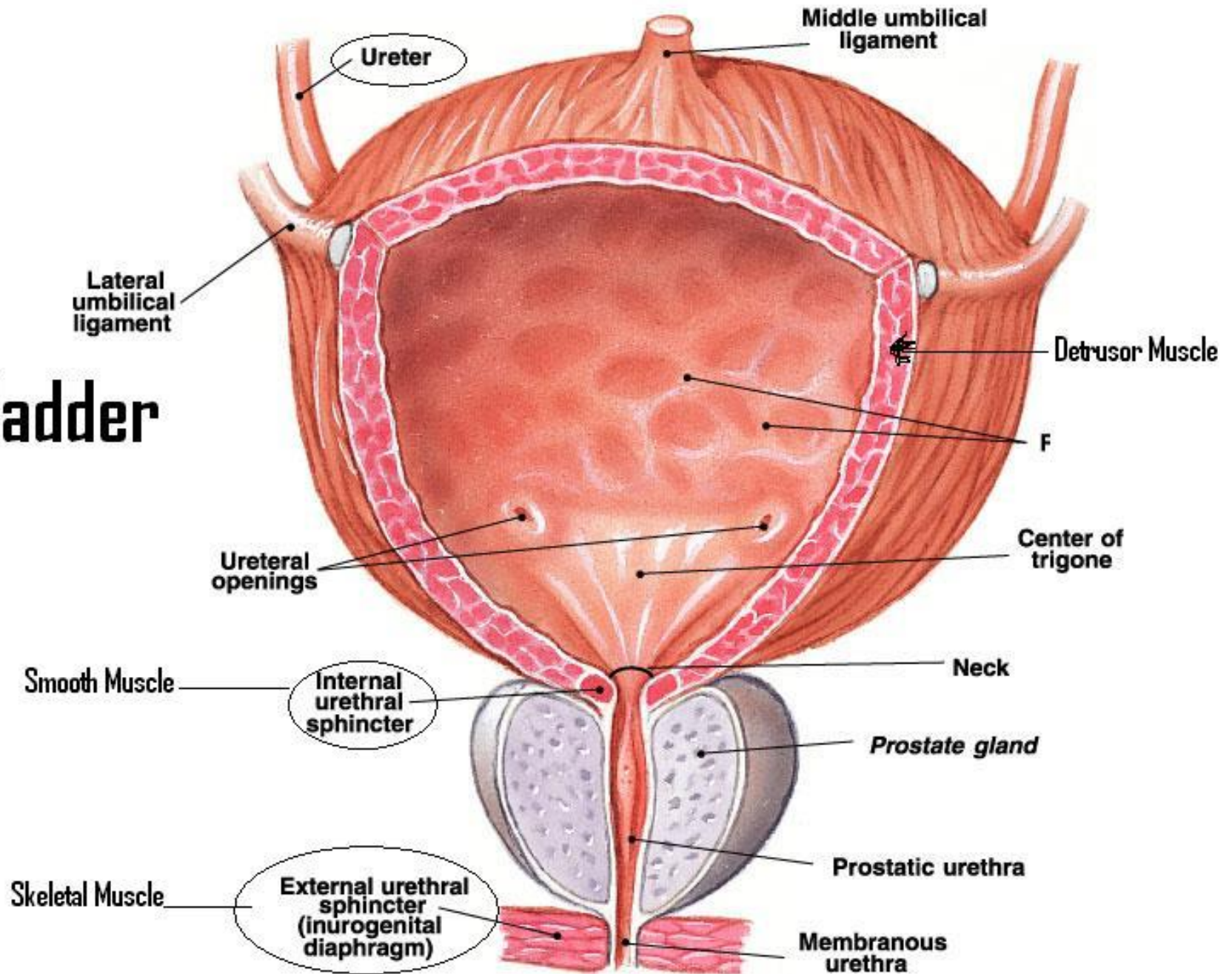
- Each vesicle consists of a single tube, coiled upon itself, and giving off several irregular caecal diverticula; the separate coils, as well as the diverticula, are connected together by fibrous tissue.
- it ends posteriorly in a cul-de-sac;
- its anterior extremity becomes constricted into a narrow straight duct, which joins with the corresponding *ductus deferens* to form the ejaculatory duct.

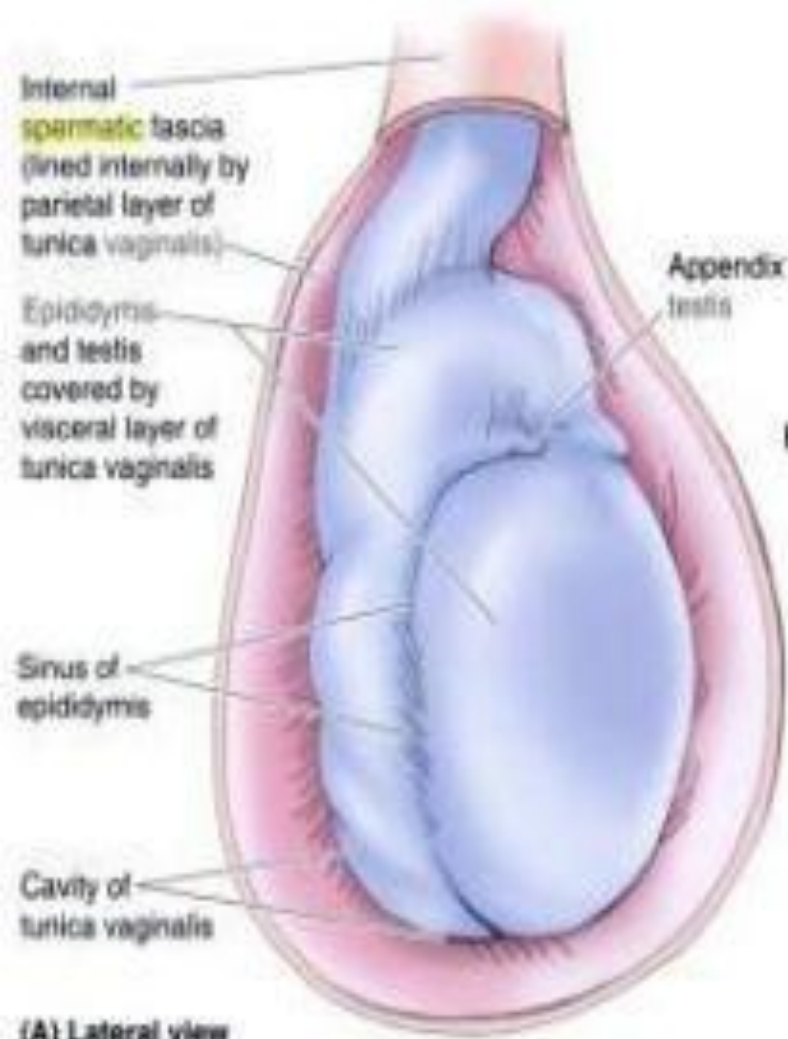


- **Structure**
- The vesiculæ seminales are composed of three coats:
  - an **external** or **areolar coat**;
  - a **middle** or **muscular coat** thinner than in the ductus deferens and arranged in two layers, an outer longitudinal and inner circular;
  - an **internal** or **mucous coat**, which is pale, of a whitish brown color, and presents a delicate reticular structure.
- The epithelium is columnar, and in the diverticula goblet cells are present, the secretion of which increases the bulk of the seminal fluid.

