



Male genital system

By

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Learning Objectives

1. Identify External and Internal male organs.
2. Discusses different scrotal layers.
3. Know different content of the scrotum.
4. Learn anatomy of the penis.
5. Identify structure of prostate.
6. Know the course and relation of vas deferens .
7. Enumerate blood , nerve supply and lymphatic drainage of External male genitalia

Male External Genital Organs

1. Scrotum
2. Testis
3. Epididymis
4. Spermatic cord
5. Penis

The scrotum

The scrotum is a cutaneous pouch

Contents :

Testis, epididymis and lower part of the spermatic cord (of both sides).

Layers of scrotum

Skin :-

The skin of the scrotum is pigmented, rugose and is marked by a longitudinal median raphe.

Superficial fascia of the scrotum:-

➤ The **fatty layer** is absent (to assist heat loss) and is replaced by the subcutaneous dartos muscle formed of involuntary muscle fibers.

The muscle aids heat regulation of testis and scrotum.

➤ The **deep membranous** layer of the scrotum is called Colles' fascia. It is continuous superiorly with Scarpa's fascia of the anterior abdominal wall



Dartos muscle,

- ❑ Smooth muscle of the fat-free subcutaneous tissue of the scrotum (dartos fascia), which inserts into the skin, assisting testicular elevation as it produces contraction of the skin of the scrotum.
- ❑ It is supplied by **sympathetic nerve** fibres reaching it through the genital branch of the genitofemoral nerve

Cremaster muscle,

- ❑ Is formed by the lowermost fascicles of the internal oblique muscle arising from the inguinal ligament
- ❑ The cremaster muscle reflexively draws the testis superiorly in the scrotum, particularly in response to cold.
- ❑ In a warm environment, the cremaster relaxes and the testis descends in the scrotum
- ❑ It is supplied by **genital branch** of the genitofemoral nerve

Cremasteric Reflex :

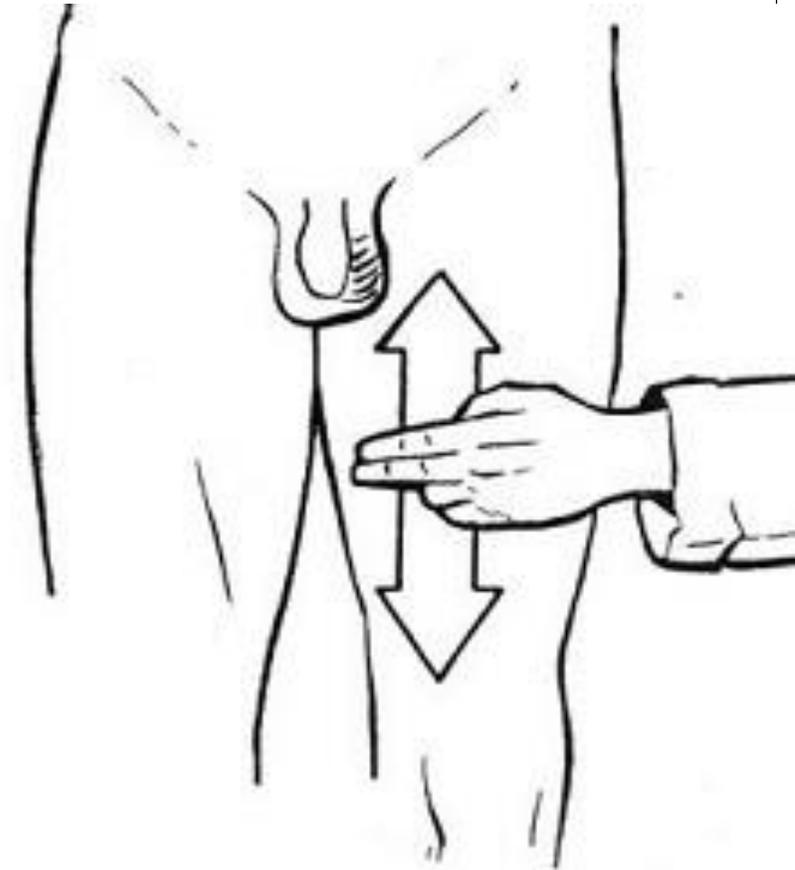
Contraction of the cremaster muscle is caused by lightly stroking the skin on the medial aspect of the superior part of the thigh leads to rapid elevation of the testis on the same side

Afferent:

Ilioinguinal nerve

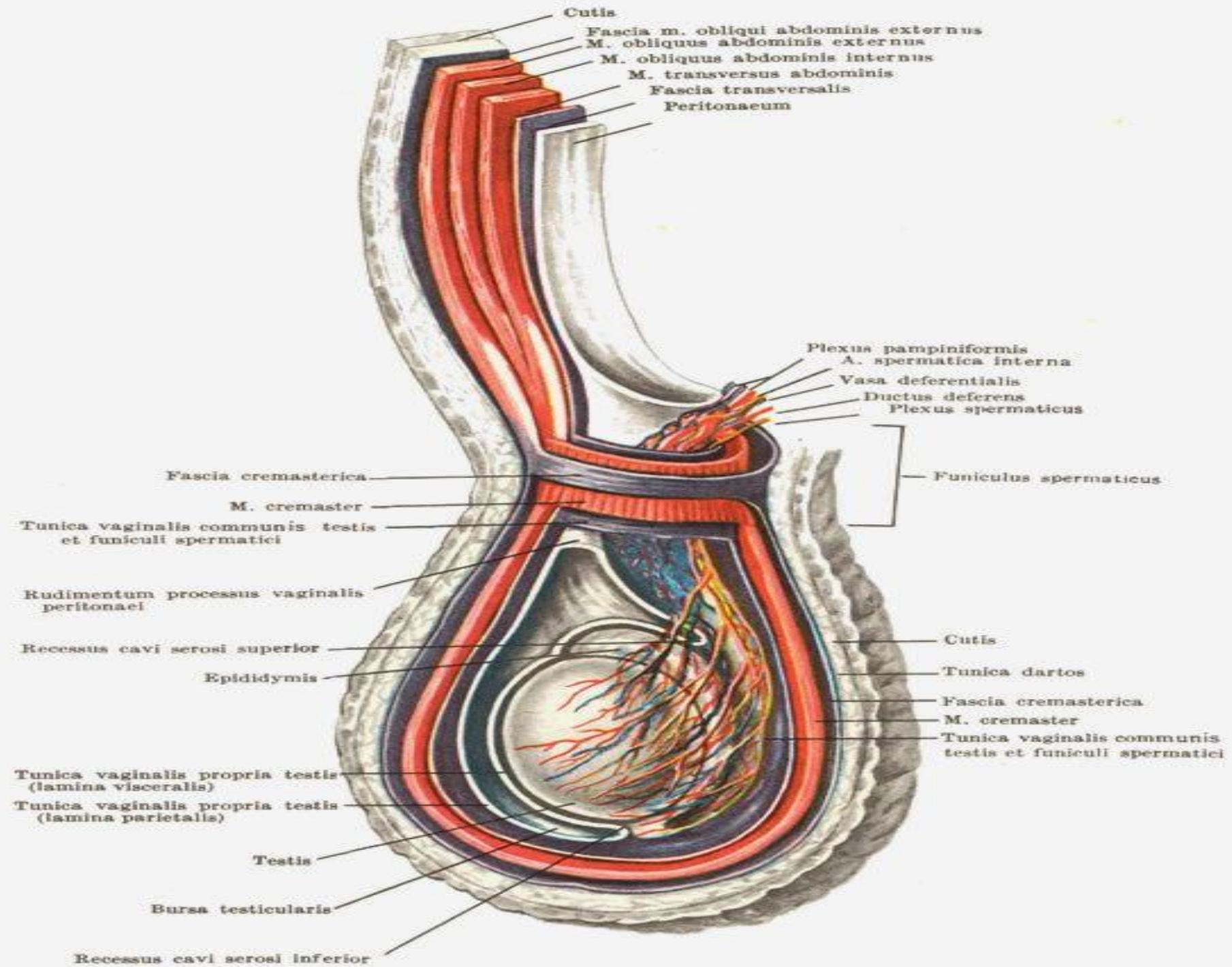
Efferent :

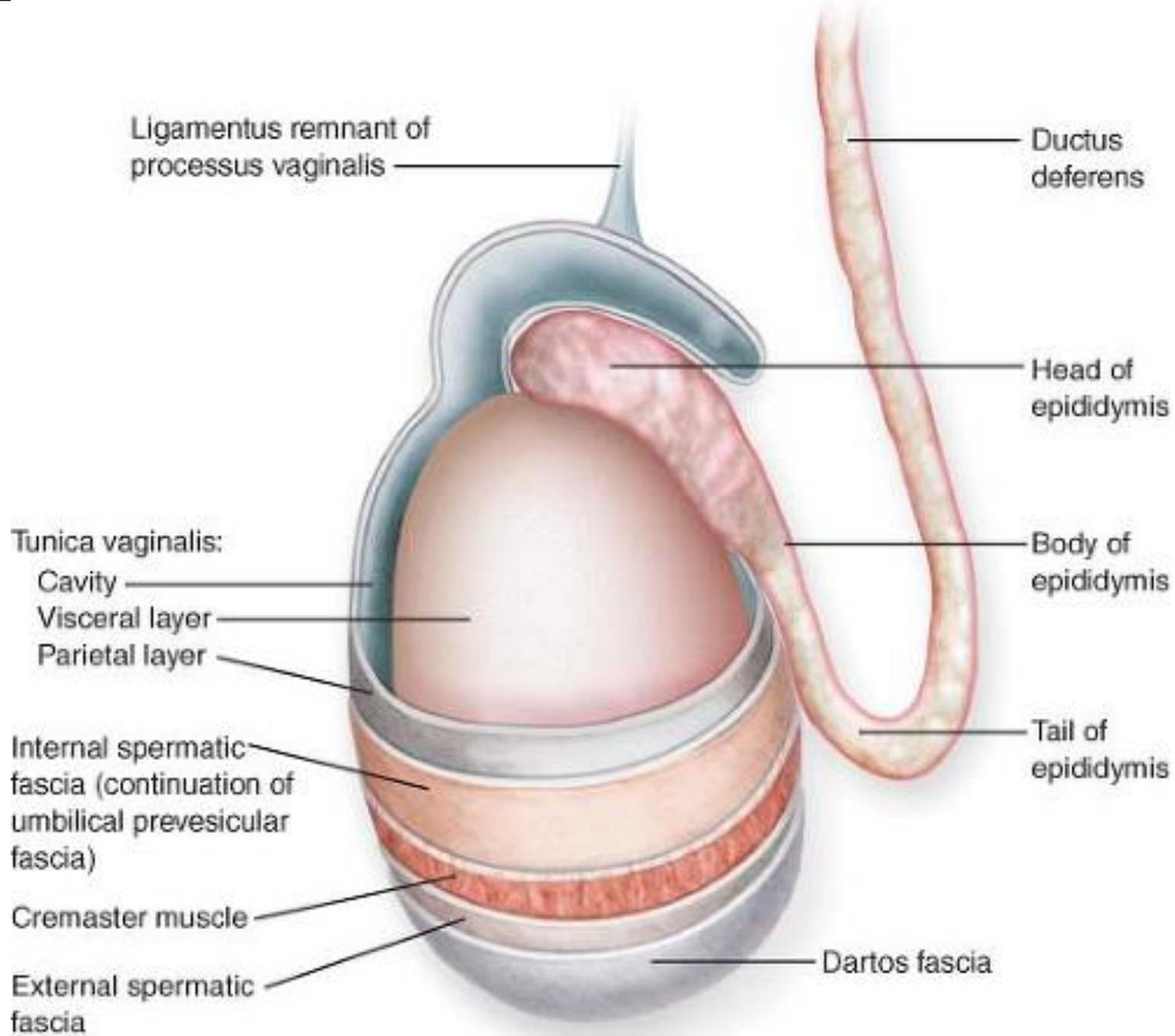
Genital branch of the genitofemoral nerve



A comparison between layers of scrotum and that of anterior abdominal wall

Layers of the anterior abdominal wall	Layers of the scrotum
Skin	Skin
Superficial fascia Superficial fatty layer Deep membranous layer (Scarpa's fascia)	Superficial fascia Replaced by Dartos muscle Deep membranous layer (Fascia of Colles)
External oblique muscle	External spermatic fascia
Internal oblique muscle	Cremastric muscle and fascia
Transversus abdominis	<i>No corresponding layer</i>
Transversus fascia	Internal spermatic fascia
Extraperitoneal tissue	Loose connective tissue
Peritoneum	Tunica vaginalis around the testis





Blood supply :-

- ❖ Cremastic branch of the **inferior epigastric artery**
- ❖ Superficial and deep external pudental branches of **femoral artery**
- ❖ Scrotal branches of **internal pudental artery.**

Nerve supply :-

- Anterior 1/3: Ilioinguinal nerve (L1 dermatome) + genital branch of genitofemoral N.
- Posterior 2/3: Scrotal branches of pudental nerve and posterior cutaneous nerve of the thigh (S3 dermatome).

Lymphatic drainage :-

Superficial inguinal lymph nodes.

Testis

- Testis is the male primary sex organ, suspended in the scrotum by the spermatic cord.
- The testis develops at the upper part of posterior abdominal wall, then descends into scrotum

Testis has 2 poles, (the upper and lower), **2 borders**, (anterior and posterior), and **2 surfaces**, (medial and lateral).

The epididymis (which is a long coiled duct) forms a cap at the upper pole of the testis, descending down lateral to the posterior border towards its lower pole.

Coverings (tunics) of the testis : From outside inwards

1. Tunica vaginalis: It is the lower part of the processus vaginalis of the peritoneum.

It is invaginated by the testis from behind,

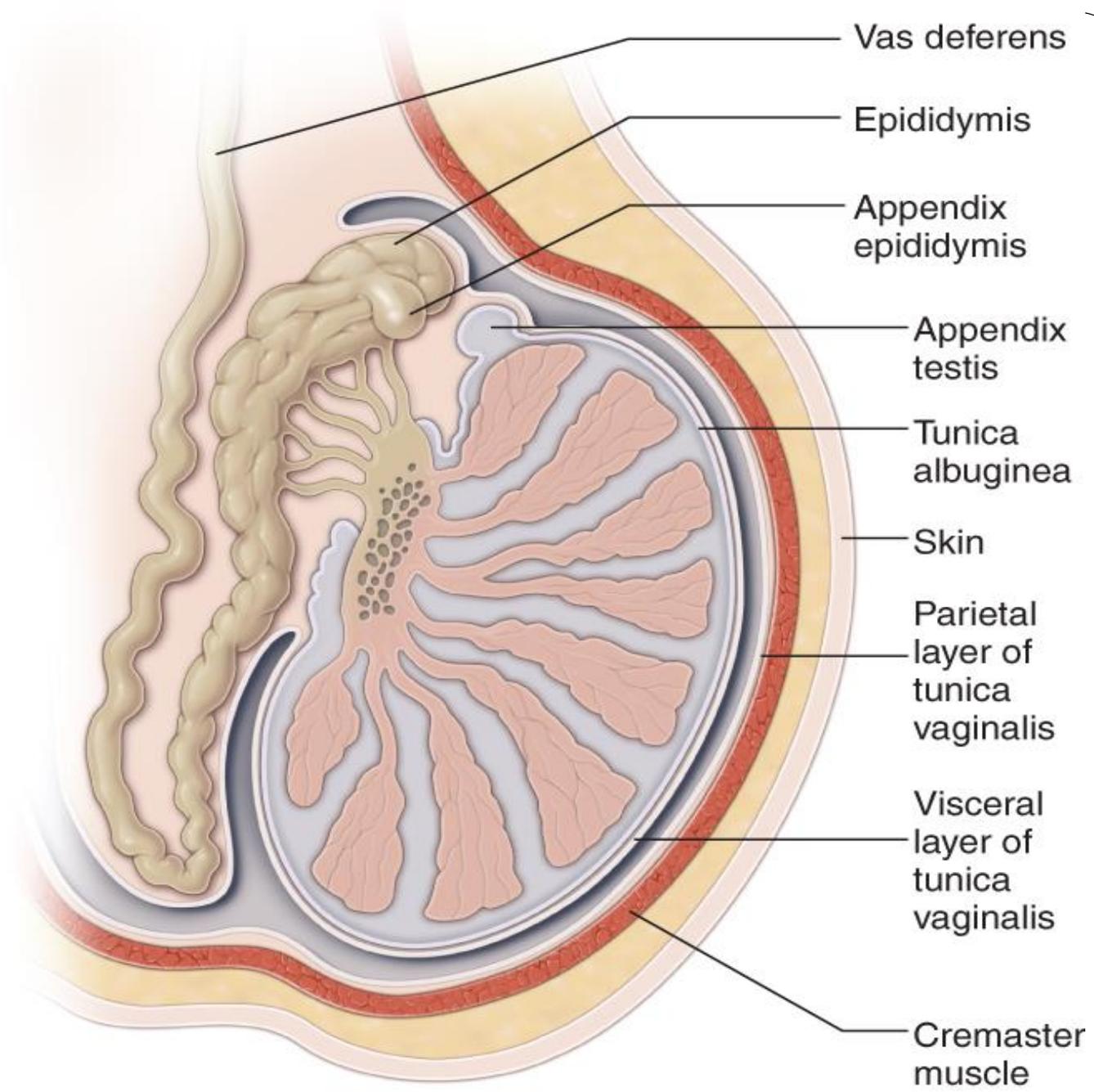
It has parietal and visceral layers with a cavity in between .

The tunica vaginalis covers the whole testis except its posterior border.

Sinus of epididymis is that part of the cavity of tunica vaginalis which extends between lateral side of testis and the epididymis .