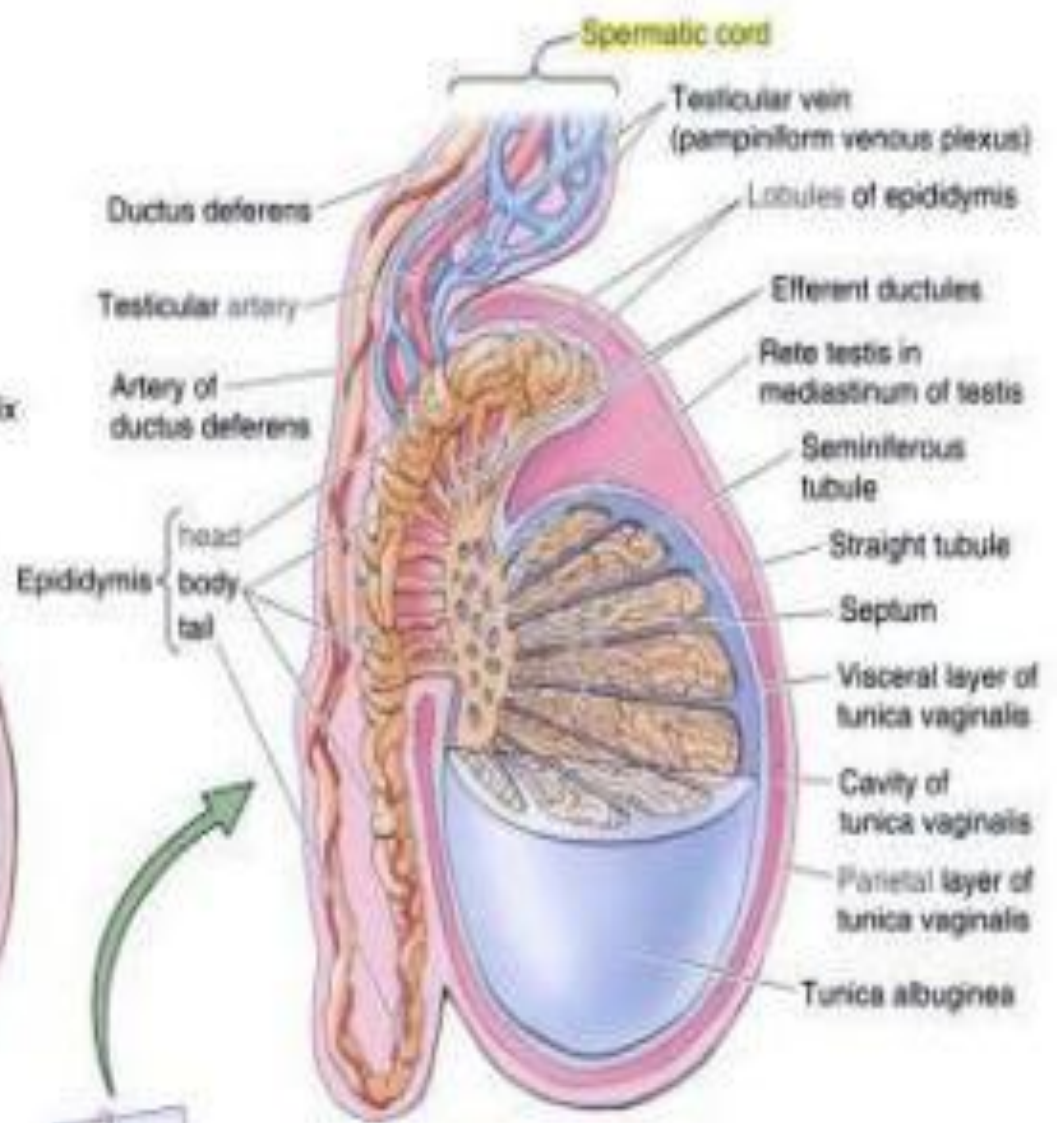
- **Vessels and Nerves**
- The **arteries** supplying the *vesiculæ seminales* are derived from **the middle and inferior vesical and middle hemorrhoidal**. The **veins** and **lymphatics** accompany the arteries.
- The **nerves** are derived from the pelvic plexuses.

# Bladder





(A) Lateral view

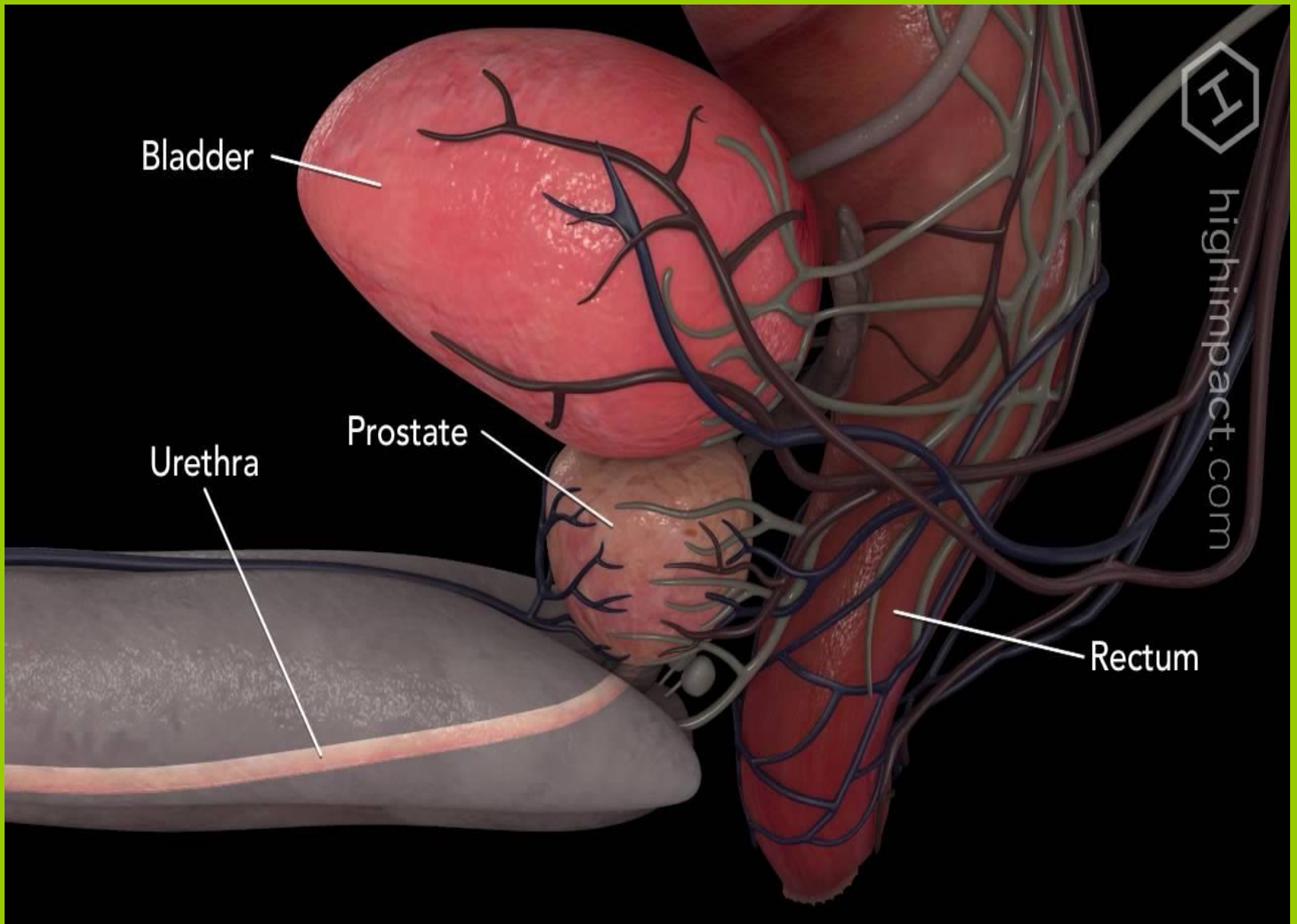


(B) Lateral view

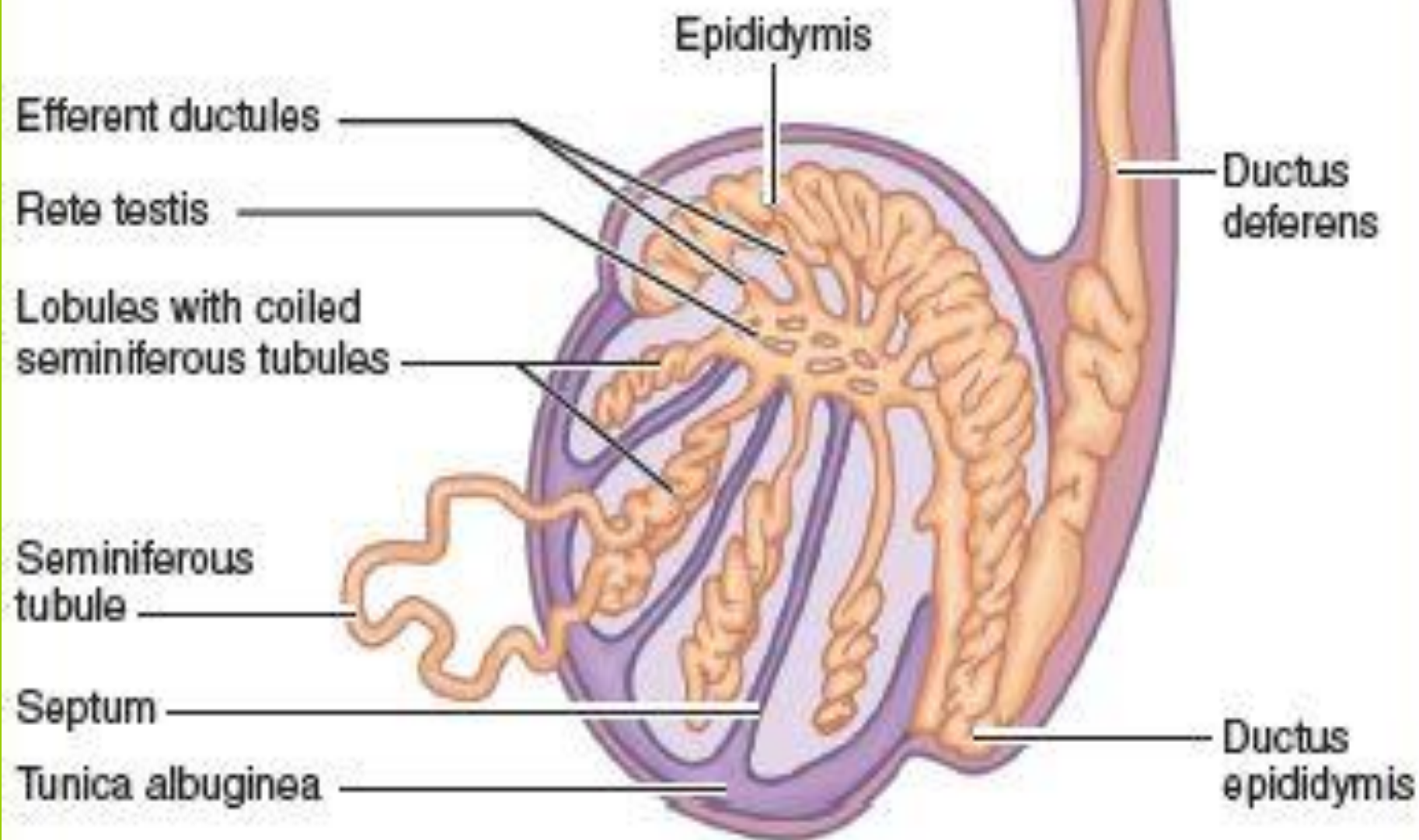
# The Ejaculatory Ducts (*Ductus Ejaculatorii*)