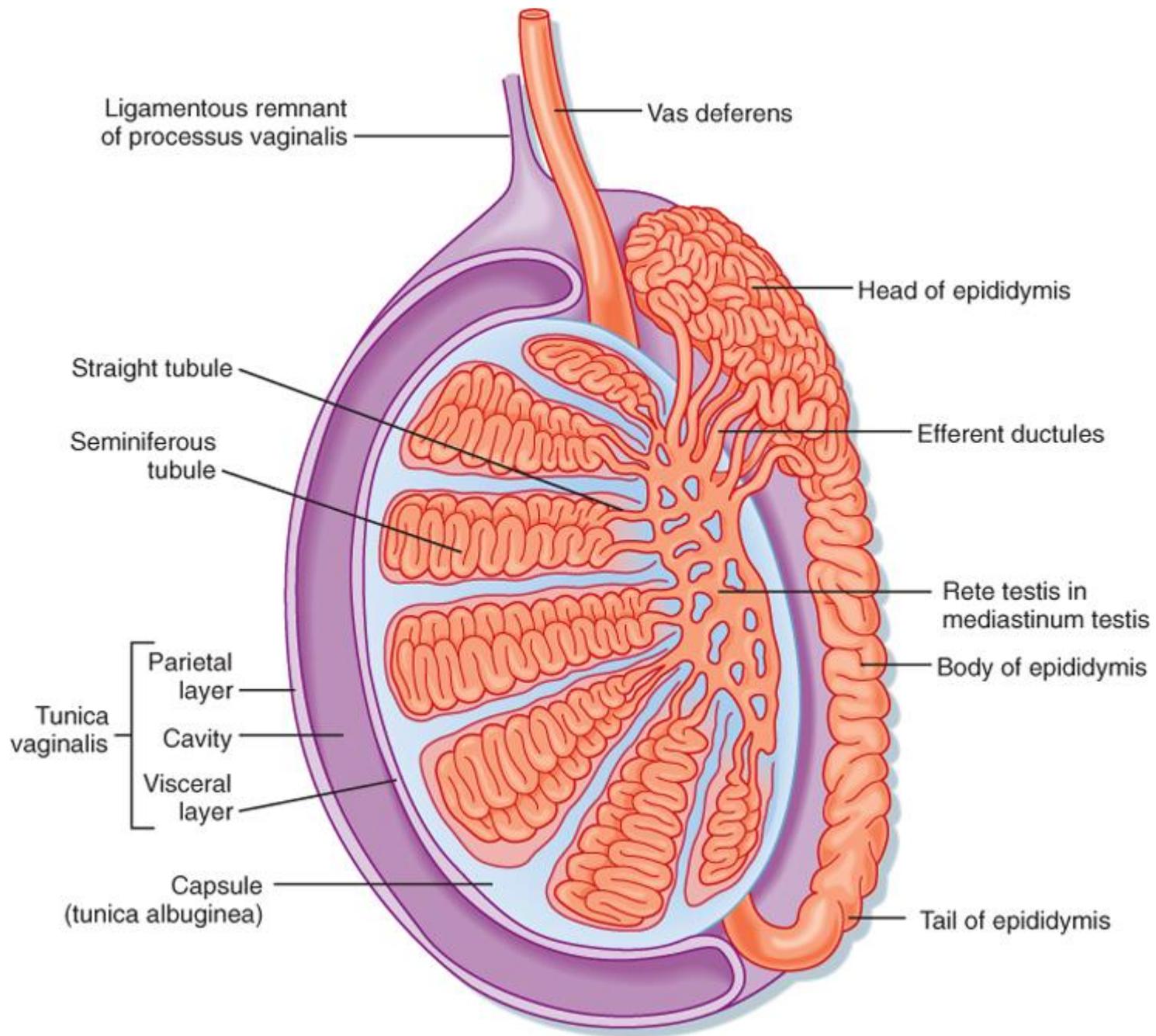
2. Tunica albuginea: It is the tough white fibrous coat which covers the testis all around.

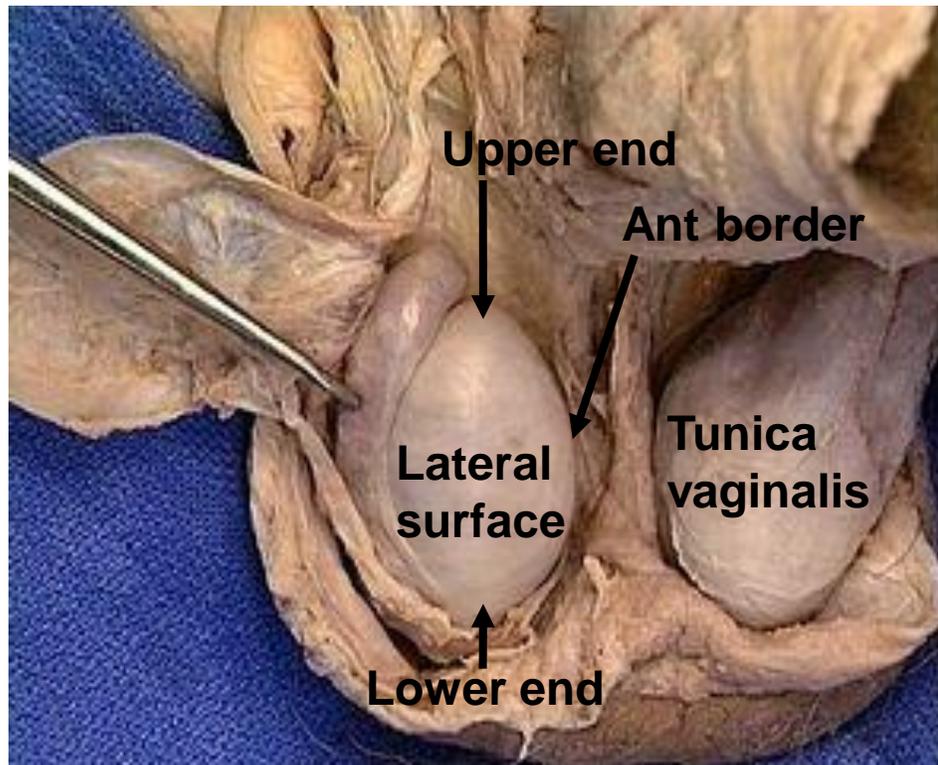
3. Tunica vasculosa: It is formed of vascularized connective tissue, deep to the tunica albuginea and extends between the lobules of the testis



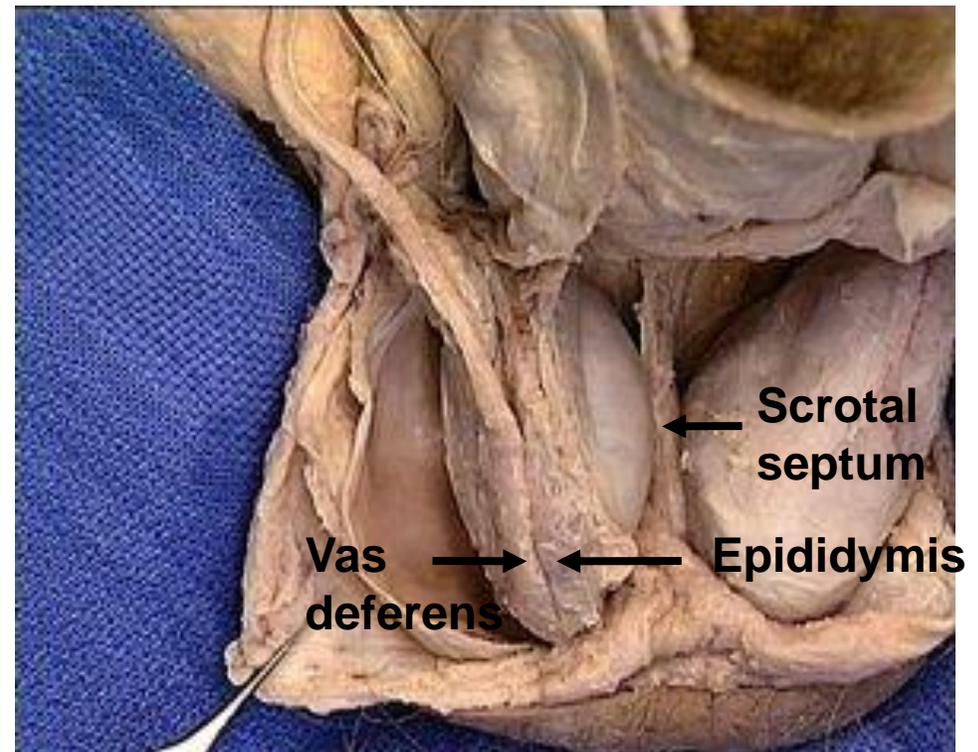
Structure of the testis

- The postero-superior part of tunica albuginea is thickened to form the ***mediastinum testis***.
- Numerous septa pass from the mediastinum to the inner surface of the rest of tunica albuginea dividing the testis into 200-300 lobules.
- Each lobule contains 2-3 seminiferous tubules with ***interstitial cells of Leydig*** in between the tubules.
- Near the mediastinum testis, the seminiferous tubules join together to form 20-30 ***straight tubules***, which enter the mediastinum anastomosing with each other to form a network of tubules called "***rete testis***"
- The rete testis gives rise to 12-20 efferent ductules which emerge from the upper pole of the testis to form head of epididymis .





Lateral view of right testis



Posterior view of right testis

The epididymis

It is the highly coiled comma shaped tube which is attached to the postero-lateral aspect of the testis. It may act as a reservoir for sperms.

Length: In the comma shaped coiled form it is about 1.5 inches long. When it is uncoiled, it measures about 6 meters in length.

It has 3 parts

- **Head:** forms a cap at upper pole of the testis, to which is connected by efferent ductules. These ductules form head of the epididymis
- **Body:** is the intermediate part and is made up of the single coiled tube
- **Tail:** is the lower end of the tube and it continues as vas deferens which ascends medial to the epididymis.

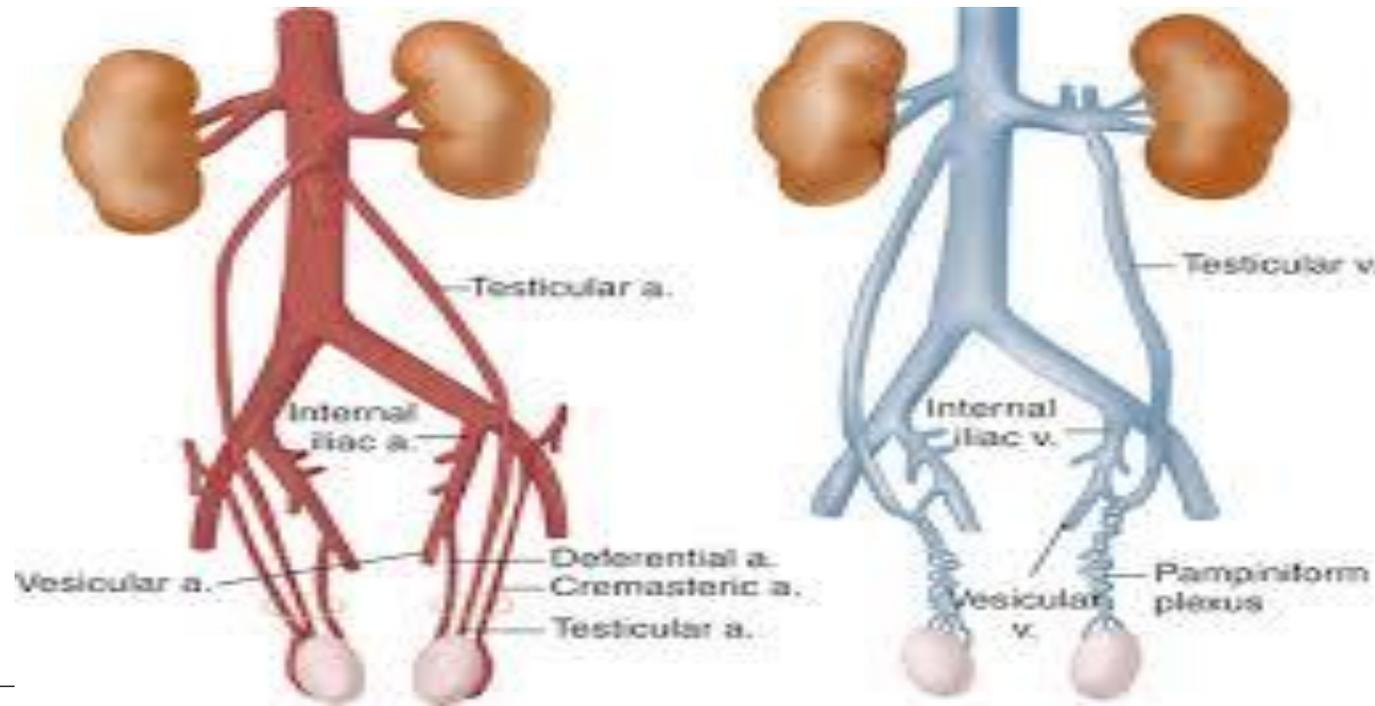


Arterial blood supply of the testis and epididymis

- ✓ By testicular artery, a branch of abdominal aorta at L2 vertebra.
- ✓ It descends on the posterior abdominal wall to reach the deep inguinal ring where it runs in the spermatic cord in the inguinal canal.
- ✓ It supplies epididymis and enters the testis
- ✓ It anastomoses with cremasteric artery and artery of the vas .

Venous drainage

- ✓ Venous blood from testis and epididymis drain into the pampiniform plexus.
- ✓ It surrounds and accompanies the testicular artery up to the superficial inguinal ring.
- ✓ In the inguinal canal, it gives rise to a single testicular vein.
- ✓ The **right** vein ends in the inferior vena cava and the **left** one ends in left renal vein.



Varicocele

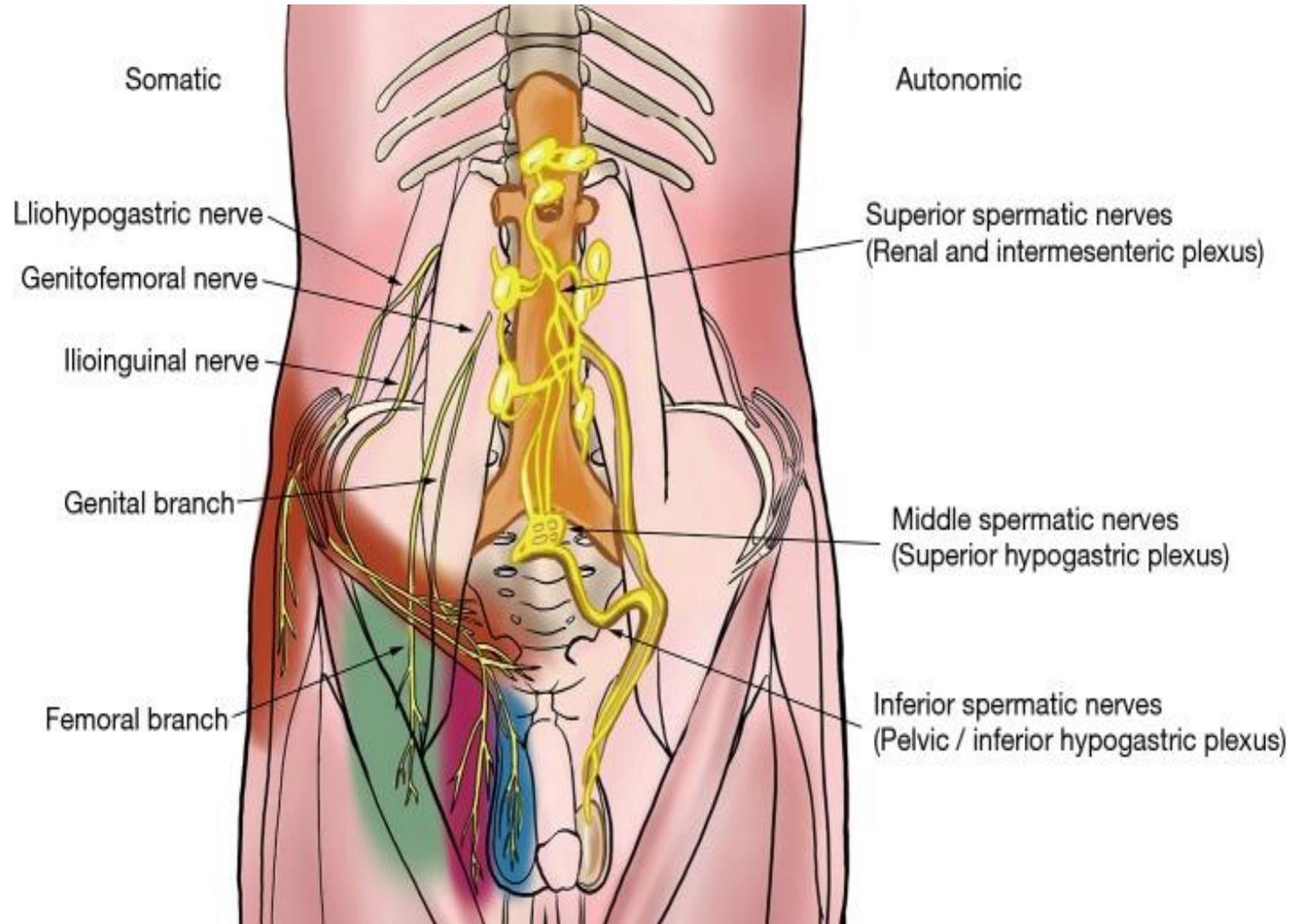
- A varicocele is a condition in which the veins of the pampiniform plexus are elongated and dilated.
- It is a common disorder in adolescents and young adults
- **It is more common occurring on the left side because :**
 - 1-The right testicular vein joins the low-pressure inferior vena cava (by acute angle)
The left vein joins the left renal vein, in which the venous pressure is higher (by right angle)
 - 2- The Left side drained by left renal vein which receive left suprarenal vein contains adrenaline and noradrenaline which causing vasoconstriction of Left testicular vein
 - 3- Left testicular vein may be compressed by heavy left colon
 - 4-The left testis is lower than right one with elongated left testicular vein
 - 5- The left renal vein is compressed between aorta and superior mesenteric artery



Nerve supply

<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5503924/>

Lymphatic drainage : Into lateral aortic lymph nodes.



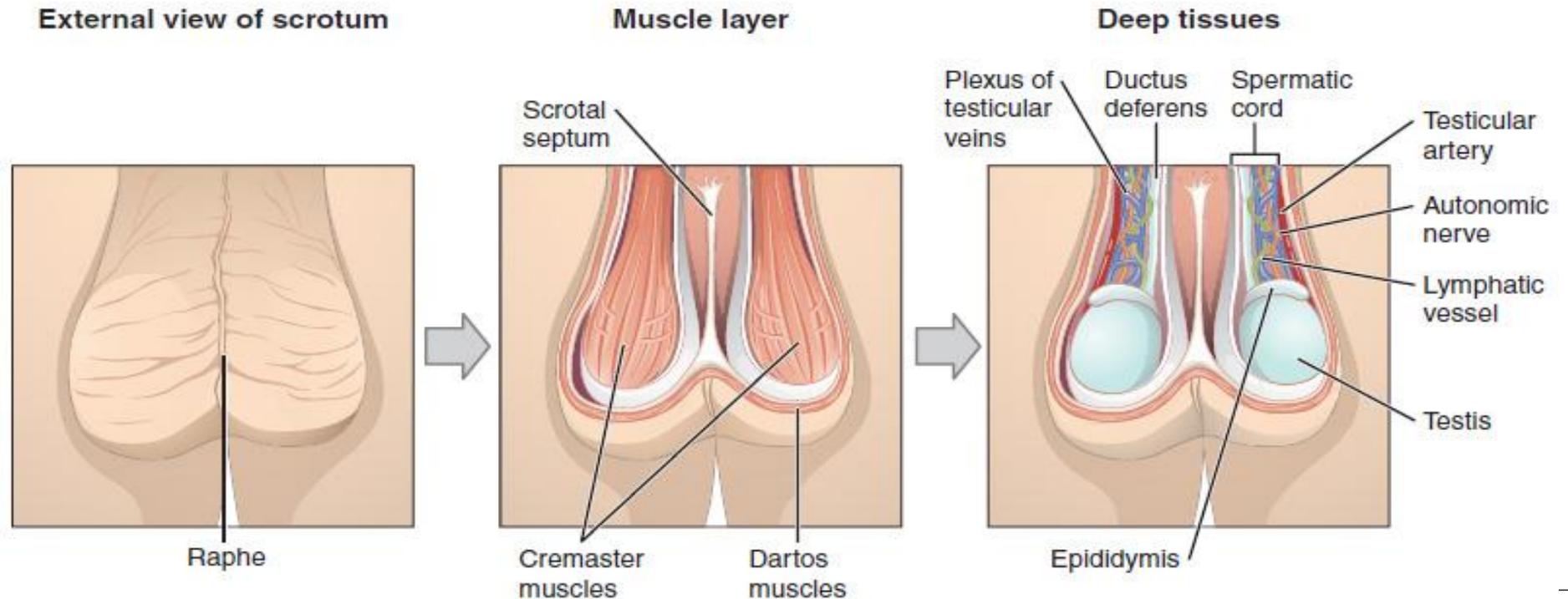
Thermoregulation of the testis

The process of spermatogenesis needs a temperature 2-3°C below the body temperature. This is achieved through the following 3 mechanisms;

1. Cutaneous mechanism; The scrotal skin is very vascular and rich in sweat glands. Fat is absent in its subcutaneous tissue, all aid heat loss.

2. Muscular mechanism: Includes 2 muscles, dartos and cremastic. In cold cremastic muscle elevates the testis near the body, so preventing heat loss. In warm weather, the opposite effects are obtained.

3. Vascular mechanism: The pampiniform plexus aids heat loss by radiation, so helps to maintain low temperature around the testis.



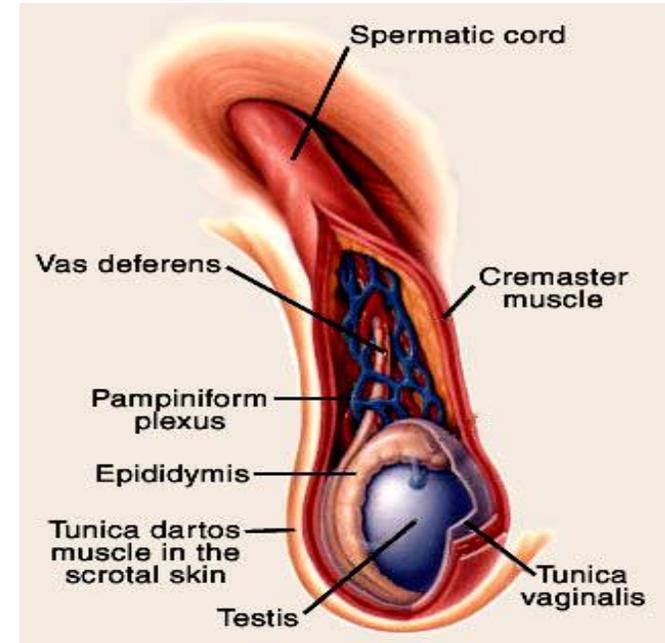
The spermatic cord

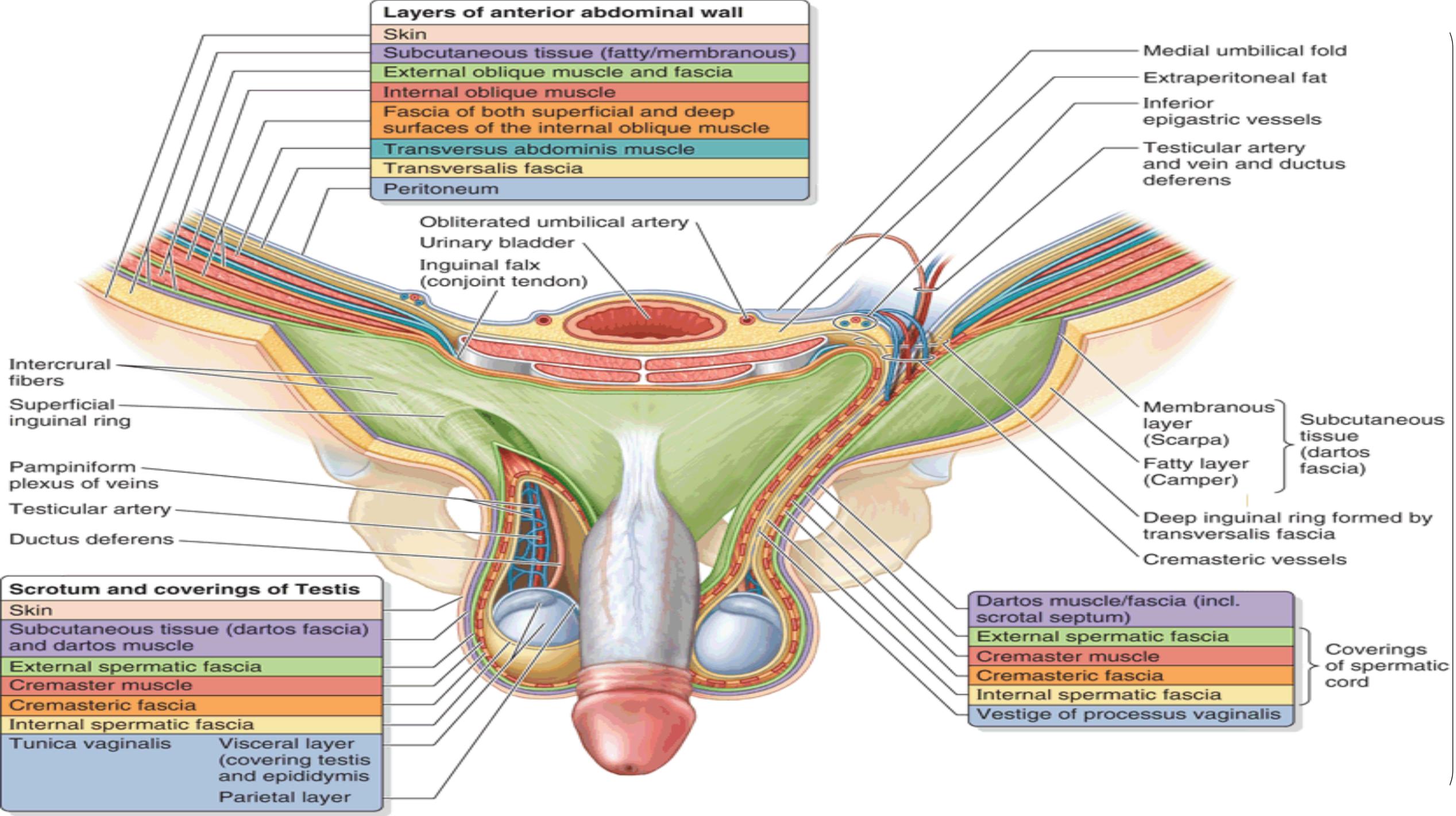
It is a group of structures which meet at deep inguinal ring and traverse the inguinal canal down to posterior border of the testis.

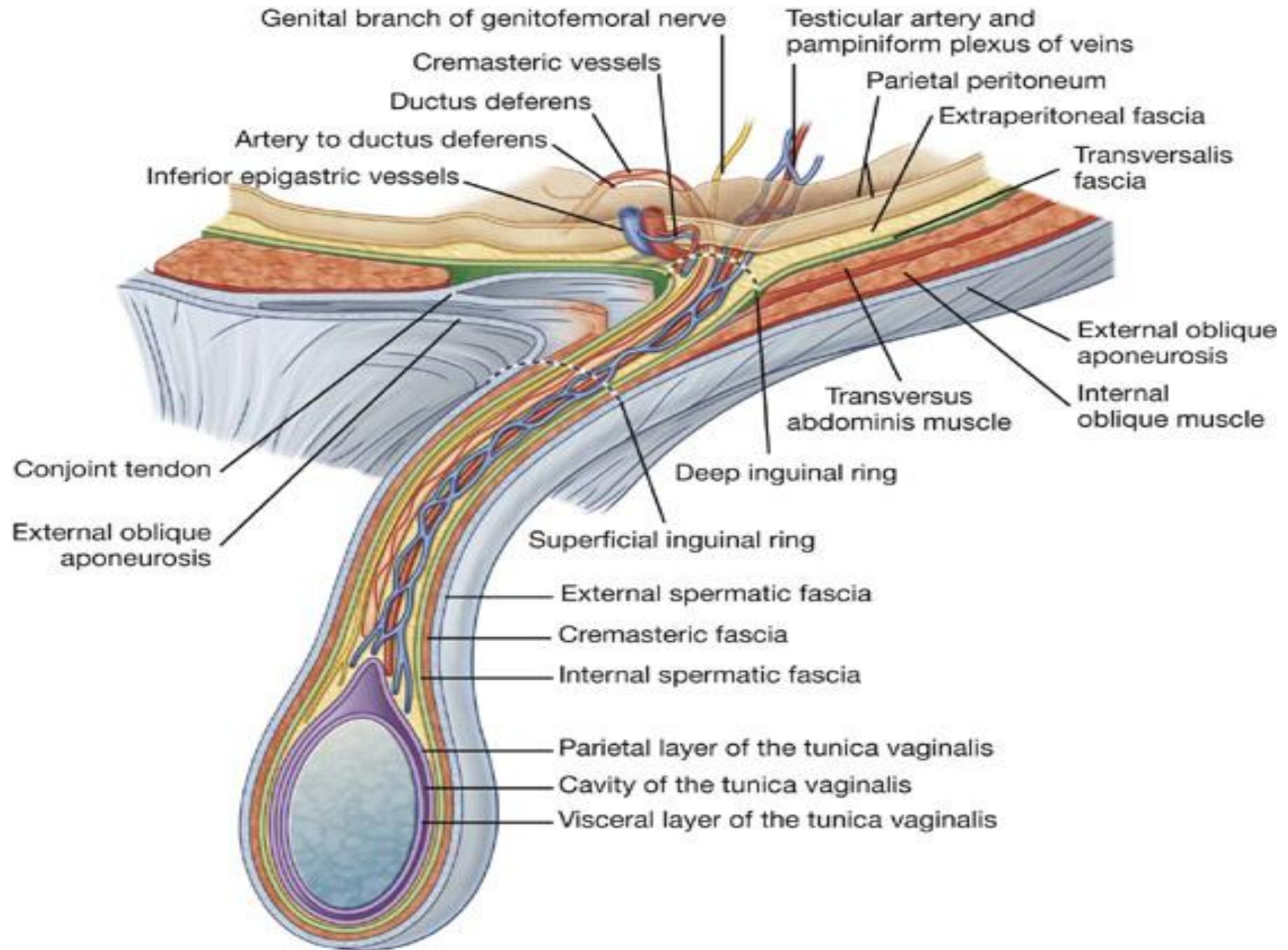
Coverings: The spermatic cord is invested by 3 coverings; *internal spermatic fascia, cremasteric muscle and fascia, and external spermatic fascia* .

Constituents of the spermatic cord

1. Testicular **A**rtery (from aorta)
2. Cremasteric **A**rtery (from inferior epigastric artery)
3. **A**rtery of the vas (from the inferior vesical artery)
4. **V**as deferens
5. Pampiniform **v**enous plexus
6. **V**estige of processus vaginalis.
7. Genital branch of genitofemoral **N**erve,
8. **S**ympathetic plexus around the testicular artery and artery of the vas
9. Lymphatics of testis and epididymis ascending to lateral aortic lymph nodes and Loose areolar tissue.







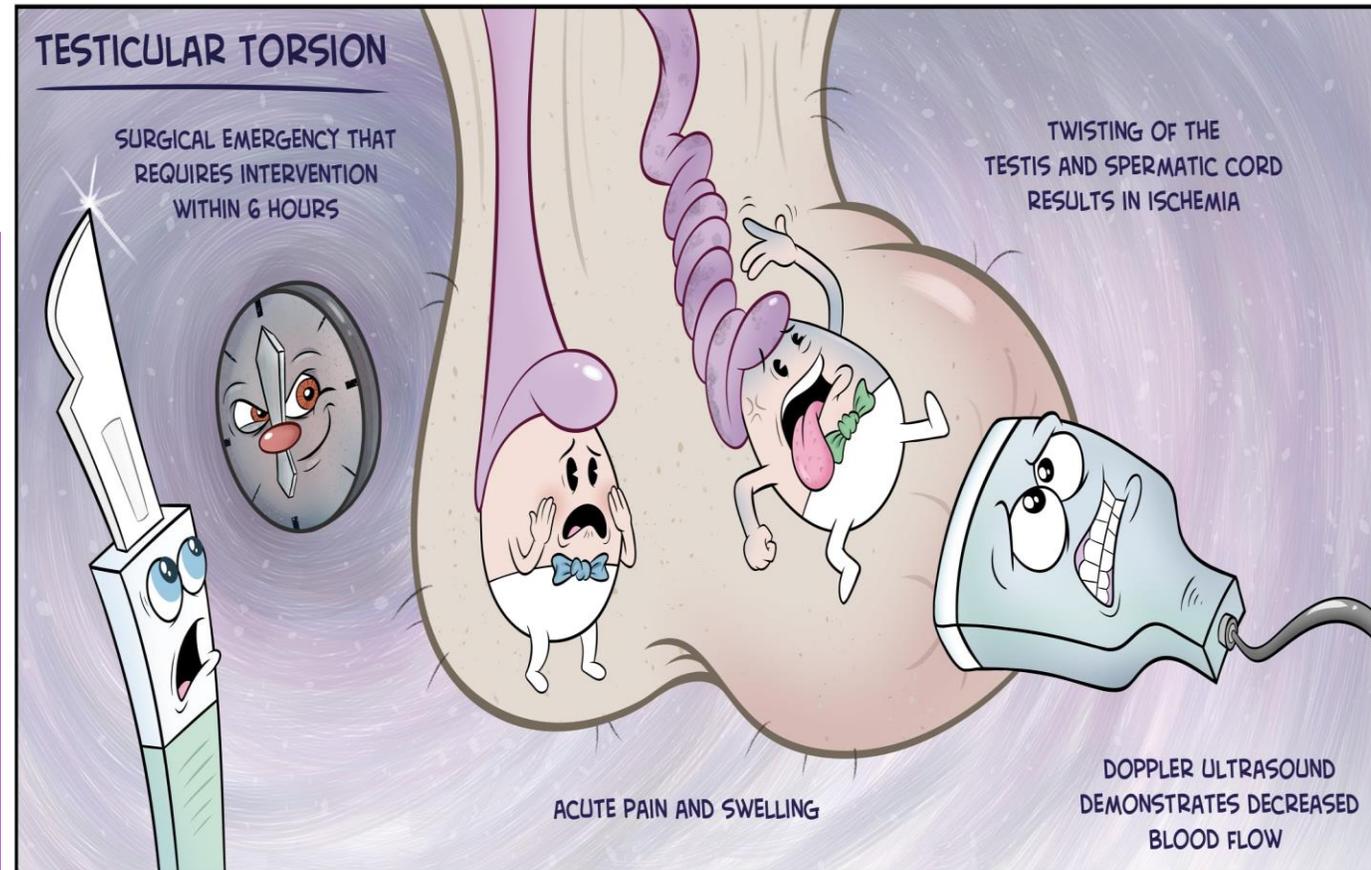
Torsion of the Testis

Torsion of the testis is a rotation of the testis around the spermatic cord .

It is often associated with an excessively large tunica vaginalis.

The patient complains from severe pain.

It is an emergency case , the testicular artery may be occluded, followed by necrosis of the testis.

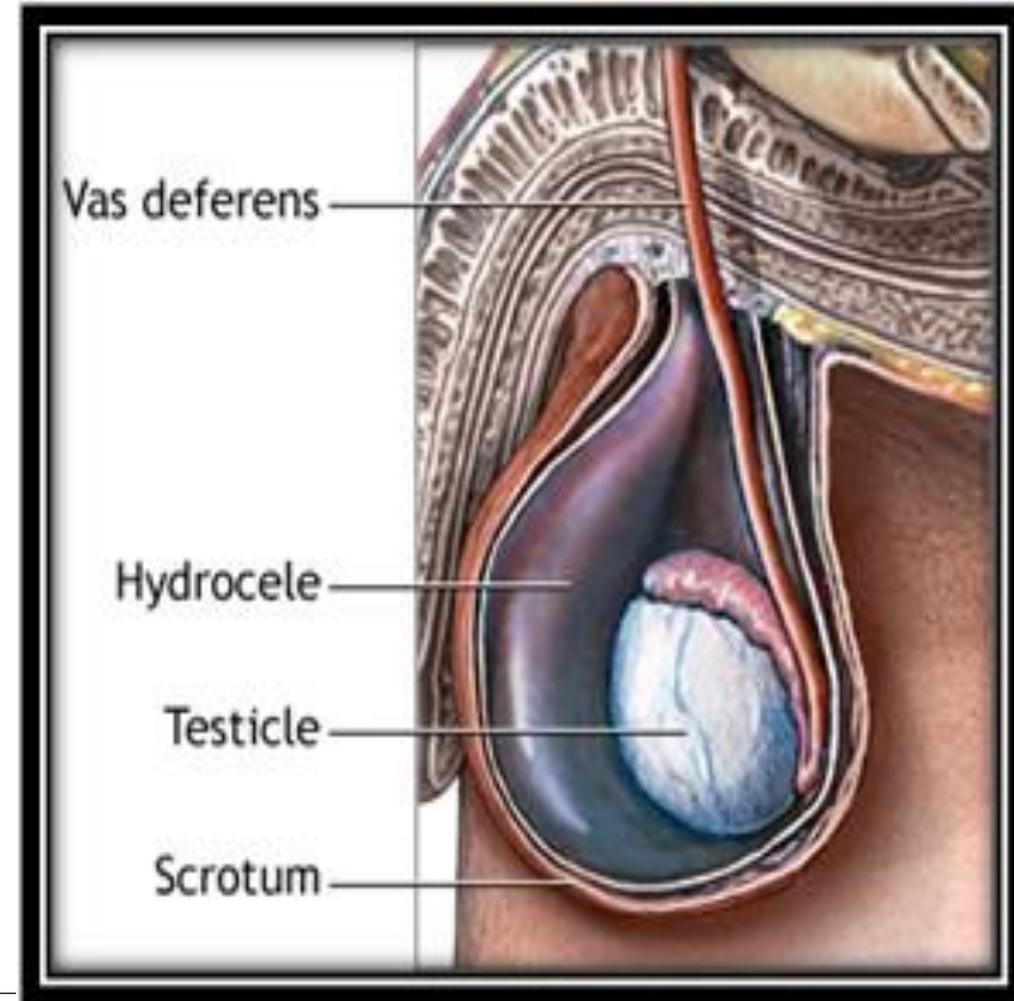


Hydrocele

It is an accumulation of fluid within the tunica vaginalis.