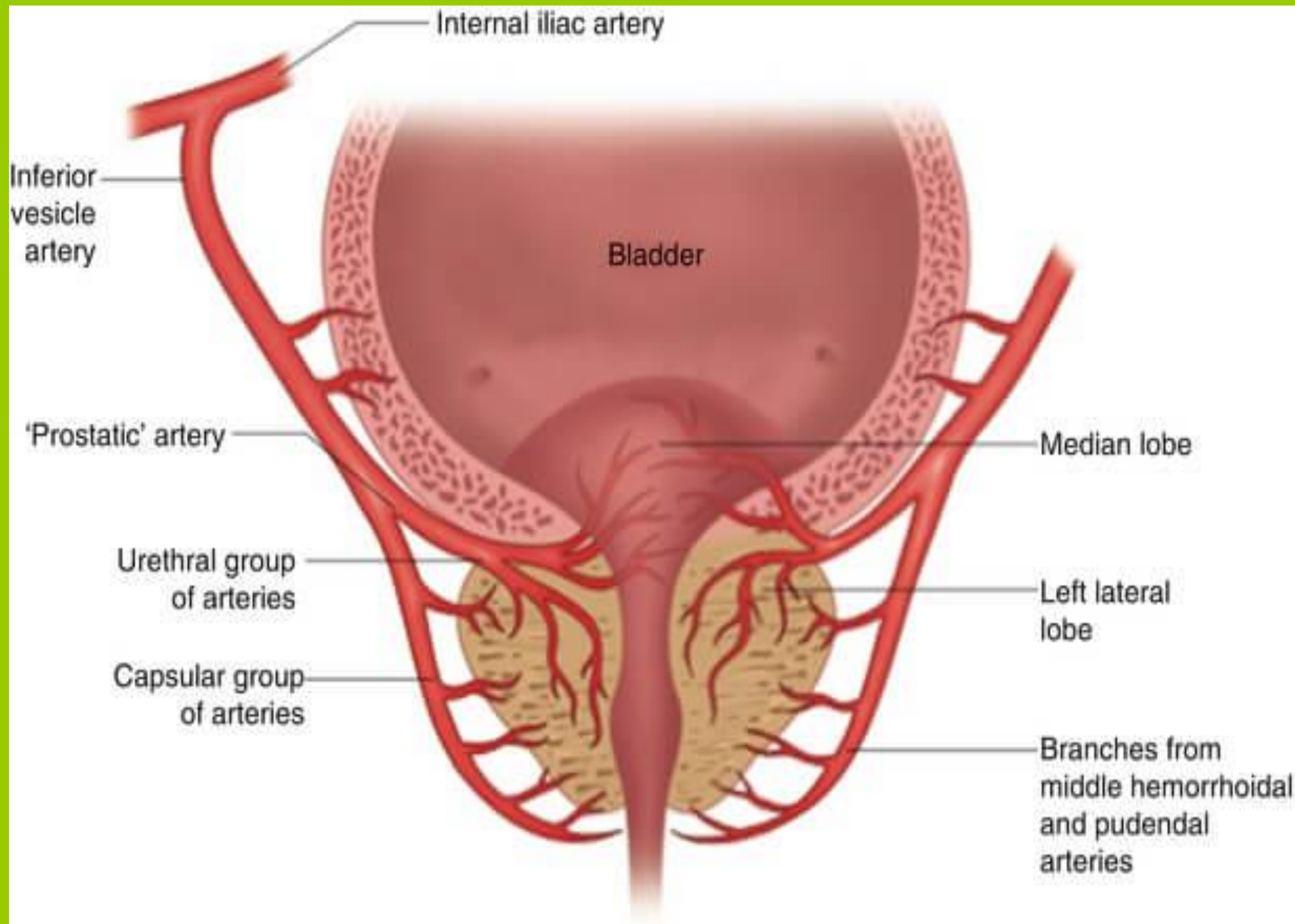
- The **ejaculatory ducts** are two in number, one on either side of the middle line.
- Each is formed by the union of the duct from the *vesicula seminalis* with the *ductus deferens*, and is about 2 cm. long.
- They commence at the base of the prostate, and run forward and downward between its middle and lateral lobes, and along the sides of the prostatic utricle, to end by separate slit-like orifices close to or just within the margins of the utricle.
- **Structure**
  - The coats of the ejaculatory ducts are extremely thin.
  - They are:
    - an **outer fibrous layer**,
    - a **layer of muscular fibers** consisting of a thin outer circular, and an inner longitudinal, layer;
    - and **mucous membrane**.







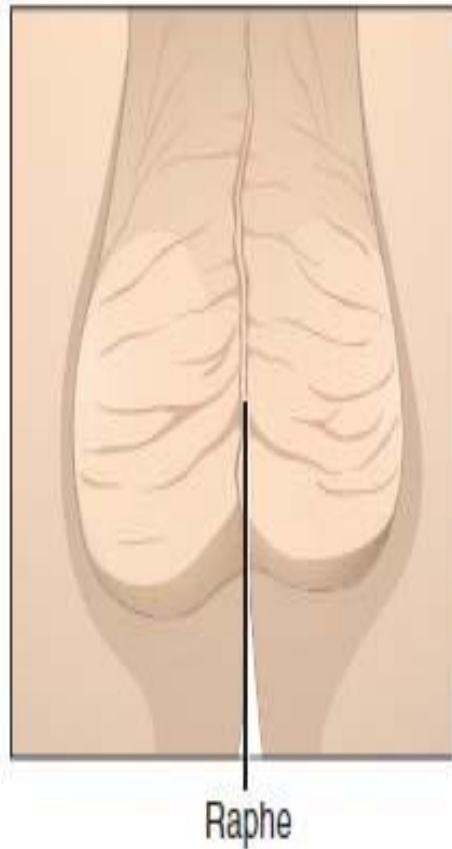




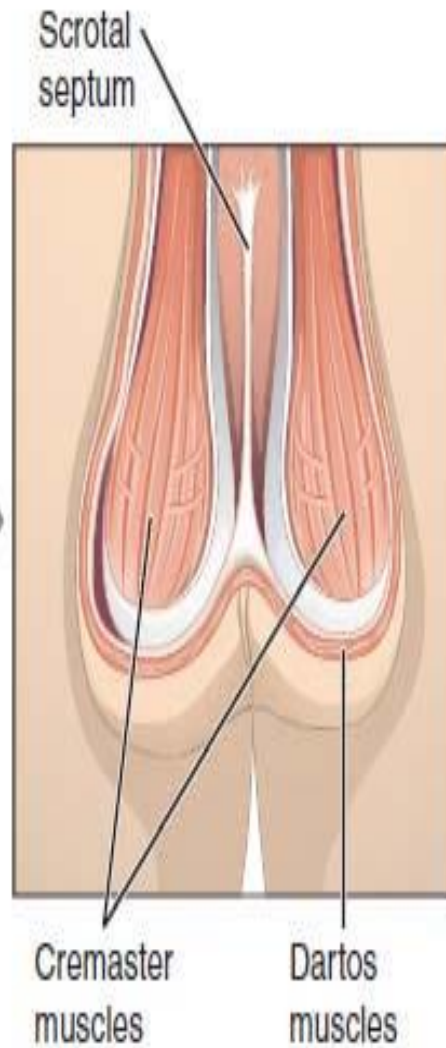
# The Prostate (*Prostata*; Prostate Gland)

- The **prostate** is a firm, partly glandular and partly muscular body, which is placed immediately below the internal urethral orifice and around the commencement of the urethra.
- It is situated in the pelvic cavity, below the lower part of the symphysis pubis, above the superior fascia of the urogenital diaphragm, and in front of the rectum, through which it may be distinctly felt, especially when enlarged.
- It is about the size of a chestnut and somewhat conical in shape, and presents for examination
  - a **base**,
  - an **apex**,
  - an **anterior**,
  - a **posterior**
  - and two **lateral surfaces**.