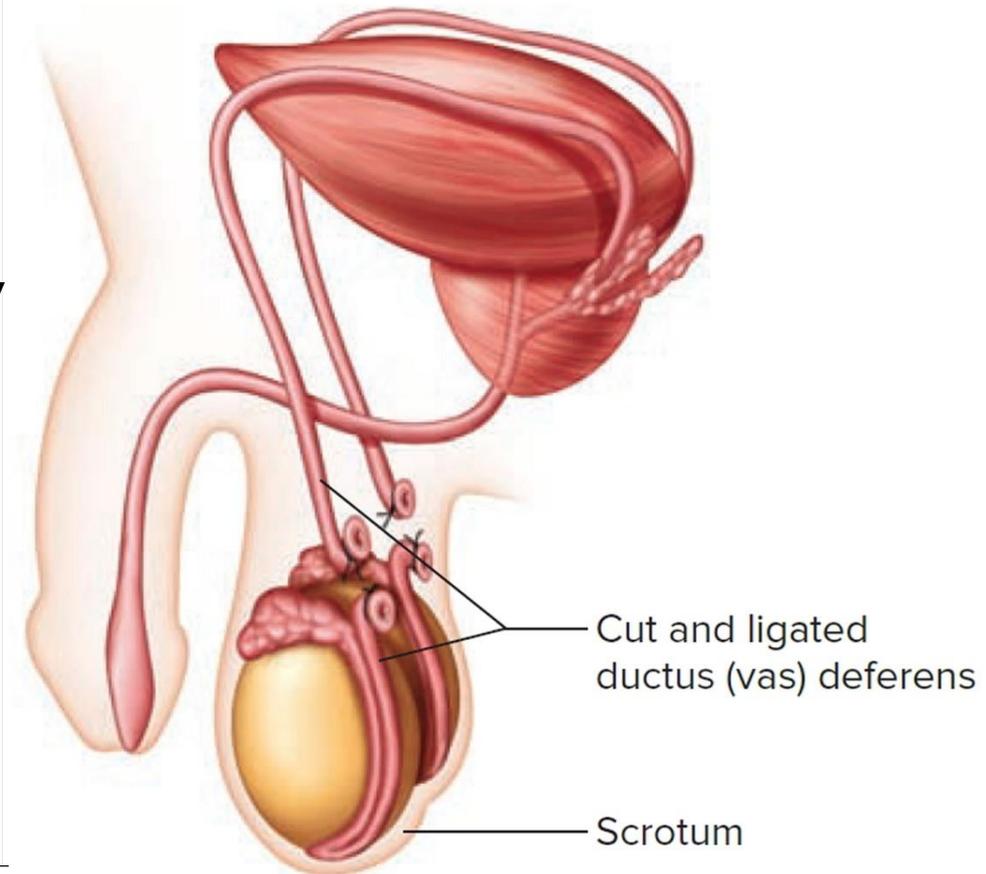
Haematocele

It is an accumulation of blood within the tunica vaginalis.



Ductus Deferens (Vas Deferens)

- It is thick walled muscular tube which springs from the lower end of the epididymis
- It ends behind the base of the bladder, by joining the duct of the seminal vesicle to form the ejaculatory duct



Length : about 45 cm, the same length of the following :

a. Thoracic duct

b. Spinal cord

c. Adult femur

d. The distance from the incisor teeth to the cardiac end of the stomach.

Function : transmit the spermatozoa from the epididymis to the ejaculatory duct, which in turn opens in the prostatic urethra.

Course and Relations of the Vas :

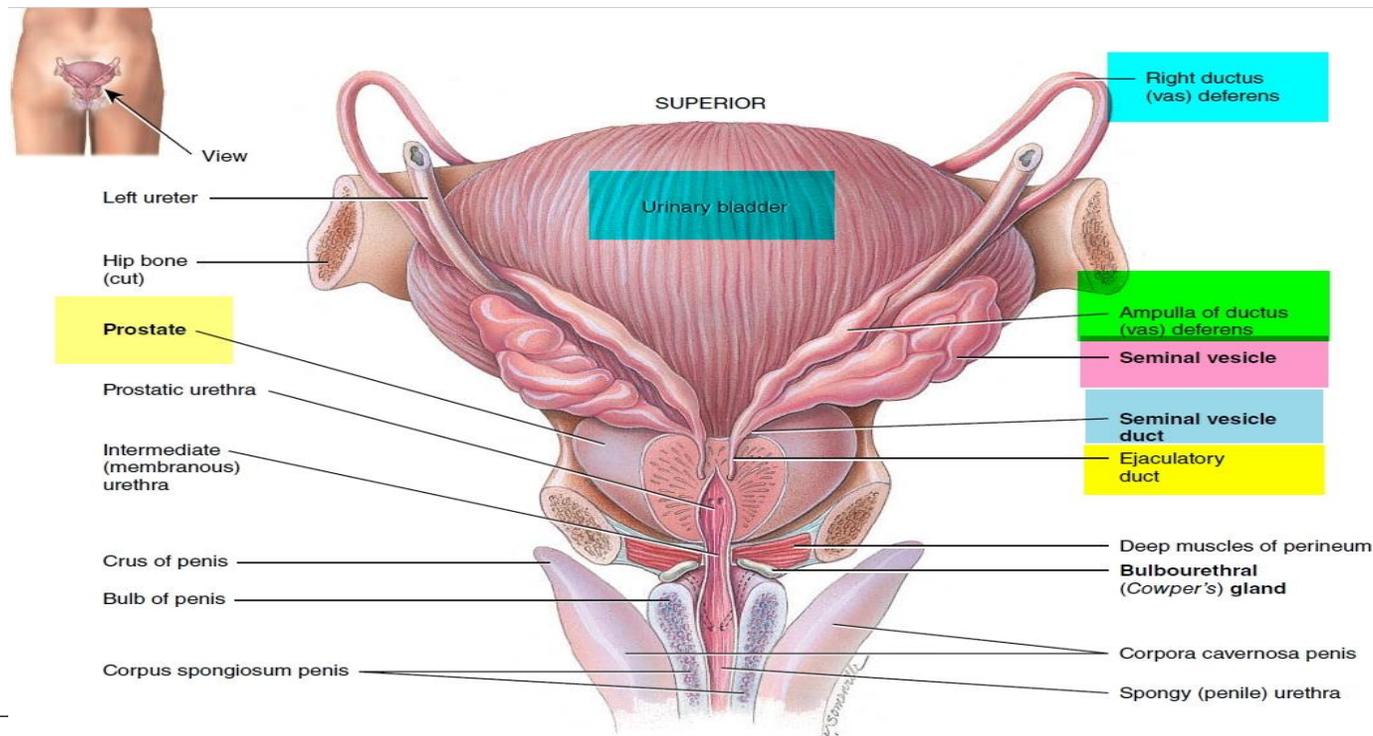
Its distal part lies in the scrotum and inguinal canal, its proximal part runs in the pelvis.

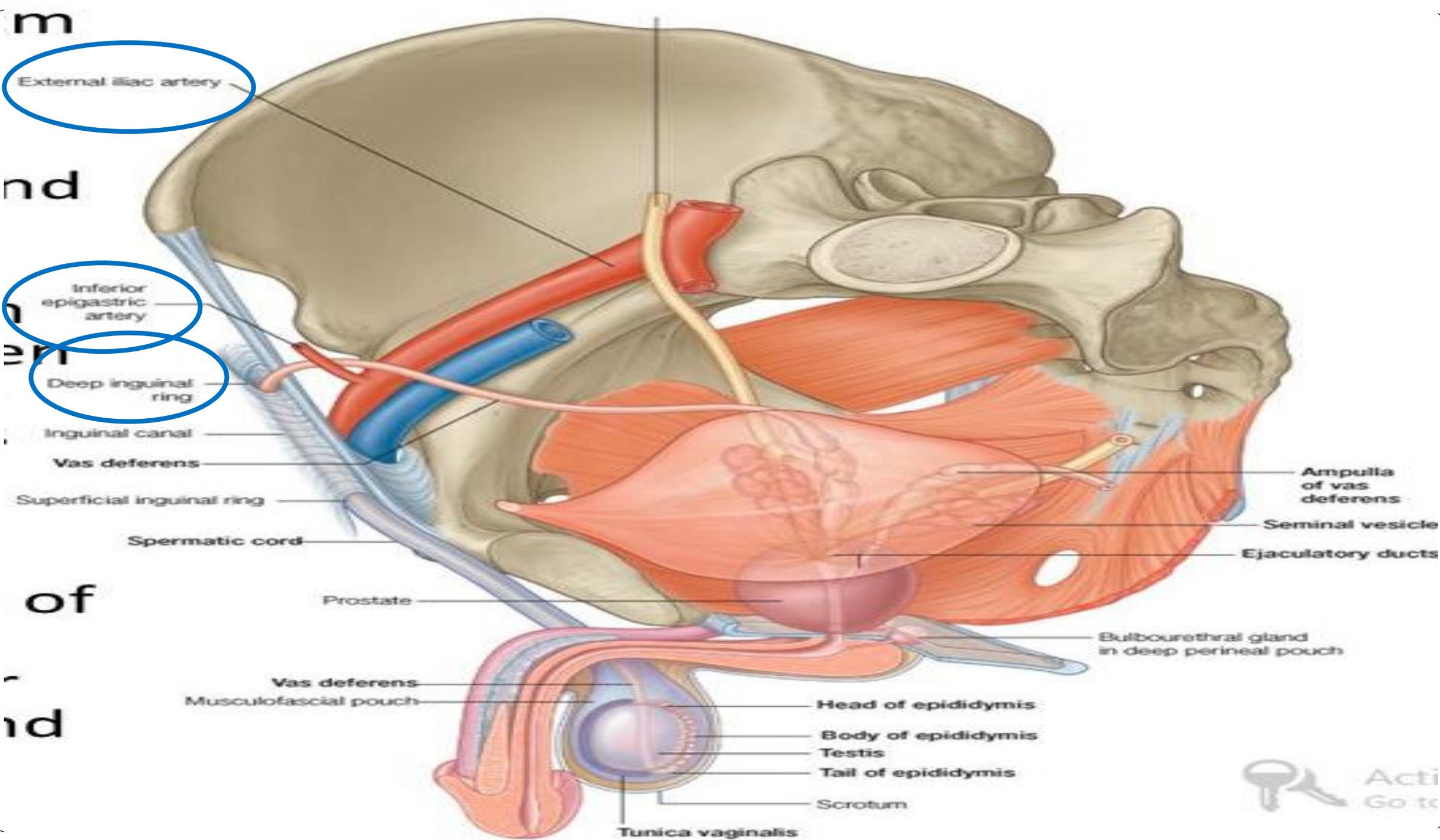
A. Of its distal part (in the scrotum and inguinal canal):

- ❖ From the tail of the epididymis, it ascends along the posterior aspect of the testis, medial to the epididymis.
- ❖ Then, it ascends in the posterior part of the spermatic cord to traverse the inguinal canal.
- ❖ At the deep inguinal ring, it leaves the cord and curves around the lateral side of the **inferior epigastric artery** to enter the pelvis.

B. Of its proximal part (in the pelvis) :

- ❖ The vas descends posteriorly external to the peritoneum, crossing these structures in the side wall of the pelvis :- external iliac vessels, obliterated umbilical artery, obturator nerve and obturator vessels.
- ❖ Then, it turns medially and crosses the **ureter** near the superolateral angle of the base of the bladder .
- ❖ Behind the bladder base, it runs superior to, then medial to the seminal vesicle and expands to form ampulla of the vas, below which it narrows to join the duct of the seminal vesicle to form the ejaculatory duct .





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Vessels of the Vas:

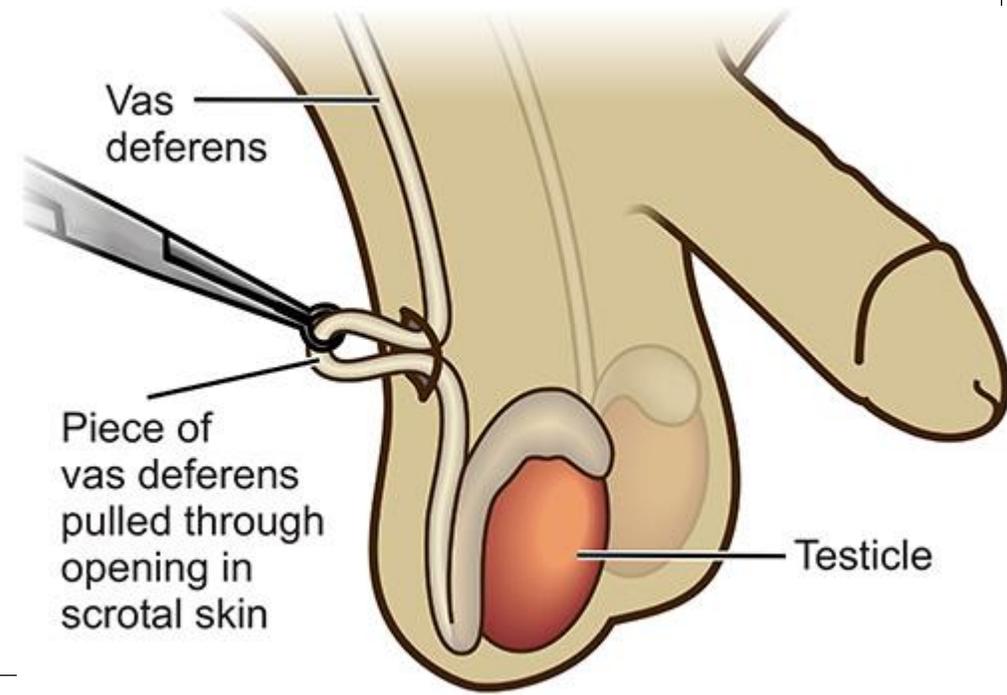
- ❖ Artery of the vas is derived from inferior vesical artery.
- ❖ It runs in the spermatic cord and anastomoses with the testicular artery.

Veins join the vesical venous plexus.

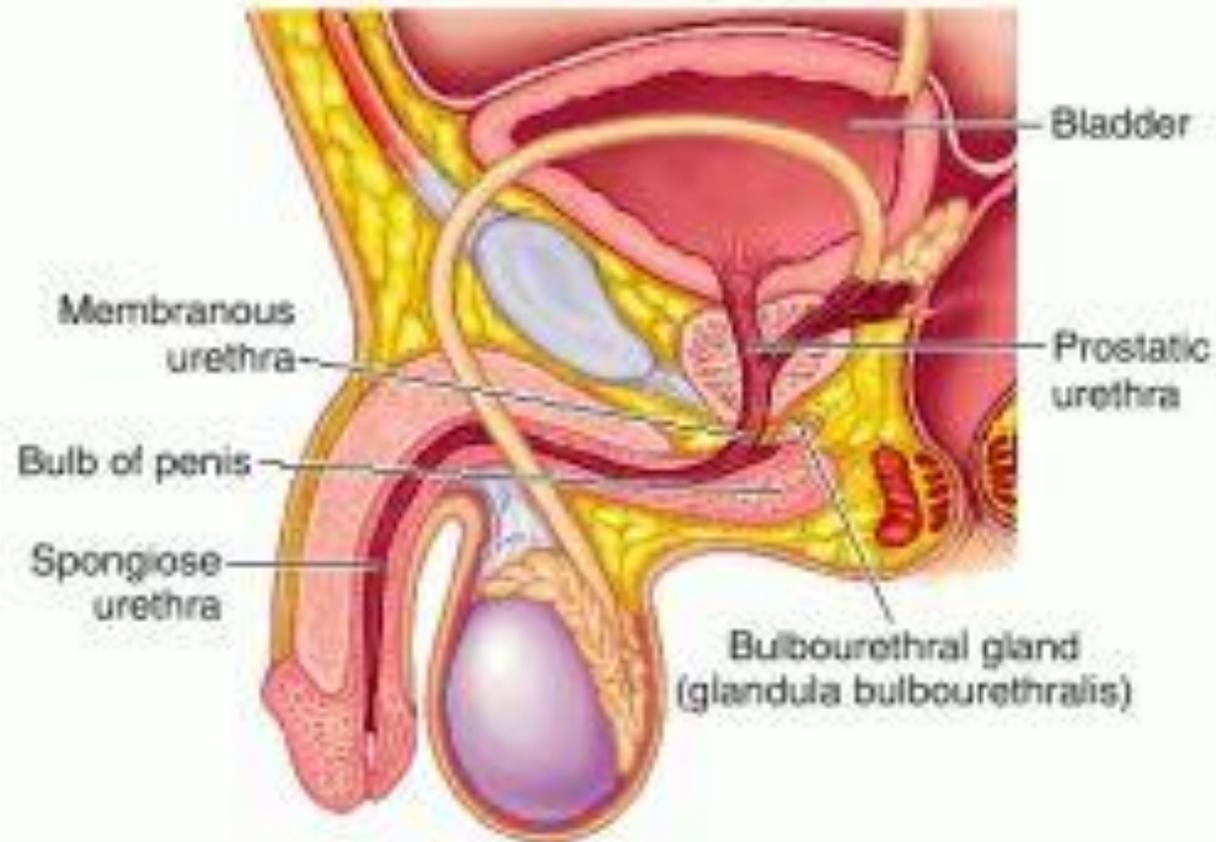
Nerves : are derived from prostatic nerve plexus which comes from the inferior hypogastric plexus.

Fibers are mainly sympathetic for the process of ejaculation.

 **Applied Anatomy:** bilateral vasectomy is a common operation for male sterilization



Seminal vesicles, ejaculatory ducts and bulbourethral glands



Seminal Vesicles

It is a sacculated tube, about 5 cm long.

Site and relations : it lies behind base of the bladder and has the following relations;

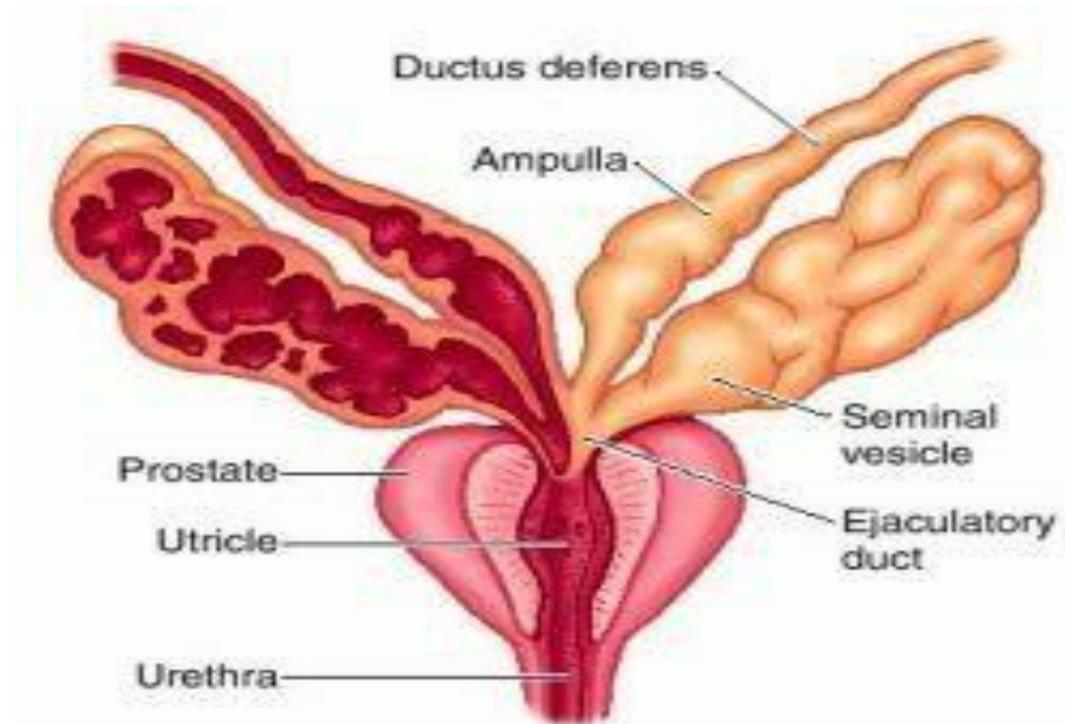
Anteriorly : Base of the bladder.

Posteriorly : Rectum and rectovesical fascia.

Superiorly : Its upper end is covered by peritoneum of rectovesical pouch and related to the vas deferens.

Medially : ampulla of the vas.

Termination : inferiorly, it narrows into a small duct which joins the vas to form ejaculatory duct.



Arterial supply : from inferior vesical and middle rectal arteries.

Veins : to vesical venous plexus.

Nerves: from prostatic nerve plexus (mainly sympathetic).

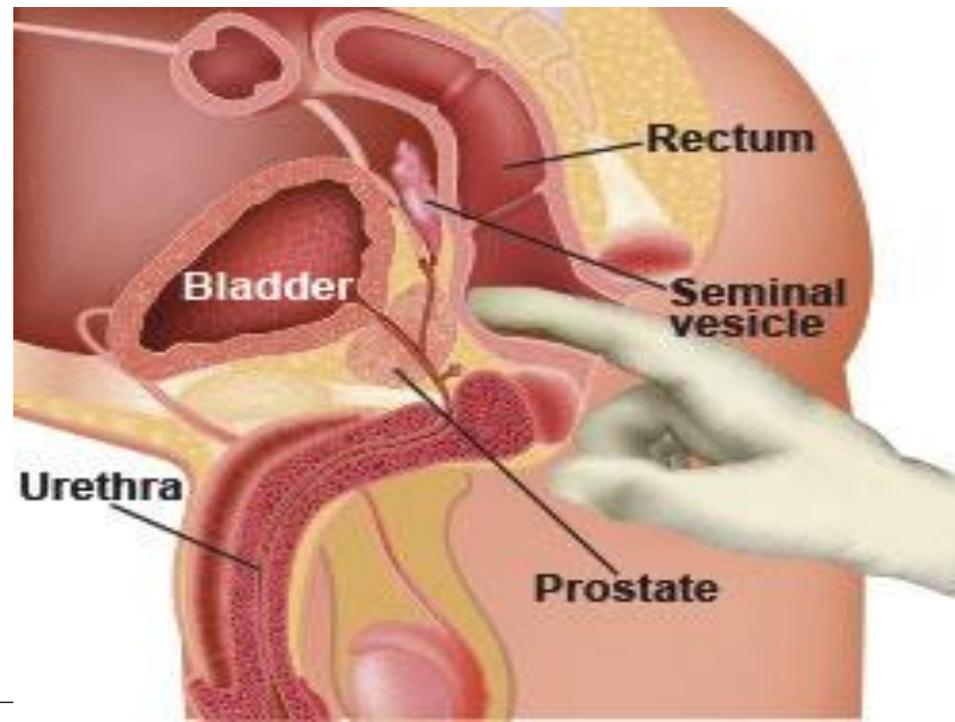
Functions :

- ❑ the seminal vesicle produces an alkaline secretion rich in fructose and mucus.
- ❑ The secretion is added to the spermatozoa in ejaculation.



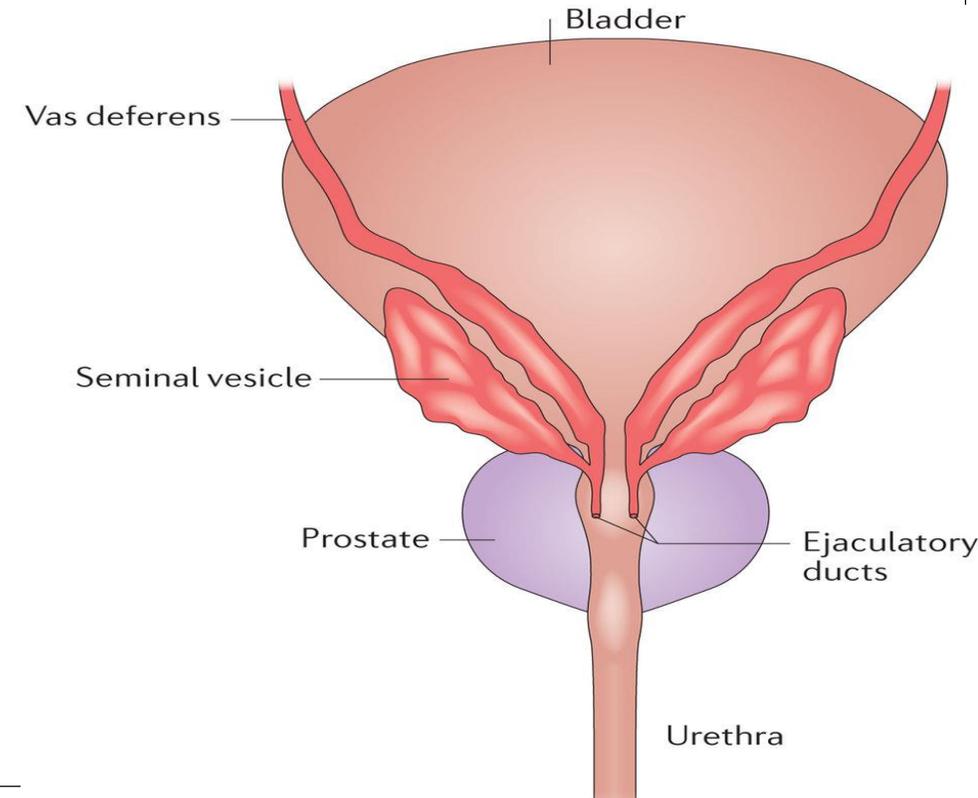
Applied Anatomy :

- ✓ The seminal vesicles when enlarged, could be felt on rectal examination.
- ✓ Abscess in the seminal vesicle may rupture into the peritoneal cavity.



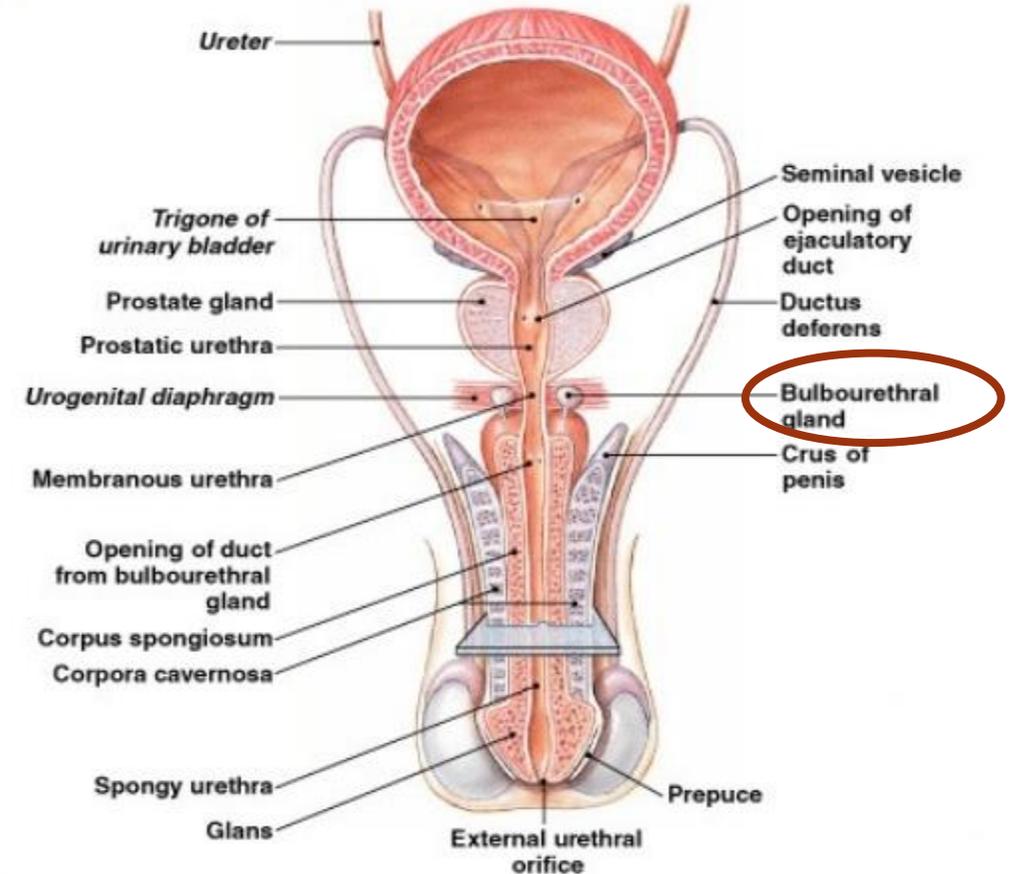
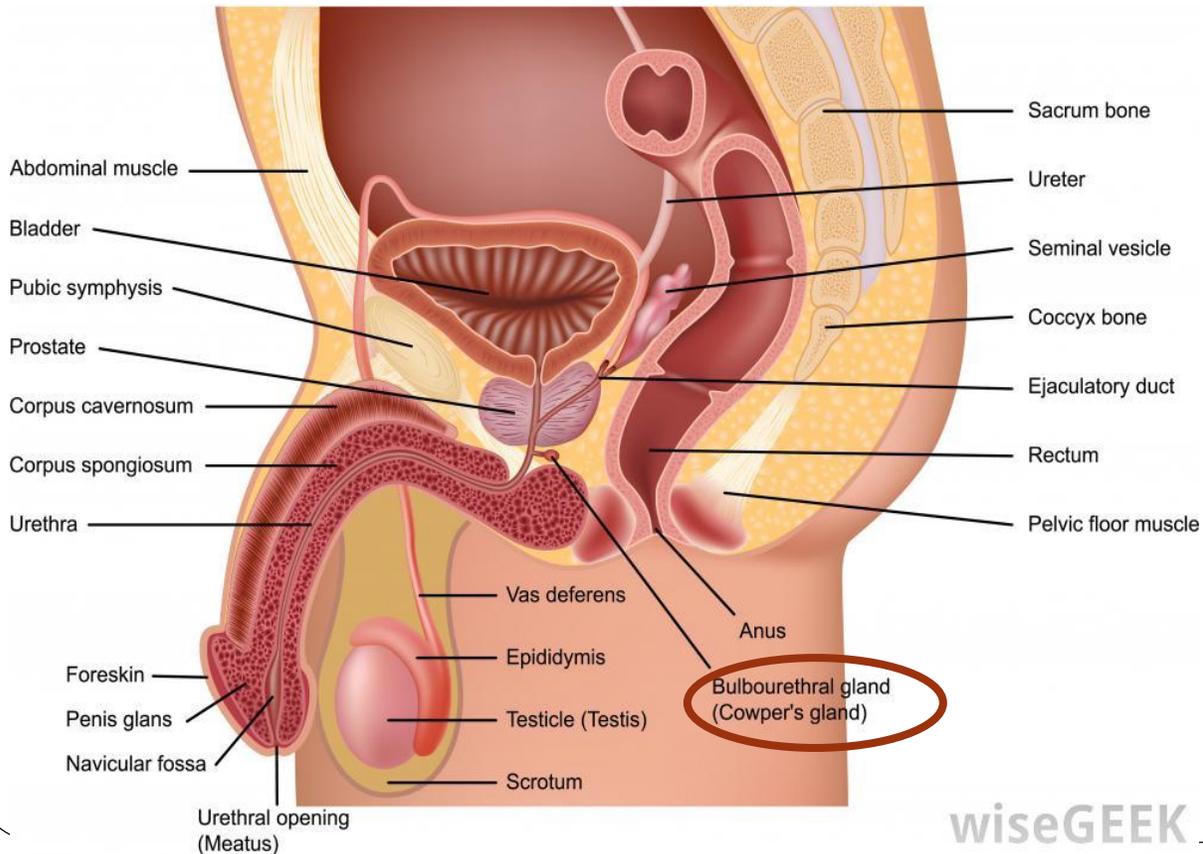
Ejaculatory Ducts :

- Each is about 2 cm long, formed by union of the ductus deferens and the duct of the seminal vesicle.
- The two ducts run antero-inferiorly between median and posterior lobes of the prostate along the sides of the prostatic utricle to open on the seminal colliculus of the prostatic urethra.



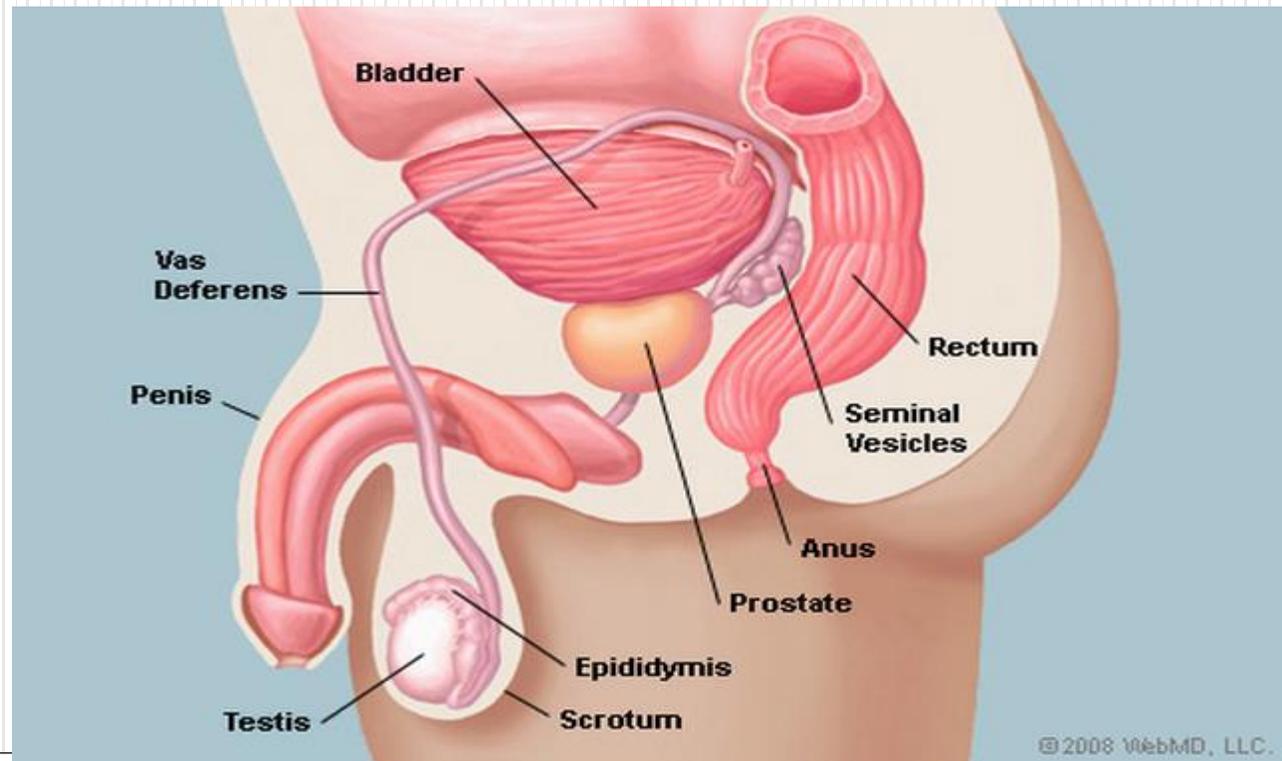
Bulbourethral Glands :

- These small glands lie lateral to the membranous urethra in the **deep perineal pouch**
- Each gives rise to a long duct (3 cm) which pierces the perineal membrane to open on the floor of the spongy part of the urethra.
- **Blood supply:** by artery of the bulb of the penis.
It is innervated by prostatic nerve plexus
- **Function :** It secretes a an alkaline mucous secretion known as pre-ejaculate.



The Prostate

It is an accessory gland of male reproductive system, which surrounds the prostatic urethra



Site : it lies in the lower part of the lesser pelvis behind the inferior border of the pubic symphysis in front of the rectum, below neck of the bladder.

Shape and Description:

It simulates an inverted cone which has a base (directed superiorly); an apex (directed inferiorly), four surfaces: anterior, posterior, and two inferolateral surfaces.

1- Base of the prostate :

- It is directed upwards, separated from the bladder by a groove contains part of the prostatic venous plexus.
- It is pierced by the urethra.

2- Apex of the prostate:

- Is directed downwards
- It rests on the perineal membrane (roof of the deep perineal pouch).
- The urethra emerges from the prostate anterosuperior to the apex.

3-Anterior surface:

- It is convex and lies behind the lower part of the symphysis pubis.
- Its upper part is connected to the pubic bodies by puboprostatic ligaments.

4- Posterior surface:

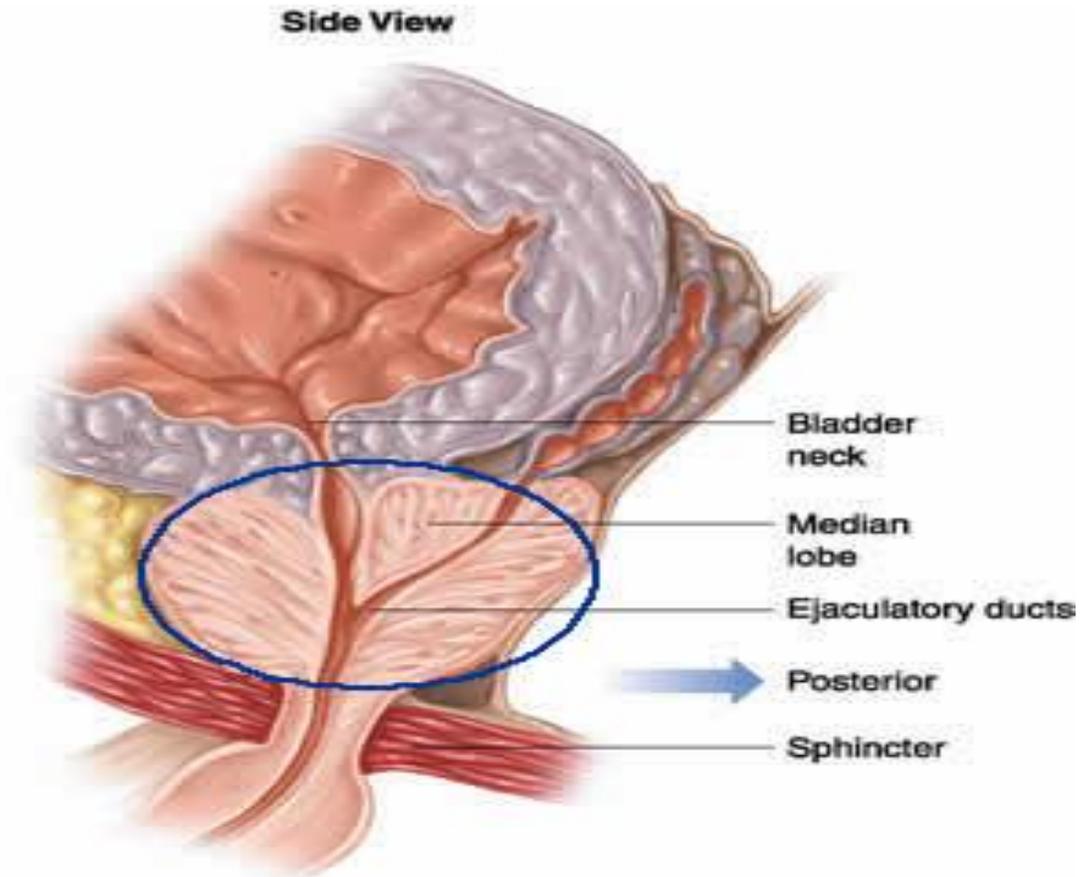
- It is nearly flat and is related to ampulla of the rectum separated from it by rectovesical fascia (fascia of Denonvilliers)
- The prostate is easily palpated by a finger in the rectum (the rectovesical fascia is attached above to the floor of rectovesical pouch and below to the perineal body).
- Near its upper border, this surface is pierced by the two ejaculatory ducts.