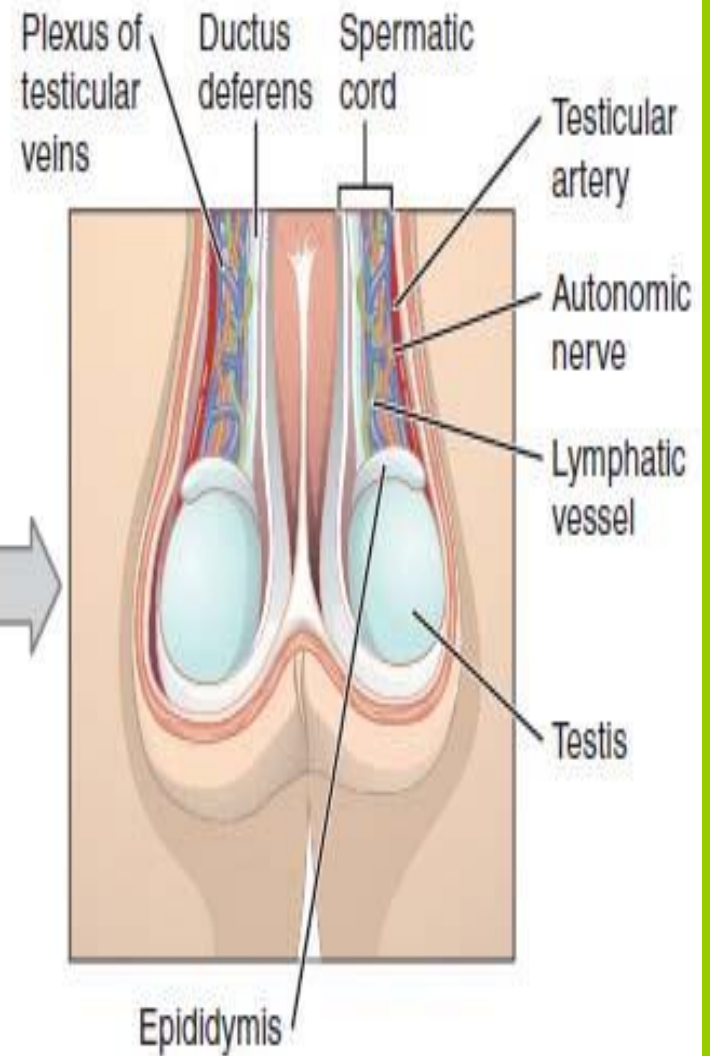
## External view of scrotum



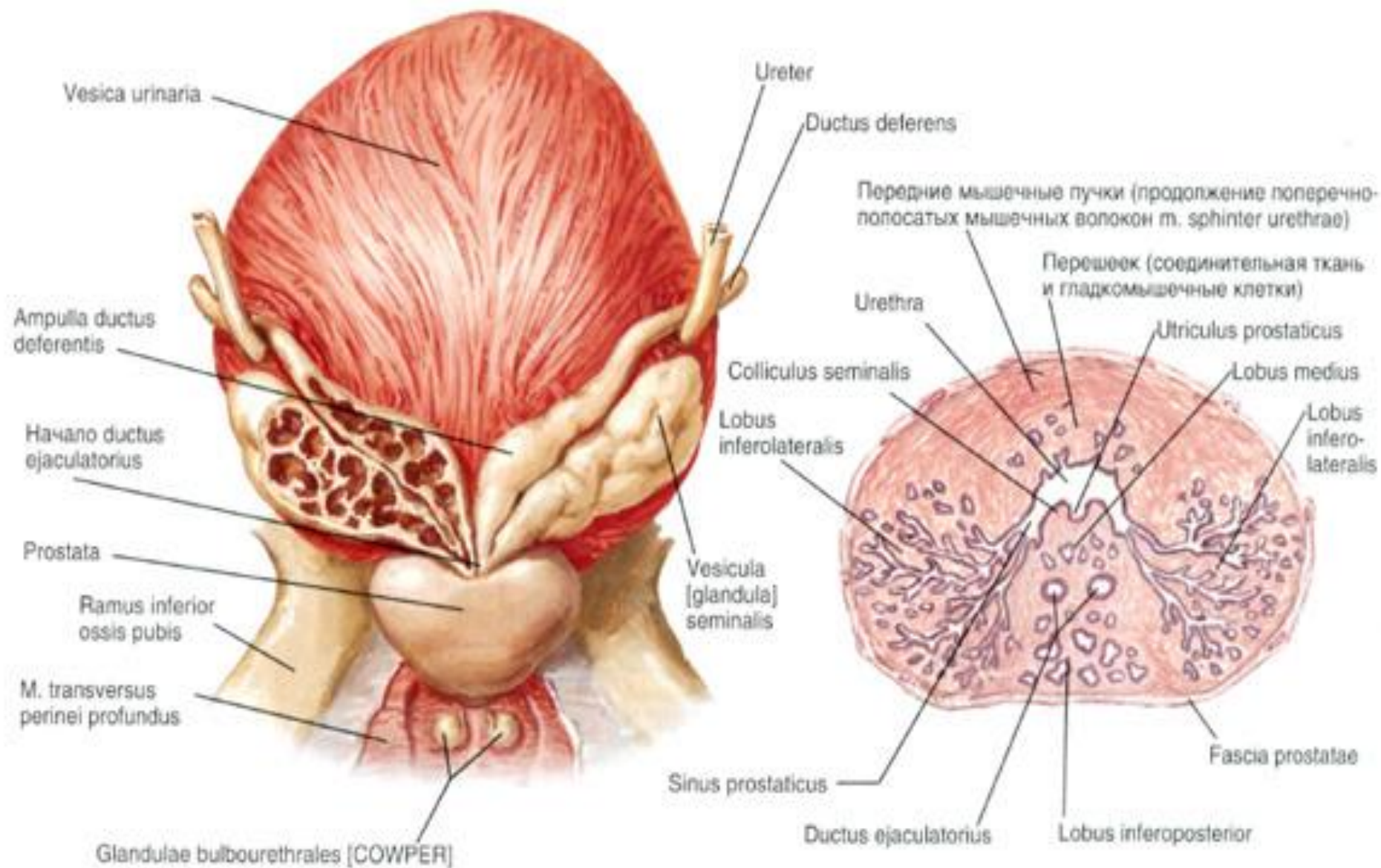
## Muscle layer



## Deep tissues



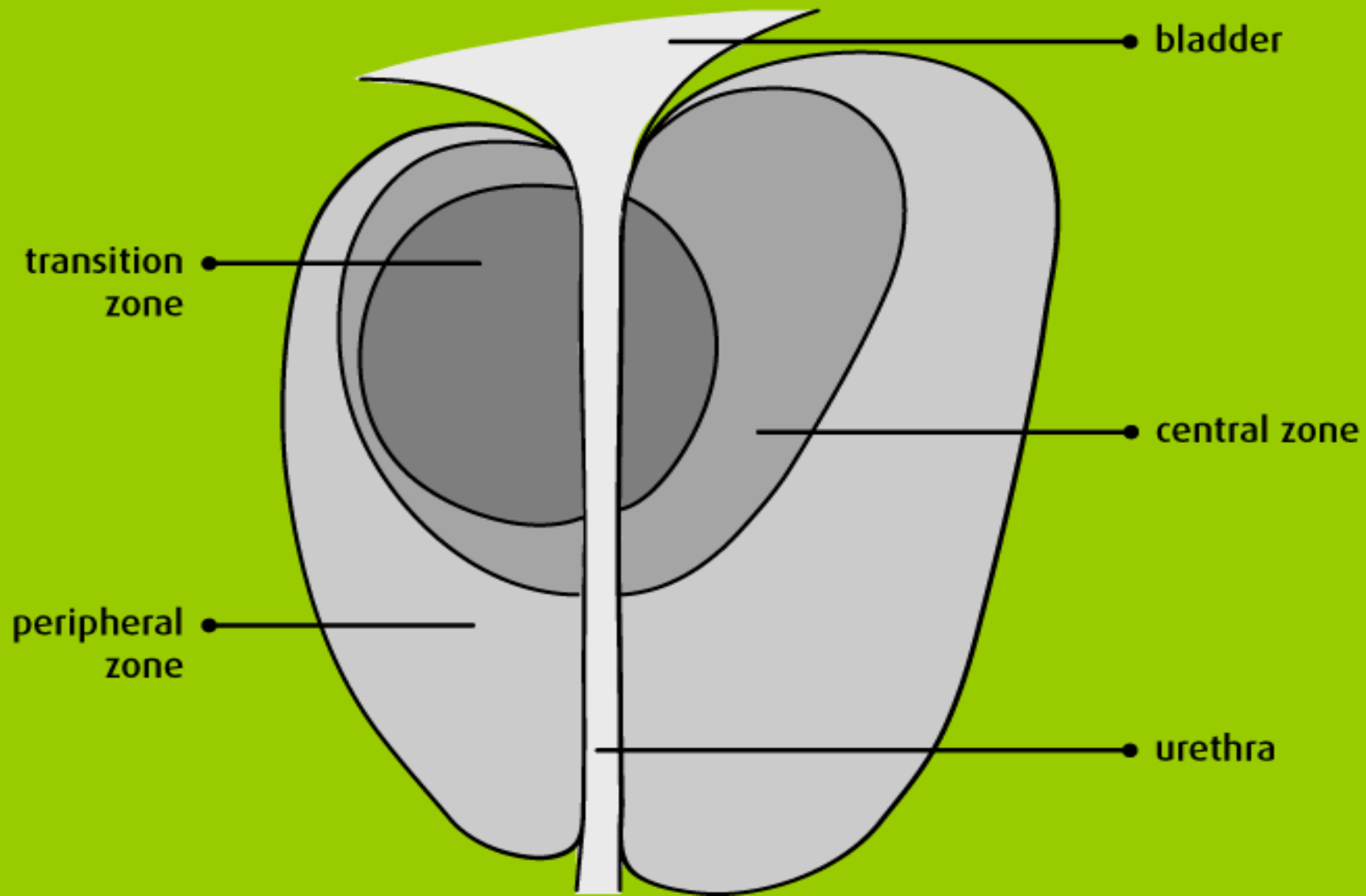




Вид сзади

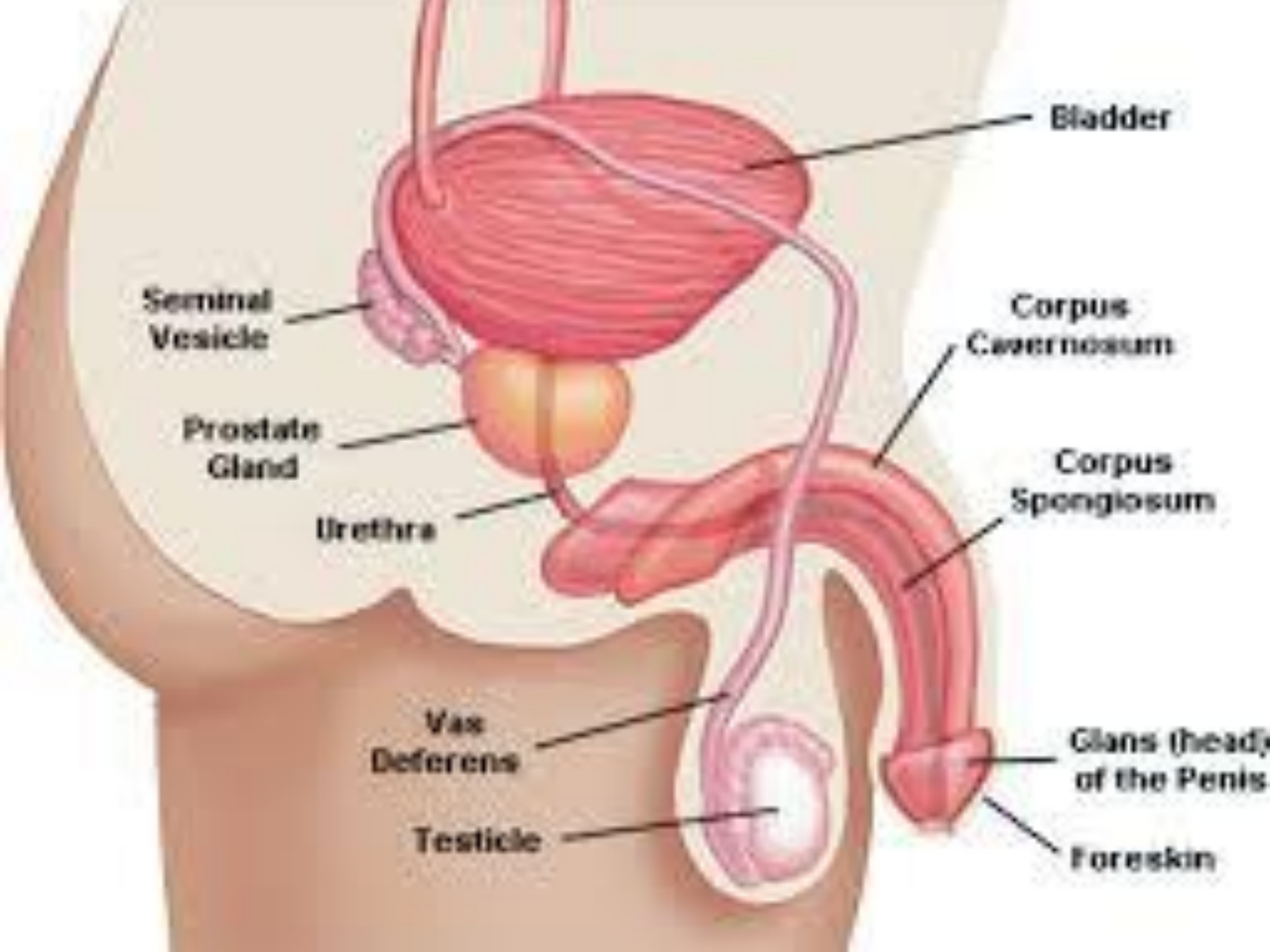
Поперечный срез предстательной железы

# Prostate Zones

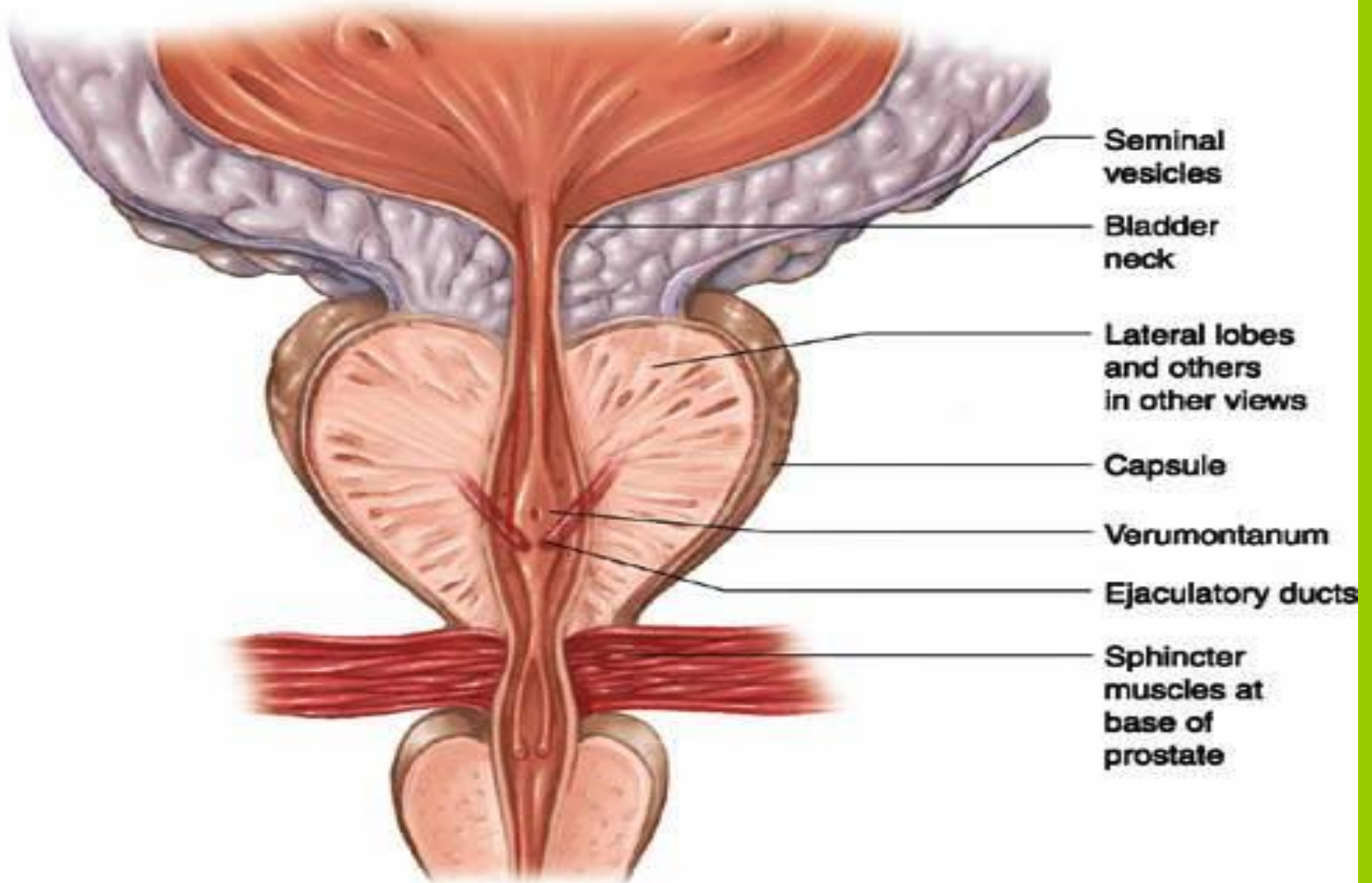


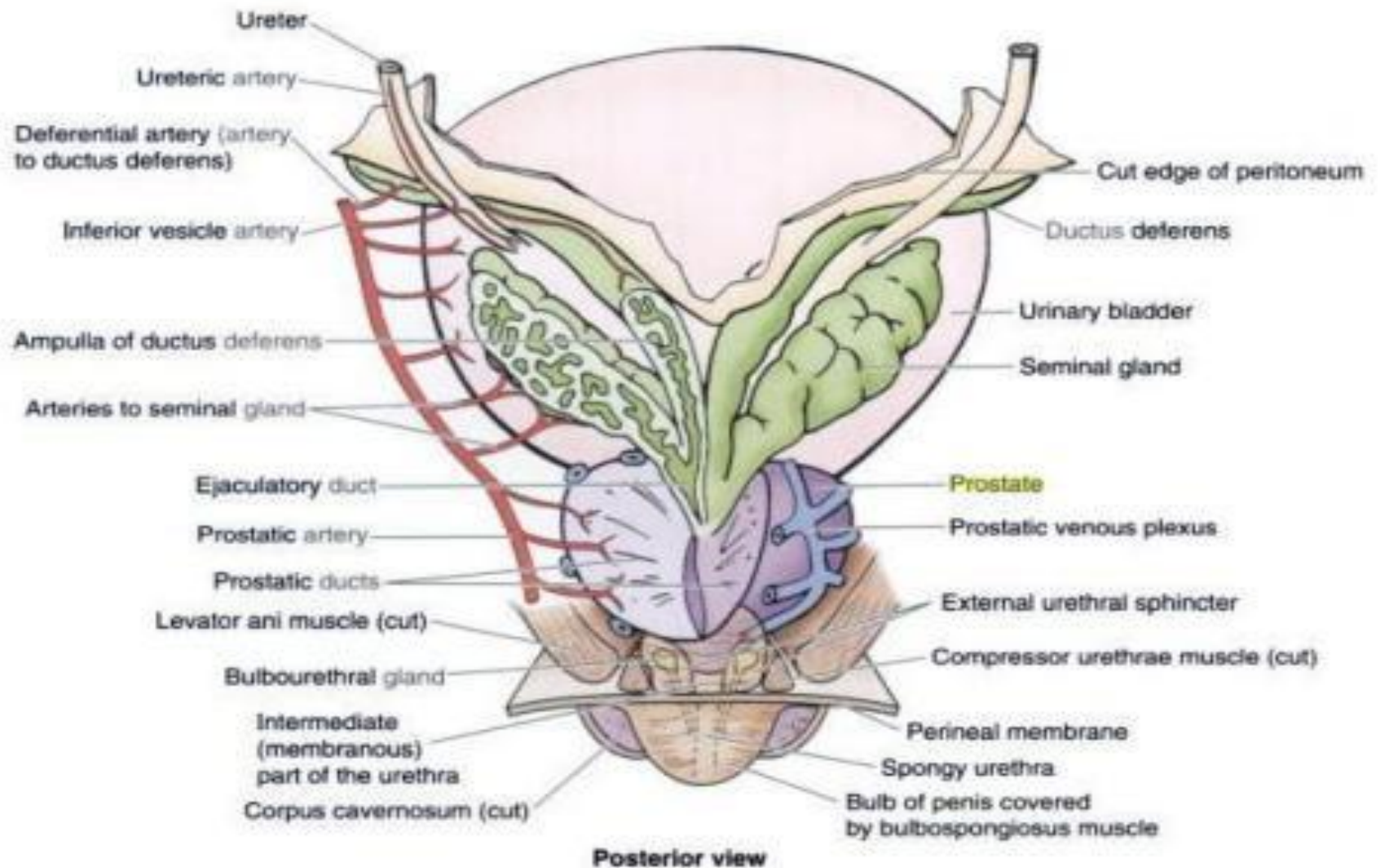


- The **base** (*basis prostatæ*) is directed upward, and is applied to the inferior surface of the urinary bladder.