5- Right and left inferolateral surfaces:

- Are convex and related to levator prostatae parts of levator ani muscle.

Structures that traverse the prostate :

- ❖ Prostatic urethra.
- ❖ The two ejaculatory ducts descend anteroinferiorly to open in the prostatic urethra
- ❖ The gland contains the utricle.



Lobes of the prostate:

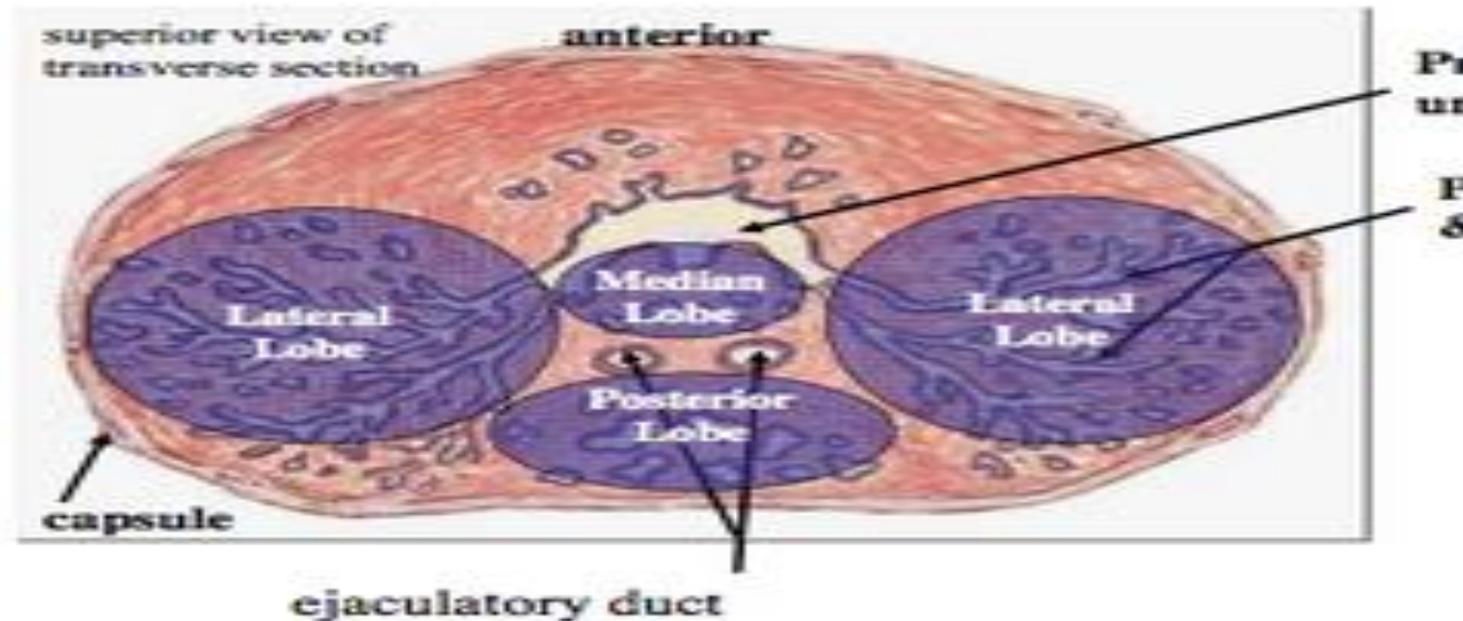
By means of the prostatic urethra and the two ejaculatory ducts, the prostate is divided into five lobes;

Anterior lobe (isthmus): lies in front of the prostatic urethra.

It consists a fibromuscular tissue with little glandular tissue.

Right and left lateral lobes : one on each of the prostatic urethra.

They are the usual sites for the senile enlargement of the prostate.



Posterior lobe : lies behind the prostatic urethra, but below the two ejaculatory ducts.

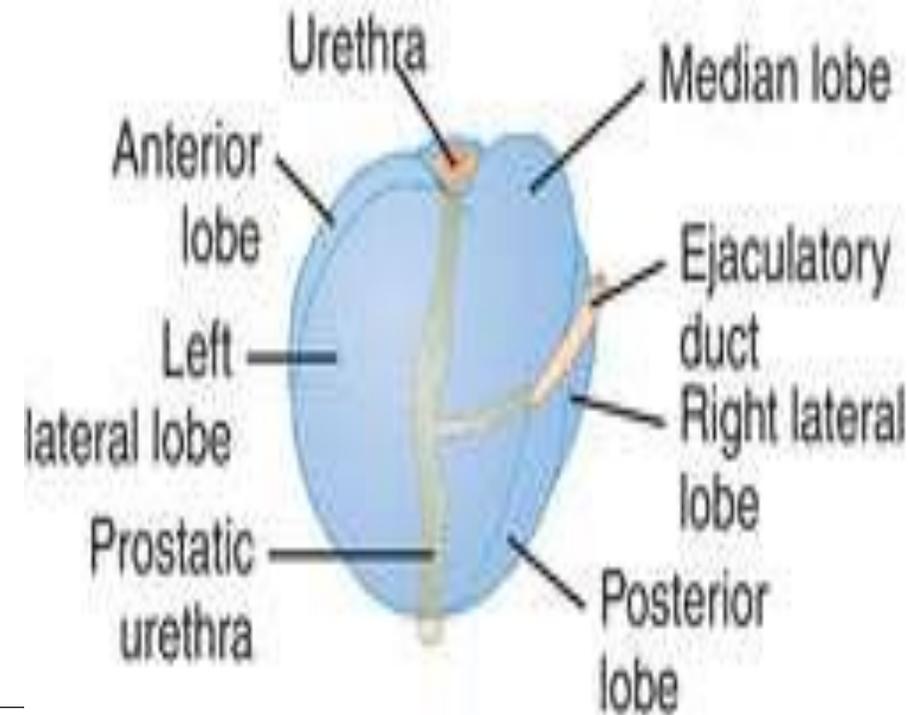
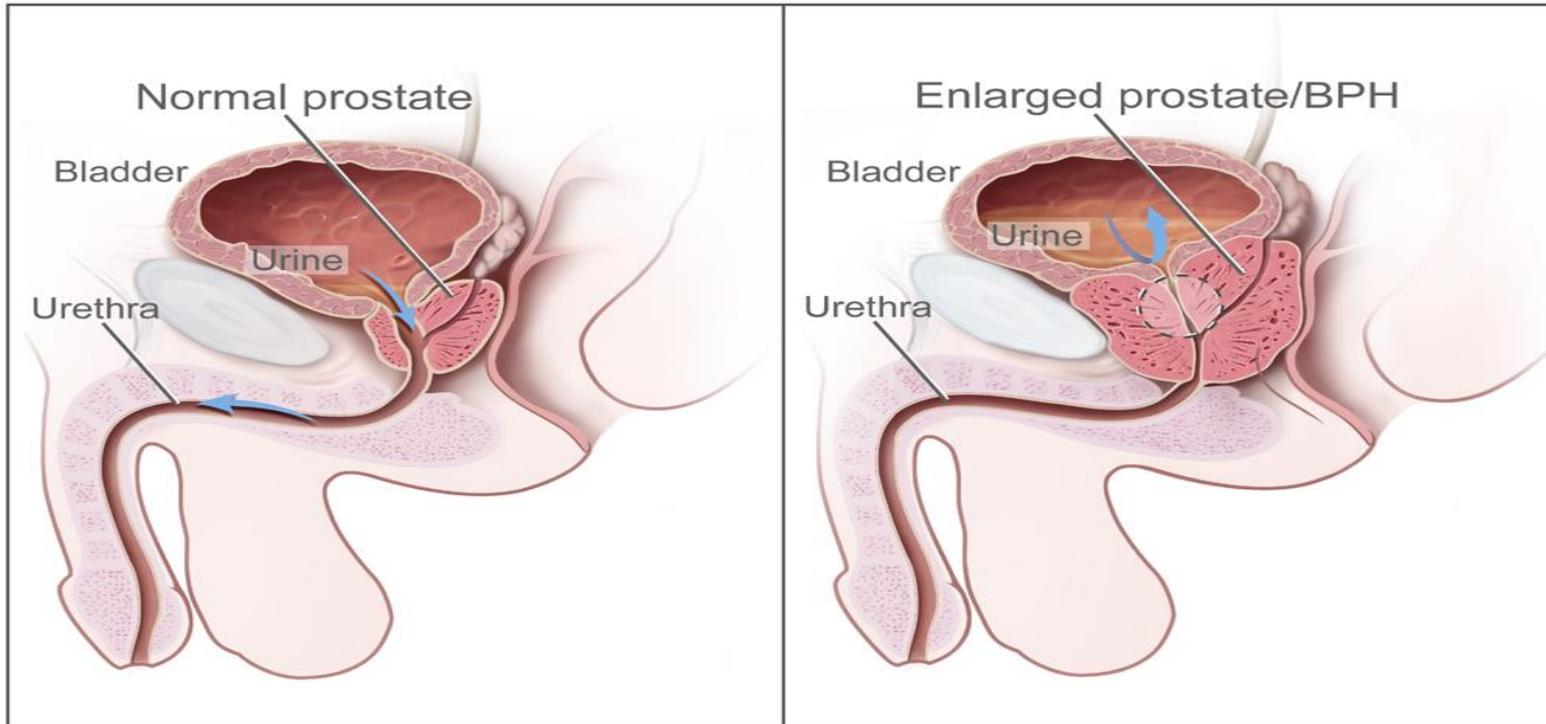
It is the usual site for cancer prostate.

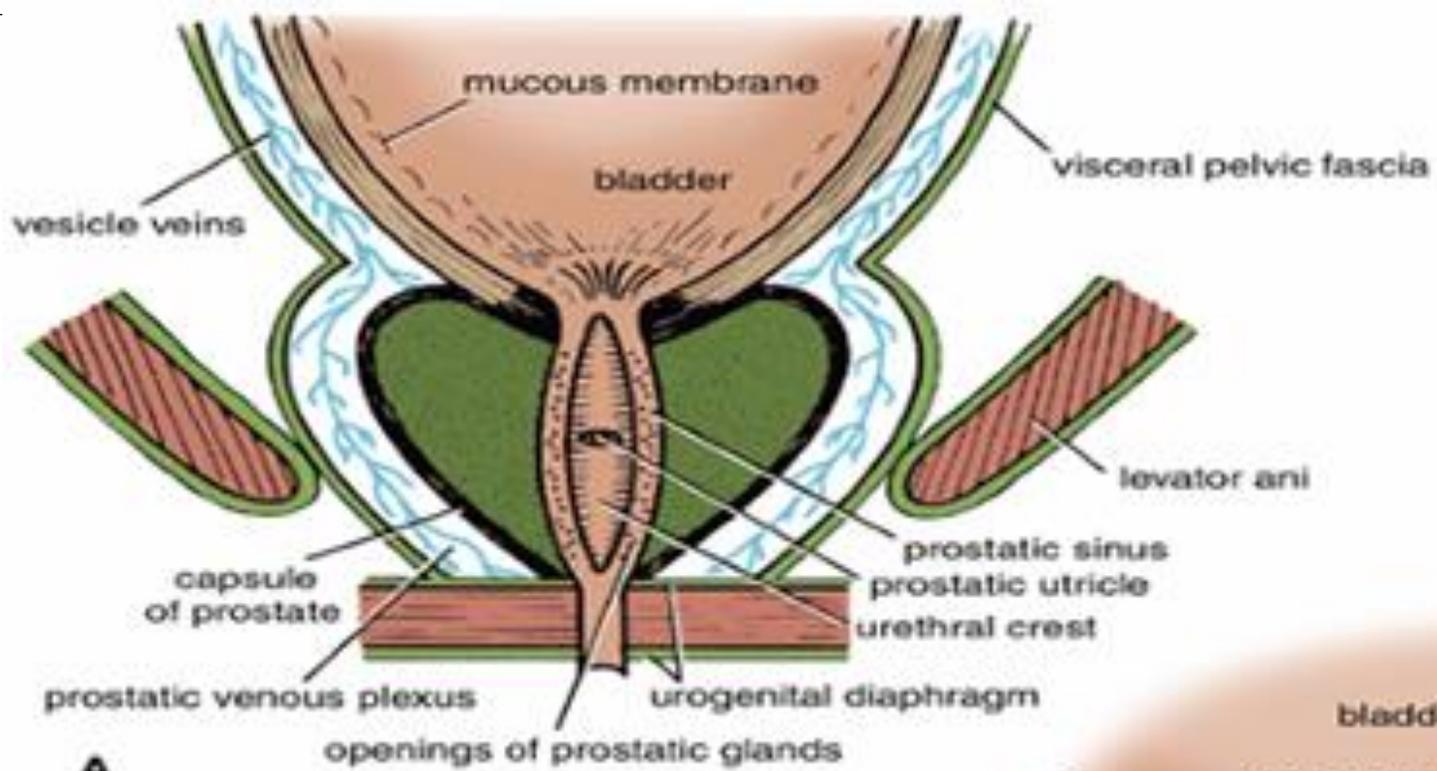
Median lobe: Lies between the upper part of prostatic urethra and the two ejaculatory ducts.

After middle age, it produces uvula vesicae, in the lower part of the bladder trigone .

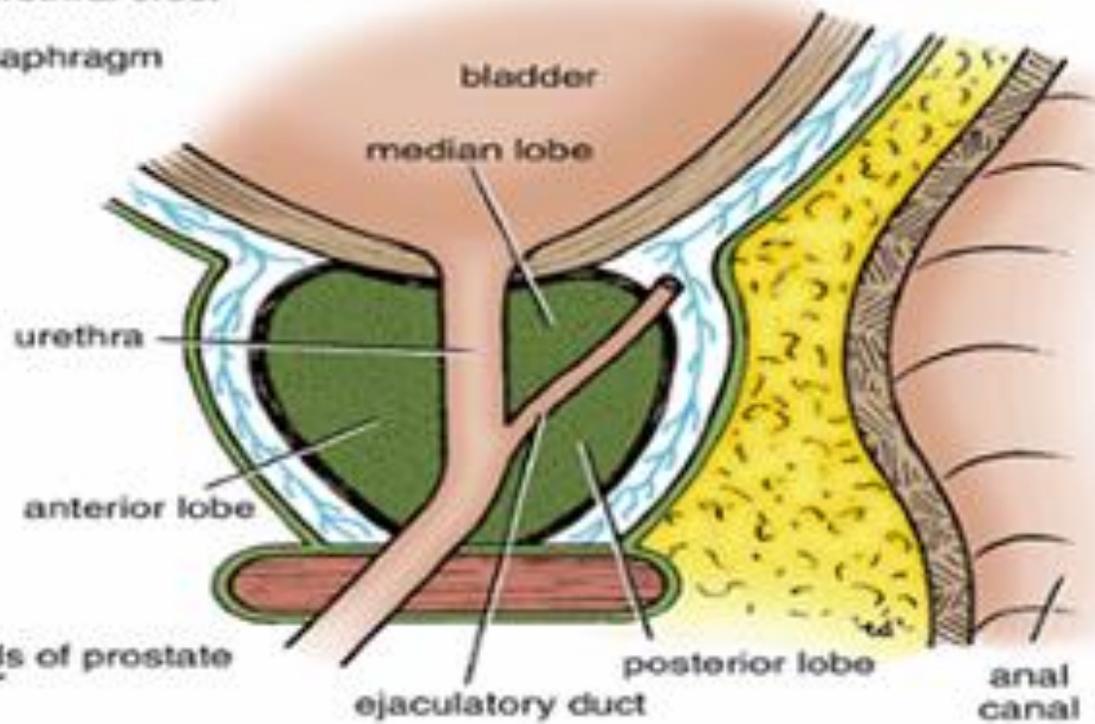
It is also a common site for senile enlargement of the prostate. (BPH)

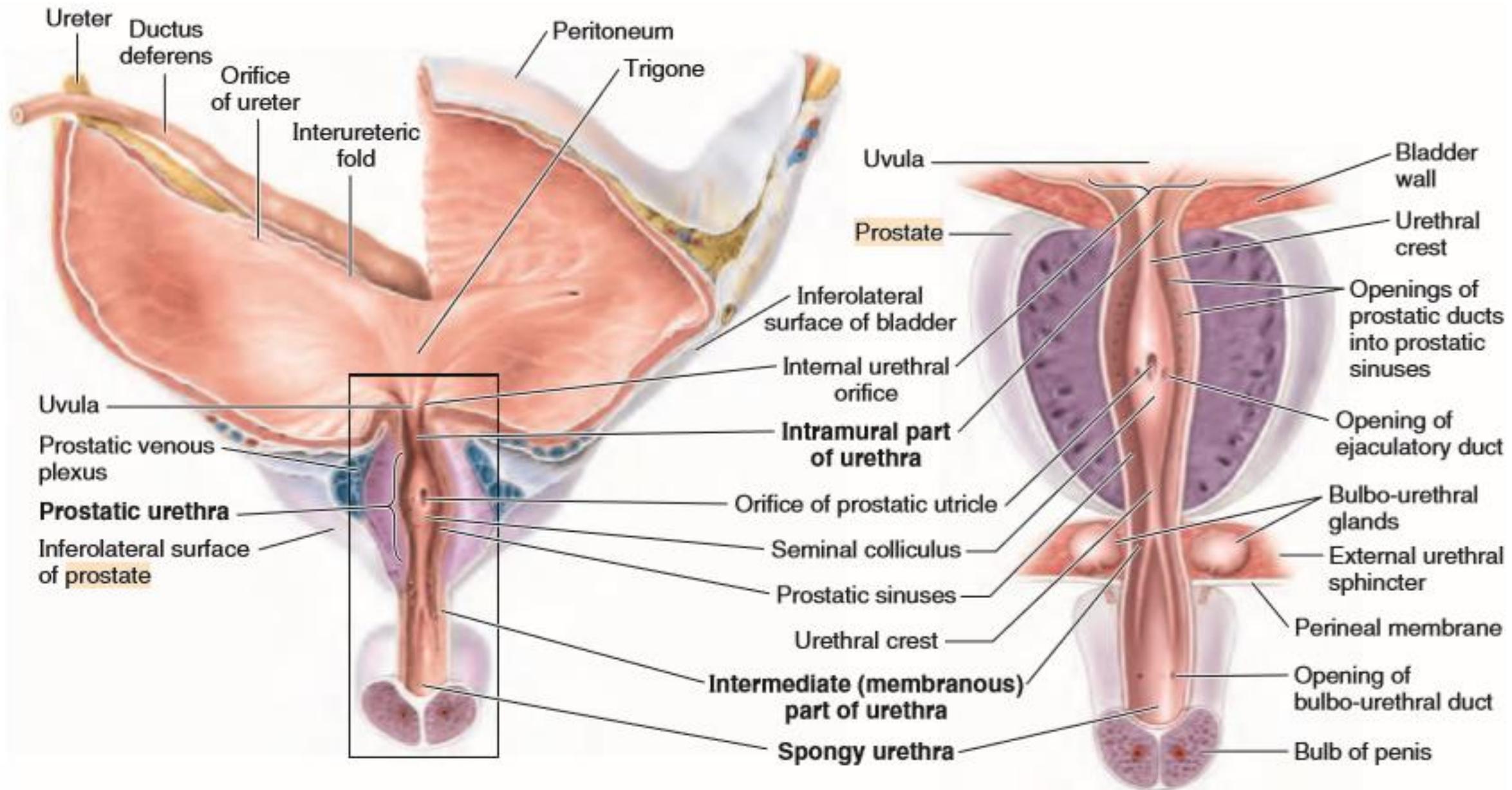
The uvula vesicae may obstruct the flow of urine at the internal urethral meatus.





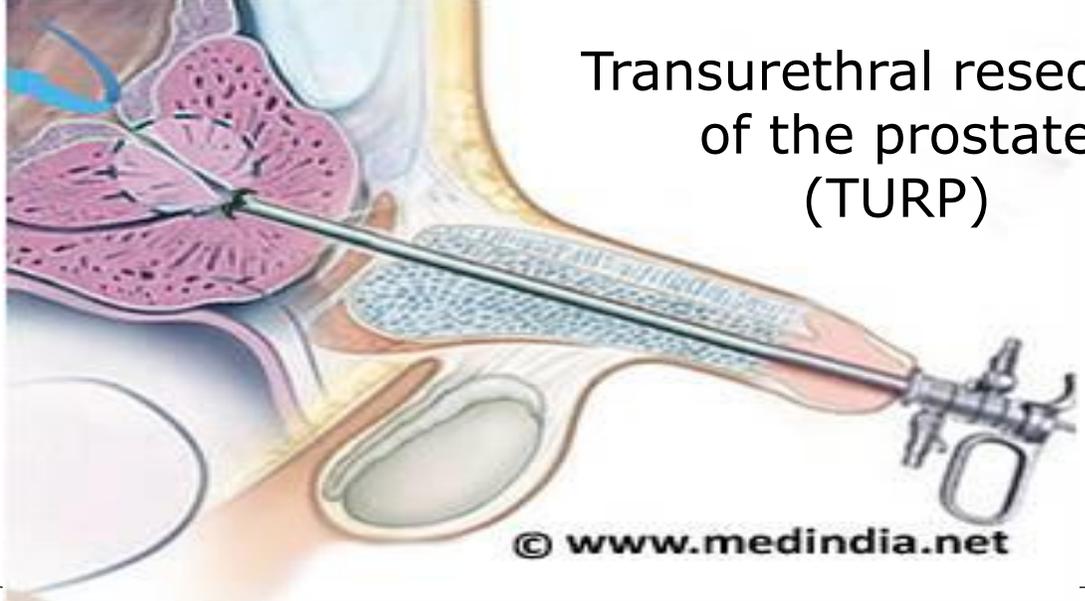
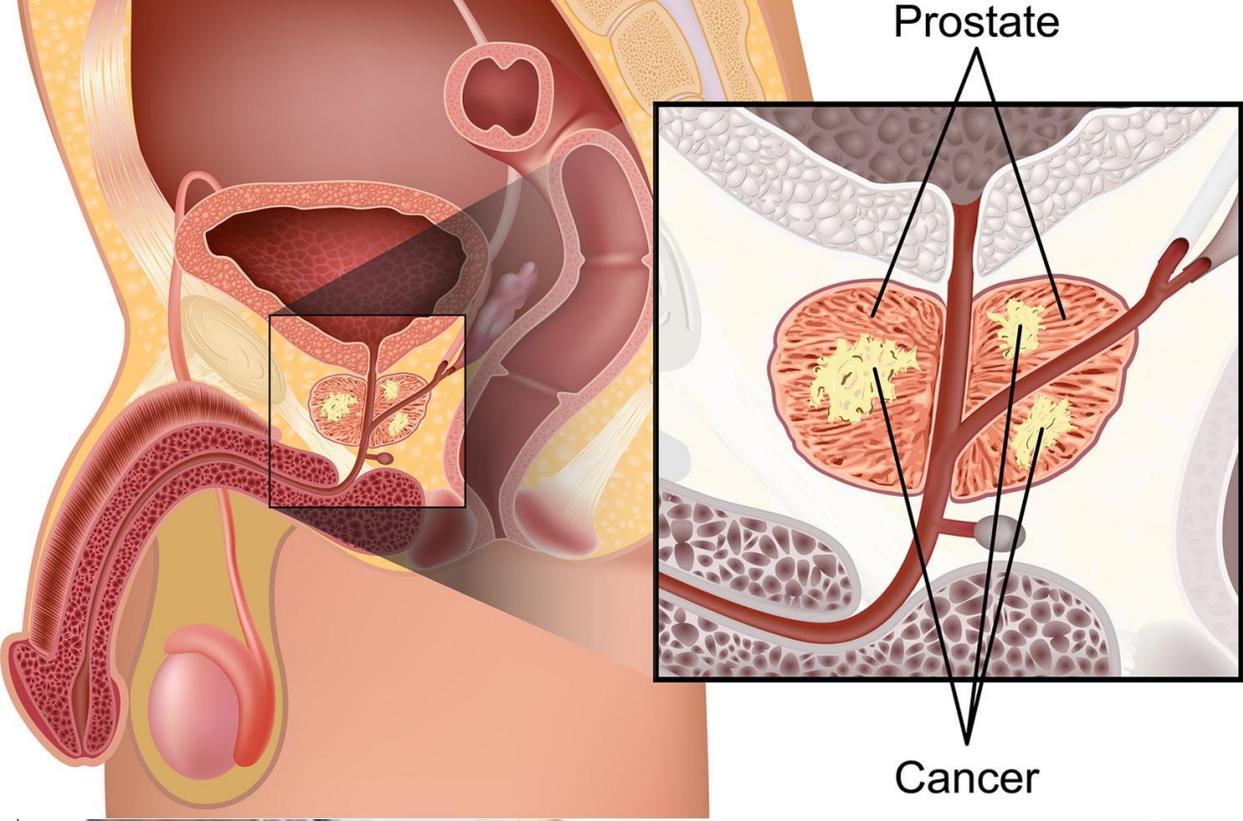
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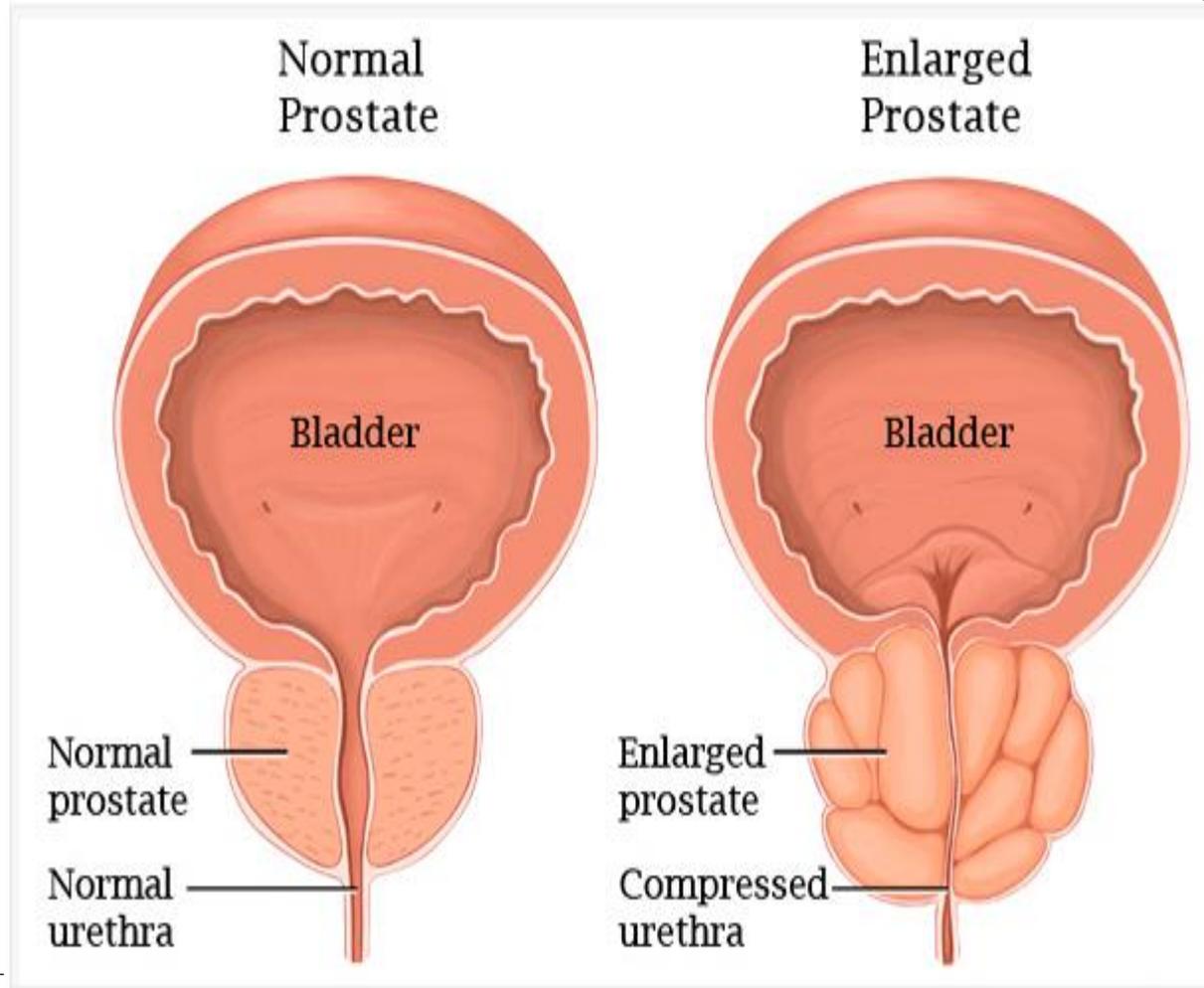


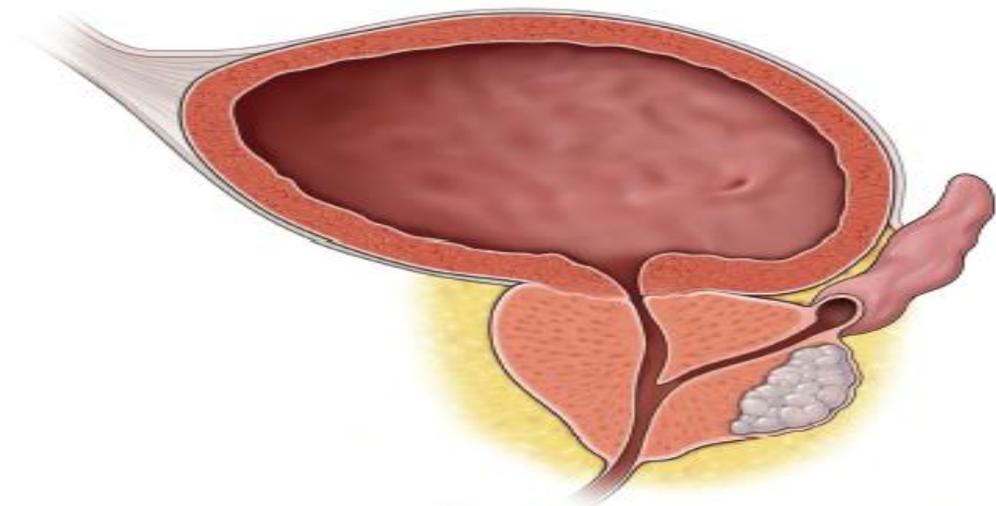
(A) Anterior view

(B) Diagrammatic enlargement of boxed area in (A)

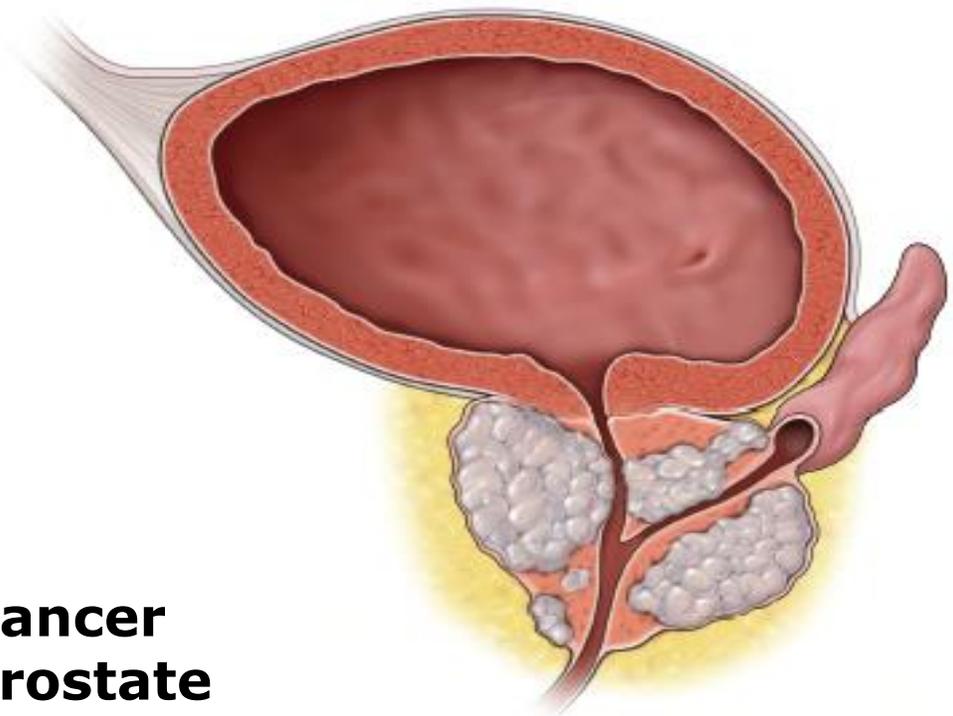
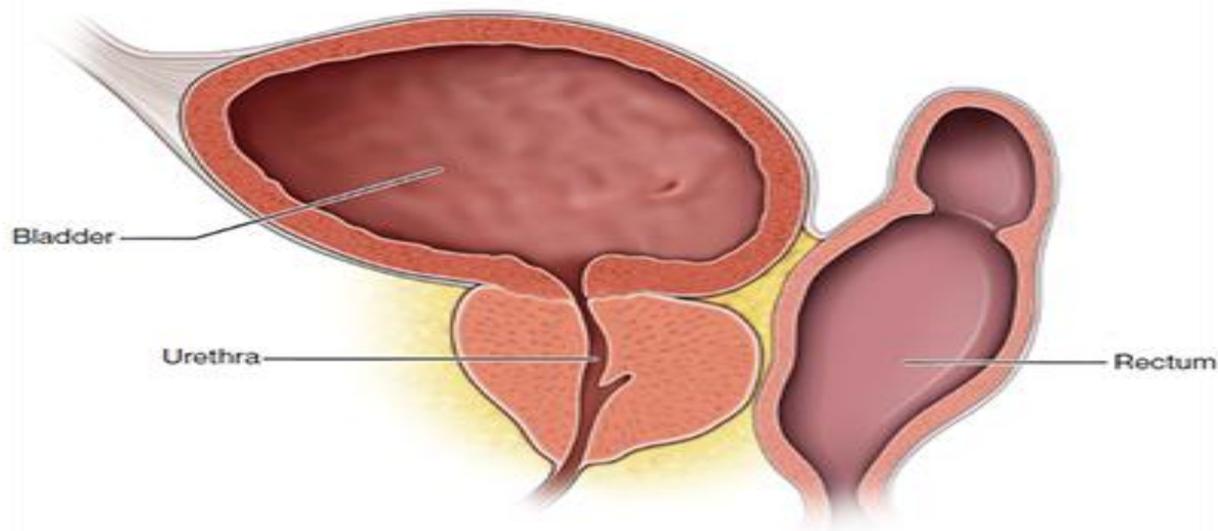


Transurethral resection
of the prostate
(TURP)

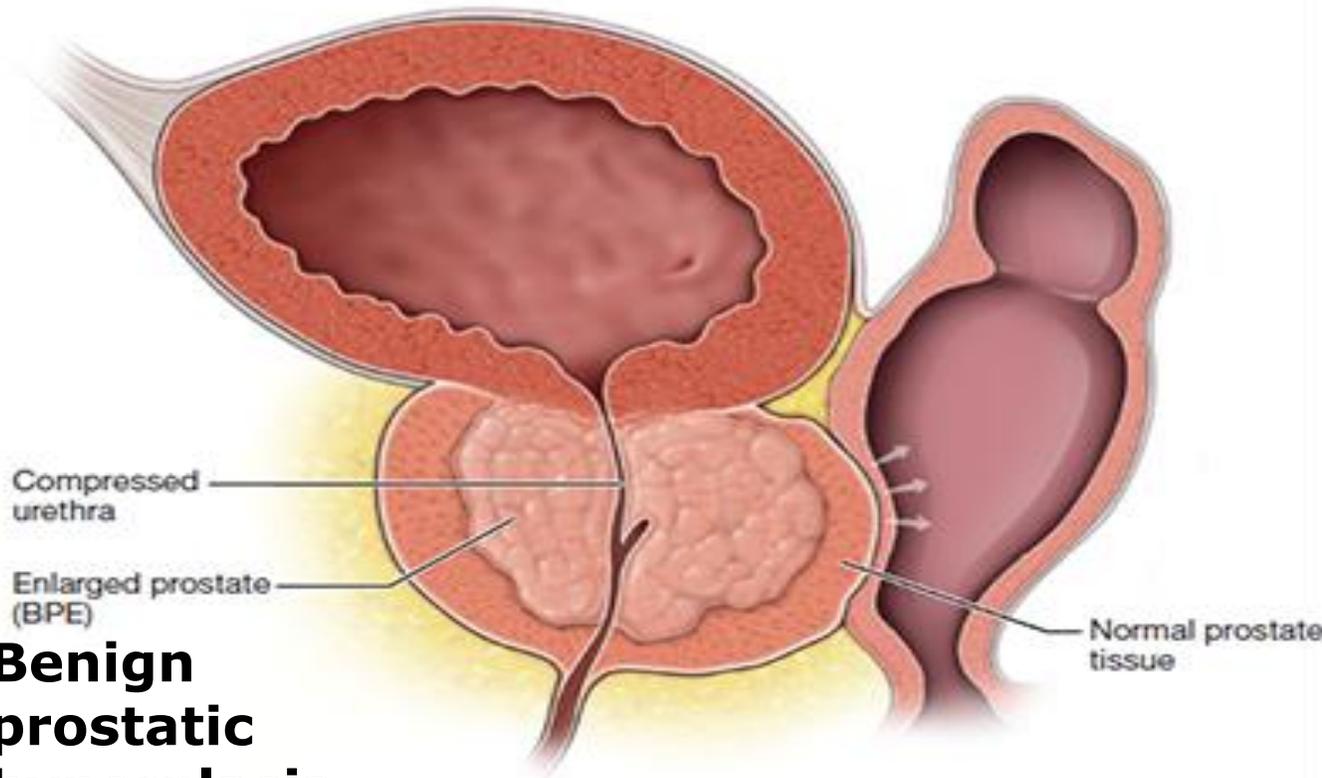




Prostate cancer



Advanced prostate cancer



Benign prostatic hyperplasia

Prostate with BPE

Cancer prostate

Blood Supply of the Prostate:

Arteries are derived from inferior vesical and middle rectal arteries.