- The greater part of this surface is directly continuous with the urinary bladder wall; the urethra penetrates it nearer its anterior than its posterior border.
- The **apex** (*apex prostatæ*) is directed downward, and is in contact with the superior fascia of the urogenital diaphragm.



## Front View



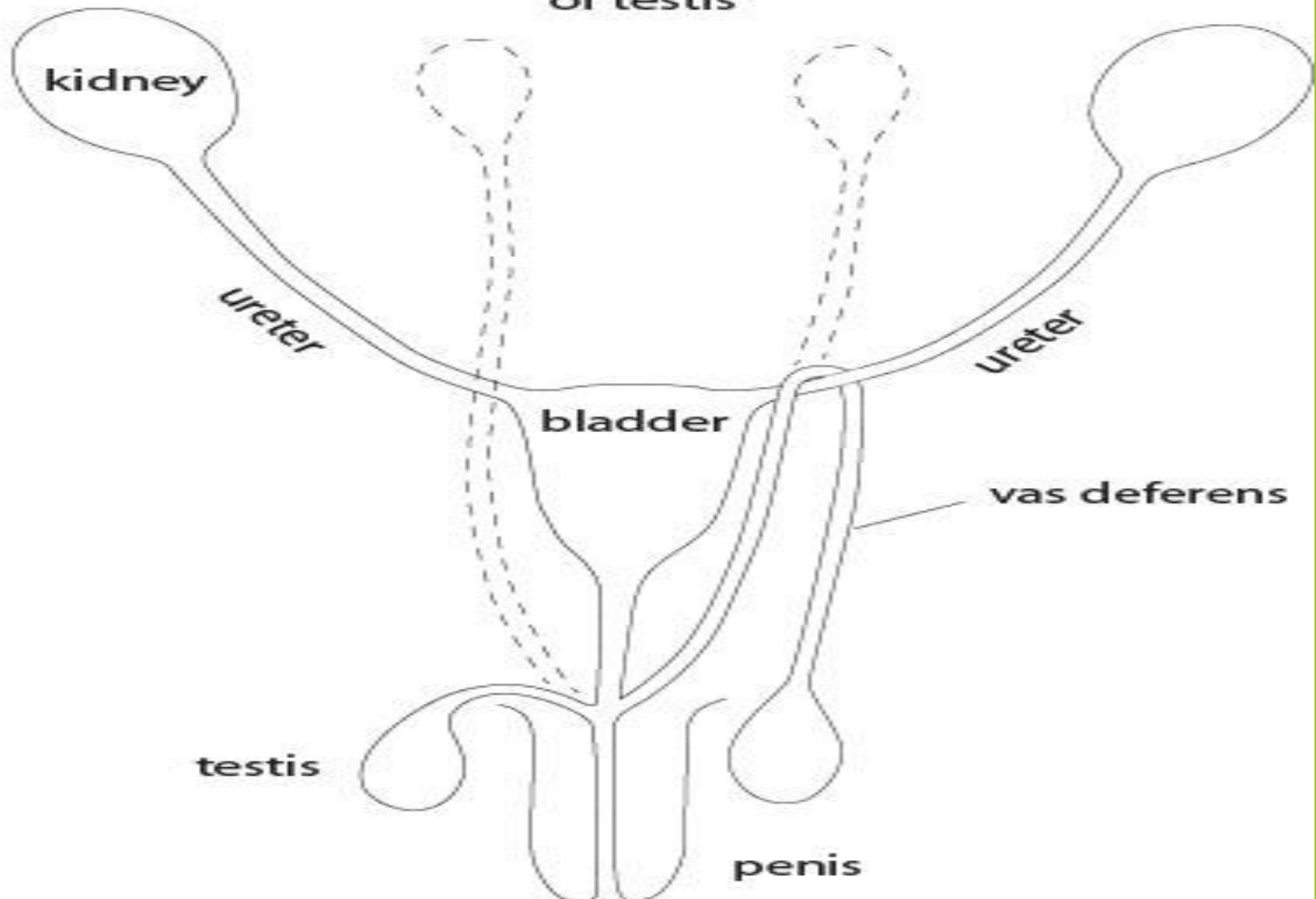


**Figure 3.22. Urinary bladder, seminal glands, terminal parts of ductus deferens, and prostate.** The left seminal gland and ampulla of the ductus deferens are dissected free and sliced open. Part of the prostate is also cut away to expose the ejaculatory duct. The perineal membrane lies between the external genitalia and the deep part of the perineum (anterior recess of ischioanal fossa). It is pierced by the urethra, ducts of the bulbourethral glands, dorsal and deep arteries of the penis, cavernous nerves, and the dorsal nerve of the penis.

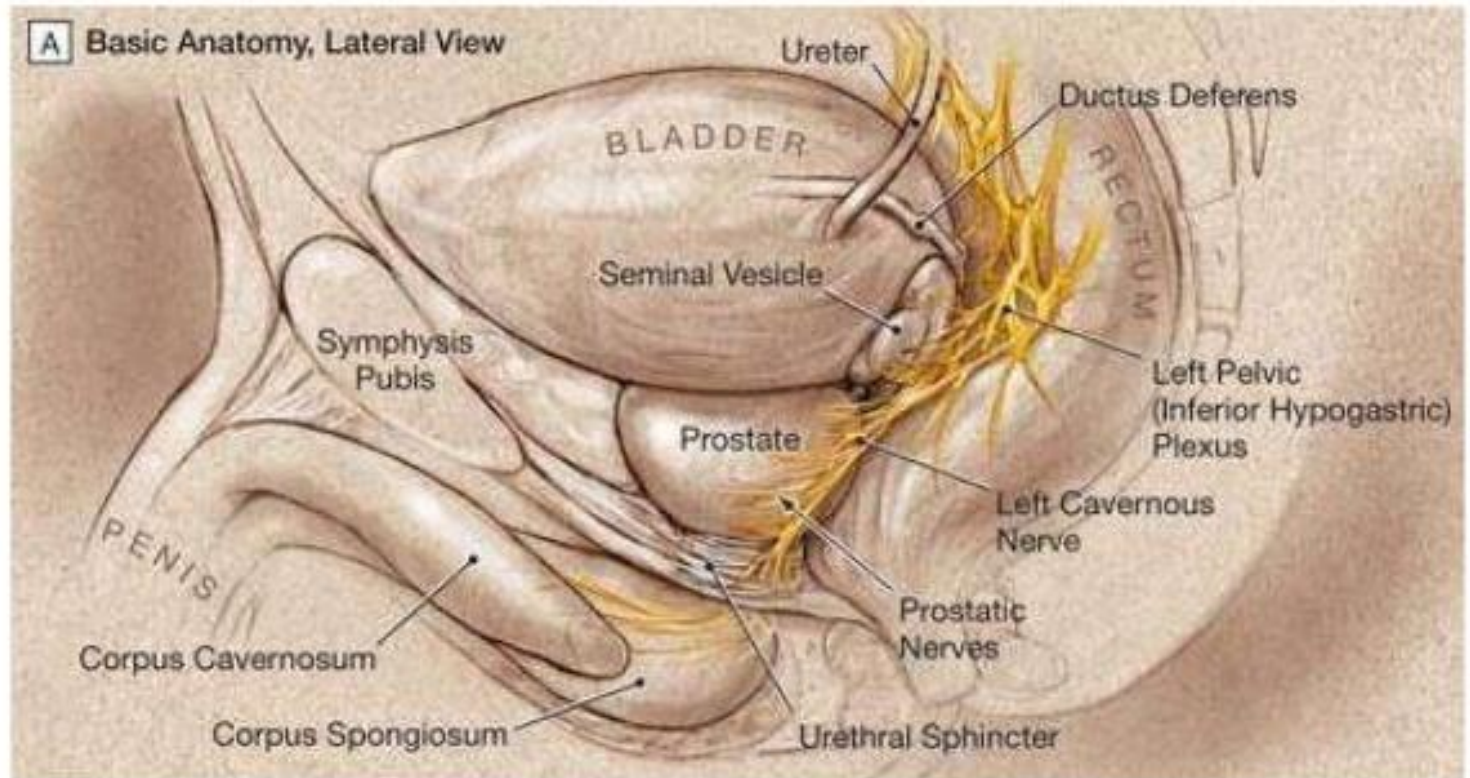


# Route of vas deferens from testis to penis

Original position  
of testis



# Prostate Anatomy...the nerves that can results in impotence are on the side of the gland





- **Surfaces**
- The **posterior surface** (*facies posterior*) is flattened from side to side and slightly convex from above downward; it is separated from the rectum by its sheath and some loose connective tissue, and is distant about 4 cm. from the anus.
- Near its upper border there is a depression through which the two ejaculatory ducts enter the prostate.
- This depression serves to divide the posterior surface into a lower larger and an upper smaller part.
- The upper smaller part constitutes the **middle lobe** of the prostate and intervenes between the ejaculatory ducts and the urethra; it varies greatly in size, and in some cases is destitute of glandular tissue.
- The lower larger portion sometimes presents a shallow median furrow, which imperfectly separates it into a **right** and a **left lateral lobe**: these form the main mass of the gland and are directly continuous with each other behind the urethra.
- In front of the urethra they are connected by a band which is named the **isthmus**: this consists of the same tissues as the capsule and is devoid of glandular substance.
-

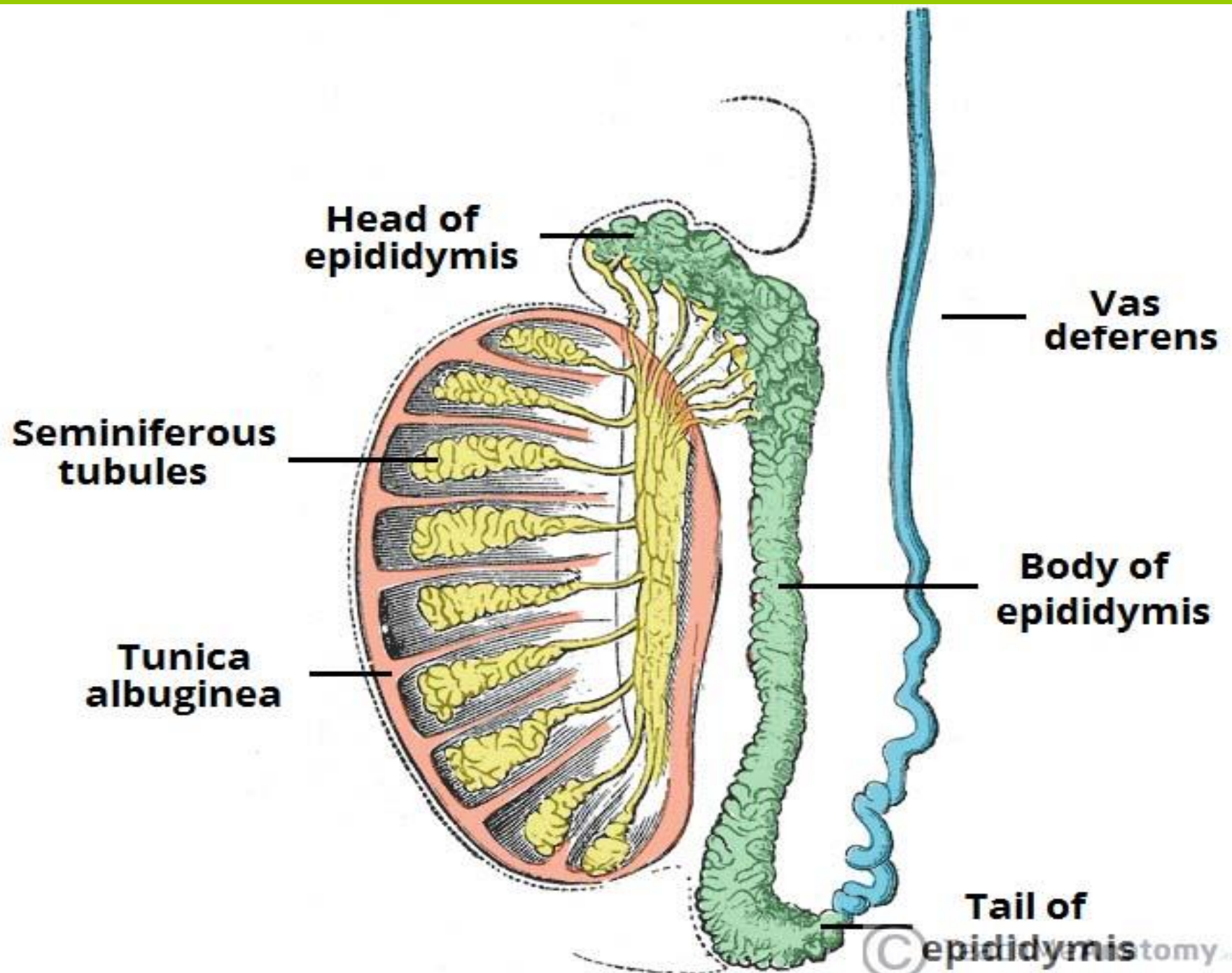
- The **anterior surface** (*facies anterior*) is narrow and convex from side to side.
- It is placed behind the pubic symphysis, from which it is separated by a plexus of veins and a quantity of loose fat.
- It is connected to the pubic bone on either side by the puboprostatic ligaments.
- The **lateral surfaces** are prominent, and are covered by the anterior portions of the *Levatores ani*, which are, however, separated from the gland by a plexus of veins.
- It is held in its position by the puboprostatic ligaments; by the superior fascia of the urogenital diaphragm, which invests the prostate and the commencement of the membranous portion of the urethra; and by the anterior portions of the *Levatores ani*, which pass backward from the pubis and embrace the sides of the prostate.
- The prostate is perforated by the urethra and the ejaculatory ducts.
- The urethra usually lies along the junction of its anterior with its middle third.
- The ejaculatory ducts pass obliquely downward and forward through the posterior part of the prostate, and open into the prostatic portion of the urethra.

- **Structure**

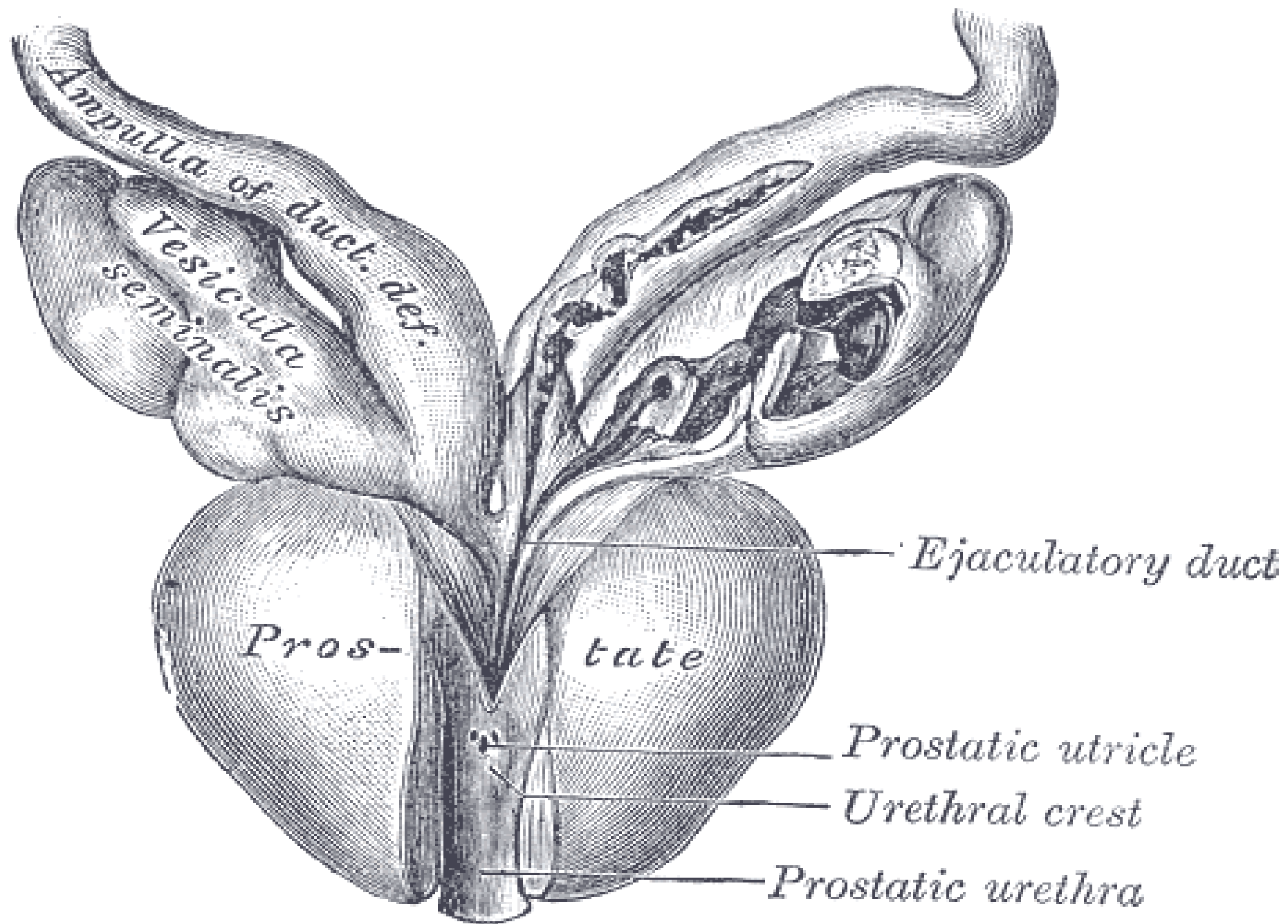
- The prostate is immediately enveloped by a thin but firm fibrous capsule, distinct from that derived from the fascia endopelvina, and separated from it by a plexus of veins.
- This capsule is firmly adherent to the prostate and is structurally continuous with the stroma of the gland, being composed of the same tissues, non-striated muscle and fibrous tissue.
- The substance of the prostate is of a pale reddish-gray color, of great density, and not easily torn.
- It consists of glandular substance and muscular tissue.

- The muscular tissue is arranged as follows:
- immediately beneath the fibrous capsule is a dense layer, which forms an investing sheath for the gland;
- secondly, around the urethra, as it lies in the prostate, is another dense layer of circular fibers, continuous above with the internal layer of the muscular coat of the bladder, and blending below with the fibers surrounding the membranous portion of the urethra.
- Between these two layers strong bands of muscular tissue, which decussate freely, form meshes in which the glandular structure of the organ is imbedded.
- In that part of the gland which is situated in front of the urethra the muscular tissue is especially dense, and there is here little or no gland tissue; while in that part which is behind the urethra the muscular tissue presents a wide-meshed structure, which is densest at the base of the gland—that is, near the bladder—becoming looser and more sponge-like toward the apex of the organ.

- The **glandular substance** is composed of numerous follicular pouches the lining of which frequently shows papillary elevations.
- The follicles open into elongated canals, which join to form from twelve to twenty small excretory ducts.
- They are connected together by areolar tissue, supported by prolongations from the fibrous capsule and muscular stroma, and enclosed in a delicate capillary plexus.
- The epithelium which lines the canals and the terminal vesicles is of the columnar variety.
- The **prostatic ducts** open into the floor of the prostatic portion of the urethra, and are lined by two layers of epithelium, the inner layer consisting of columnar and the outer of small cubical cells.
- Small colloid masses, known as **amyloid bodies** are often found in the gland tubes.







caput epididymis

testicular blood supply

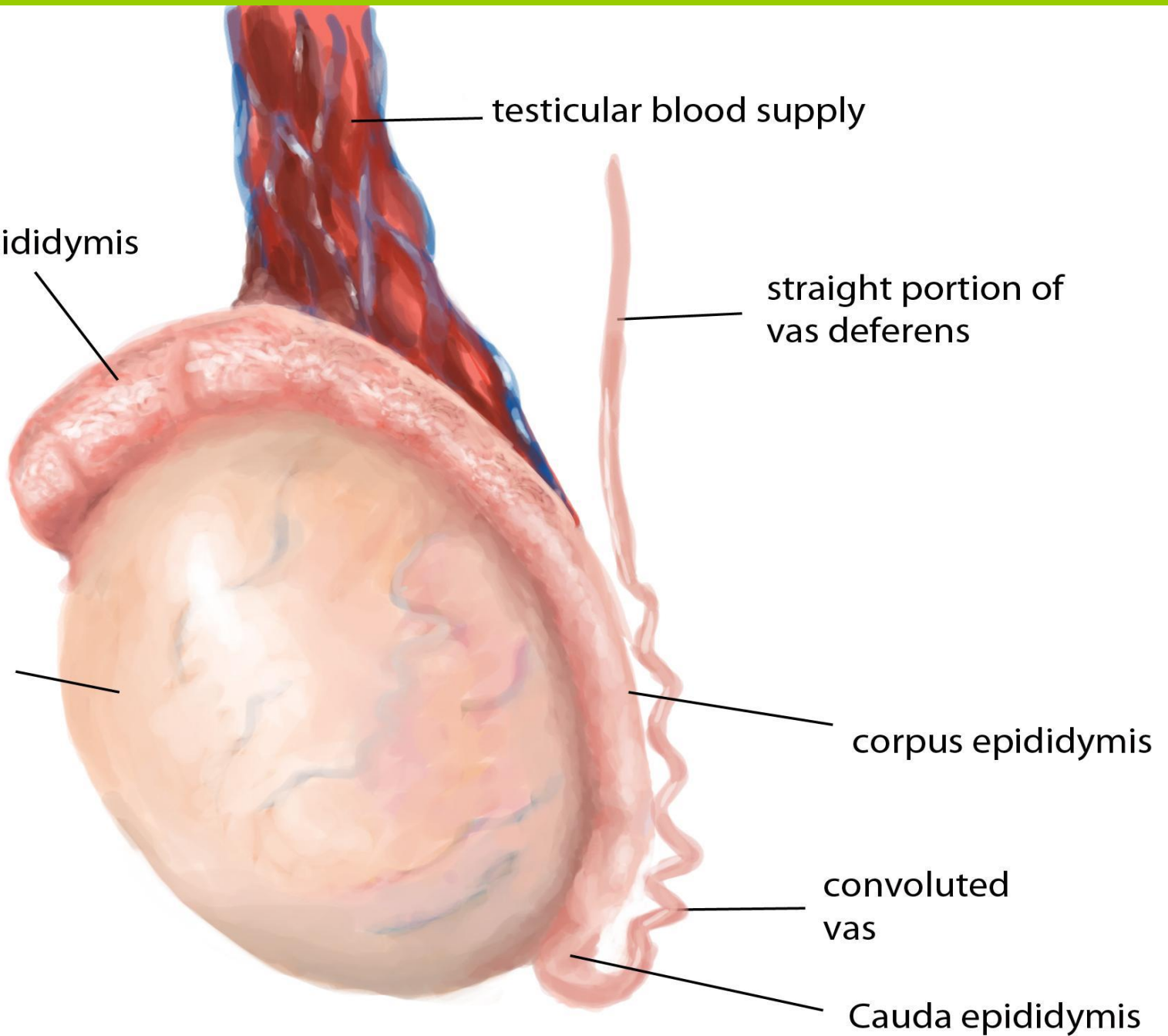
straight portion of  
vas deferens

Testis

corpus epididymis

convoluted  
vas

Cauda epididymis



# Vessels and Nerves

- The **arteries** supplying the prostate are derived from the internal pudendal, inferior vesical, and middle haemorrhoidal.
- Its veins form a plexus around the sides and base of the gland; they receive in front the dorsal vein of the penis, and end in the hypogastric veins.
- The **nerves** are derived from the pelvic plexus.