Venous drainage : the veins form the prostatic venous plexus which has the following features :

- ❖ It is embedded between the two capsules of the prostate.
- ❖ It is present only in front and sides of the gland
- ❖ Superiorly, it is continuous with the vesical venous plexus.
- ❖ Anteriorly : it receives the deep dorsal vein of penis.

 Posterolaterally : the plexus is drained to the internal iliac veins which in turn communicates with the internal vertebral venous plexuses by the lateral sacral veins.

These veins are valveless and responsible for spread of cancer prostate to lumbar vertebrae

Lymphatic Drainage: to internal, external iliac lymph nodes.

Nerve Supply: by prostatic nerve plexus derived from the inferior hypogastric plexus.

The prostatic capsules:

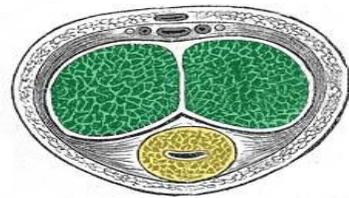
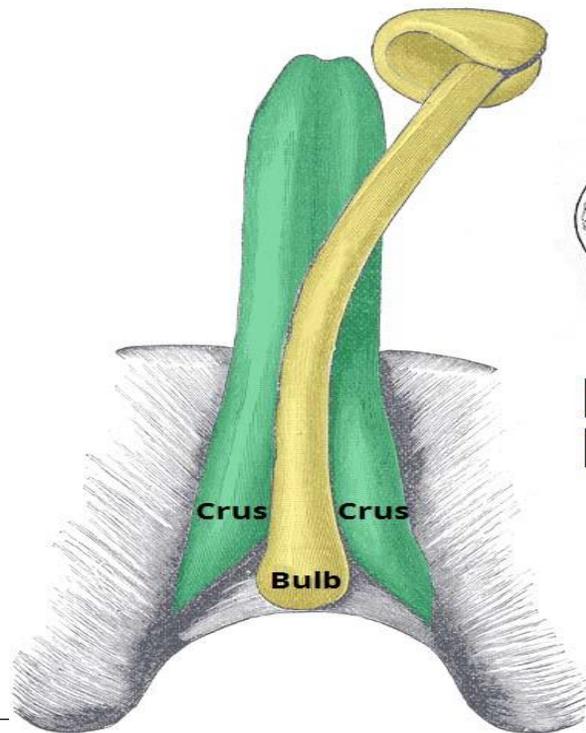
1. Inner true capsule : it is fibromuscular in structure.
2. Outer false capsule (prostatic sheath): it is a condensed visceral pelvic fascia.

Between the two capsules, lies the prostatic venous plexus.

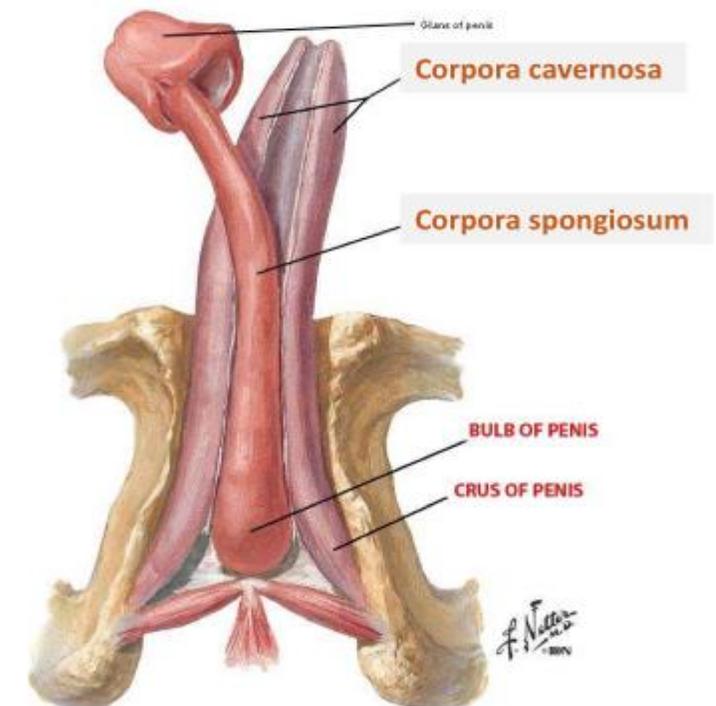
 Acid phosphatase and Prostate-Specific Antigen (PSA) are markedly elevated in prostatic diseases especially carcinoma

Penis

- ❖ It has a root (or attached portion) and a shaft (or free portion).
- ❖ The root is formed of 3 parts; two crura (right and left) and bulb of penis, all are present in the superficial perineal pouch of perineum .
- ❖ The **bulb** is covered on its outer surface by the **bulbospongiosus** muscles
- ❖ The shaft is formed of 3 columns of erectile tissue; two corpora cavernosa (right and left) and a median corpus spongiosum.
- ❖ Each **crus** is attached to the side of the pubic arch and is covered on its outer surface by the **ischiocavernosus** muscle.



 **Corpus cavernosa**
 **Corpus spongiosum**



The shaft of the penis

The body of the penis is essentially composed of three cylinders of erectile tissue enclosed in a tubular sheath of fascia (Buck's fascia).

A- The two corpora cavernosa:-

- They lie dorsally side by side in the shaft of penis.
- Each is firmly surrounded by fibrous tissue called tunica albuginea which also sends a median septum between the two
- Followed distally, the corpora cavernosa end in pointed projections within the cap-like glans penis of corpus spongiosum
- Followed proximally (towards the root of the penis), the two corpora cavernosa diverge from each other and each passes postero laterally to continue as the crus penis, which becomes firmly attached to the everted lip of the ischio pubic ramus
- The corpora cavernosa contain many irregular cavernous spaces which become filled by blood during erection.

B- The corpus spongiosum

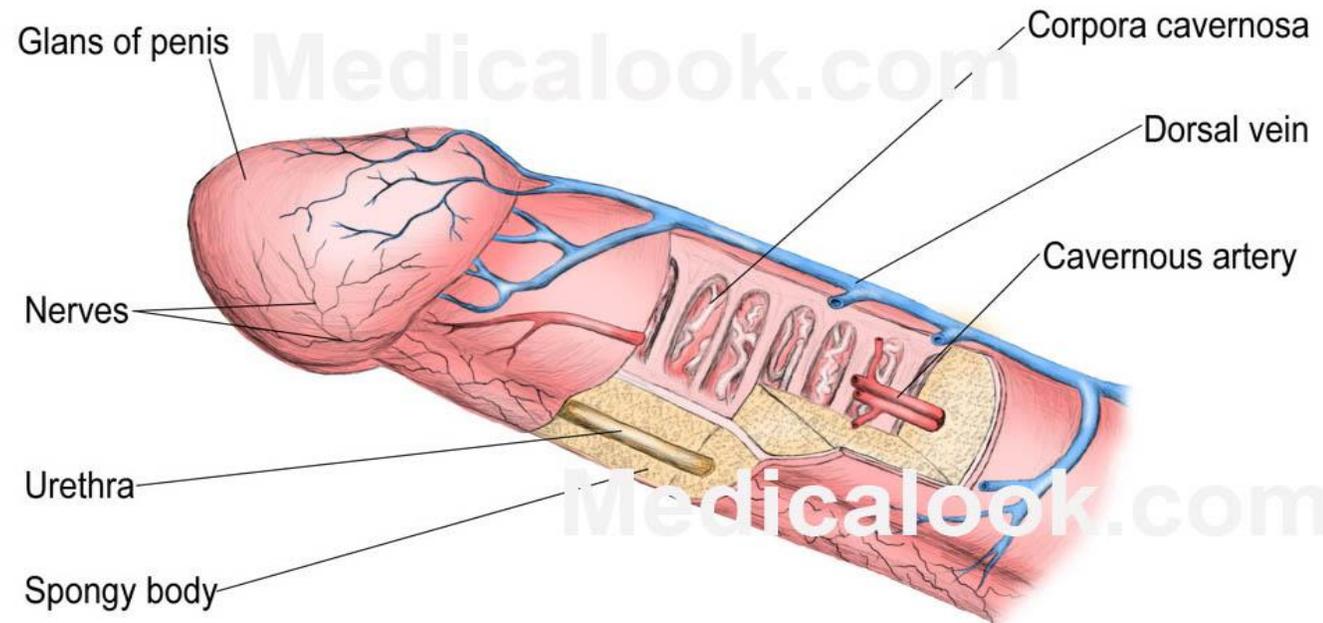
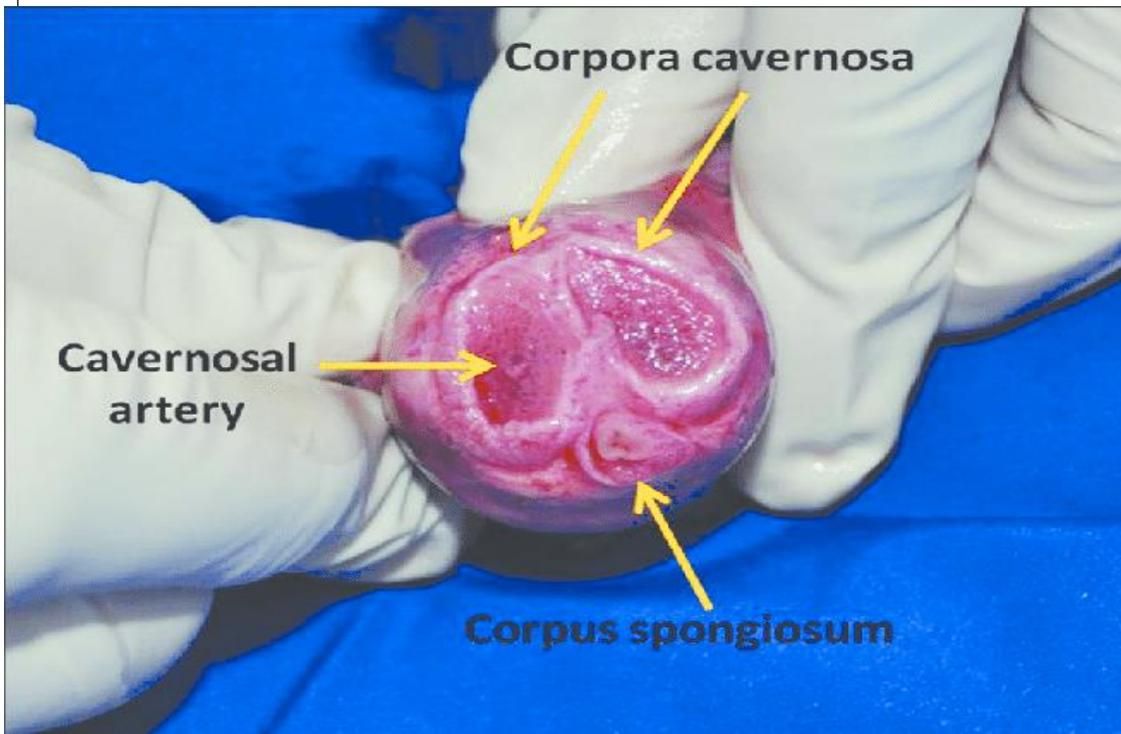
It is median and lies in the ventral surface of the two corpora cavernosa.

It is also surrounded by a separate sheath of tunica albuginea

Followed distally, it forms glans penis which fits over the distal ends of the corpora cavernosa. The base of the glans penis is called the corona glandis

Followed proximally (towards the root of the penis), it remains in the attached to the inferior surface of the perineal membrane.

The corpus spongiosum is traversed by the penile part of the urethra. It also contains cavernous tissue capable of erection.



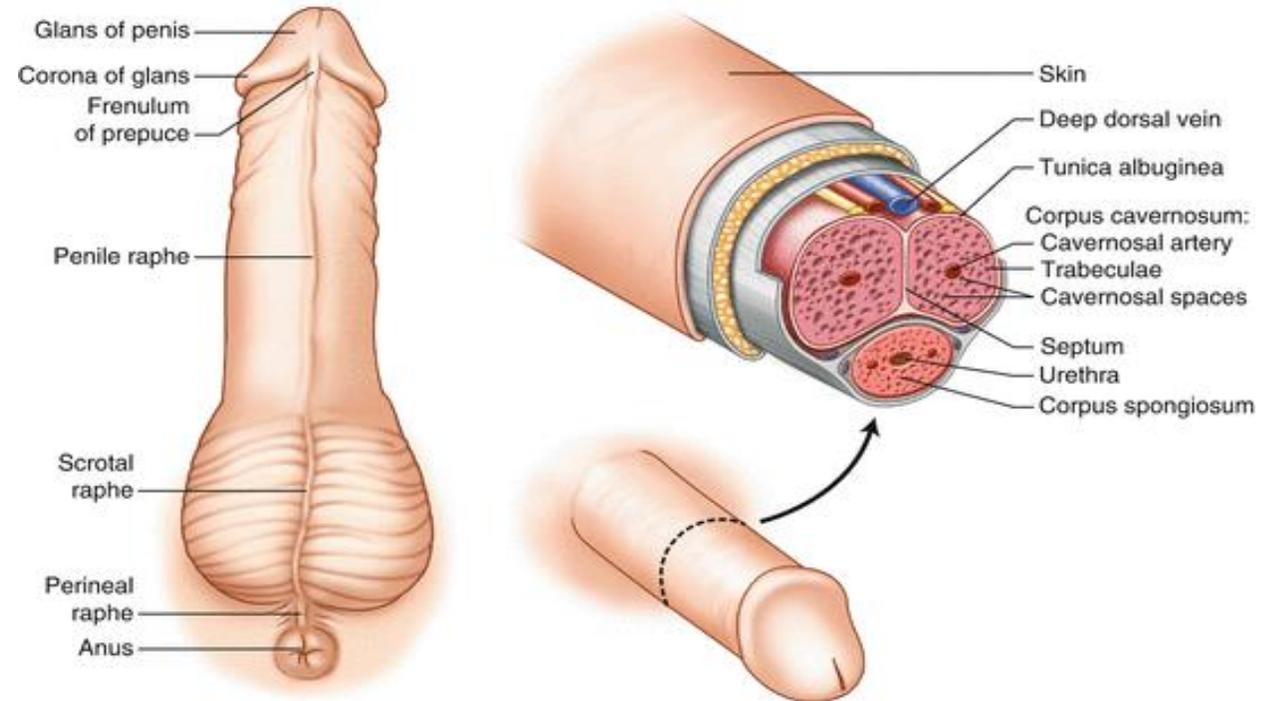
The skin of the penis

Followed distally, the skin forms a loose fold called the prepuce or foreskin which covers the glans.

The deep layer of this fold is attached to the coronary sulcus of the glans by frenulum. Followed proximally, the penile skin is continuous with skin of the scrotum.

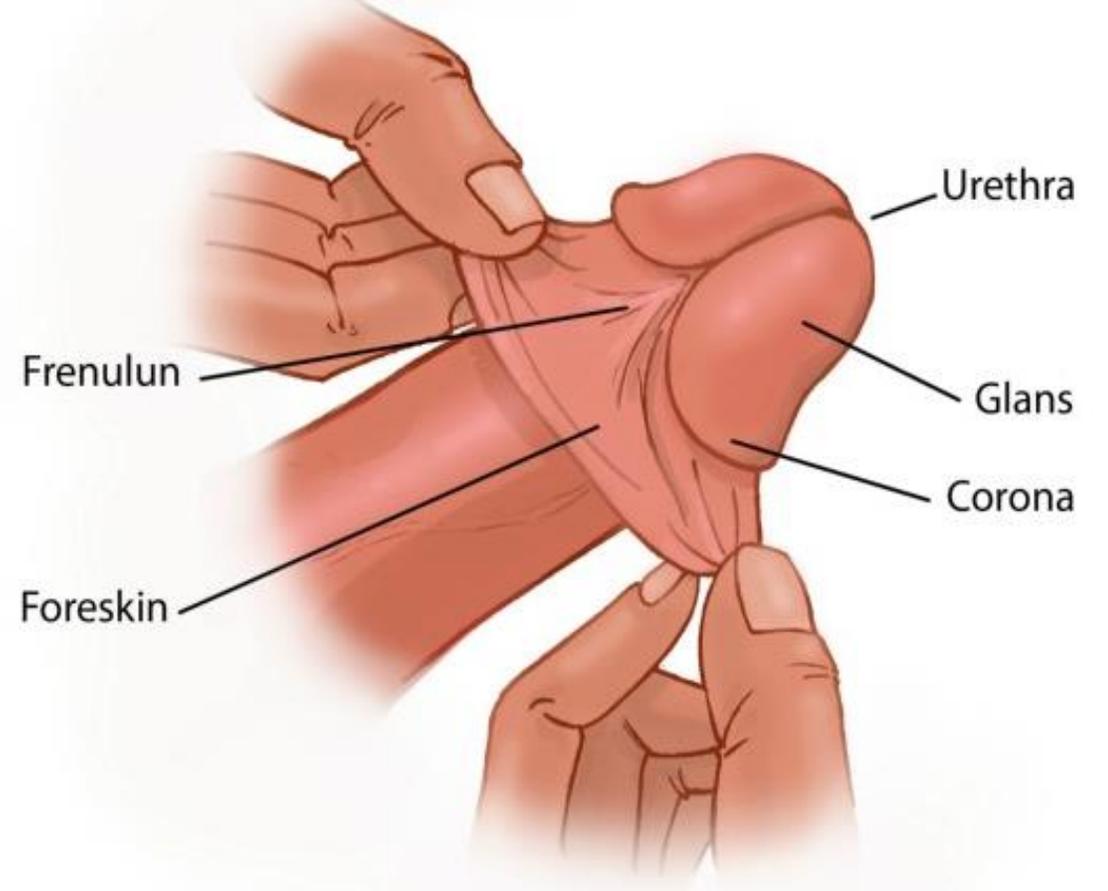
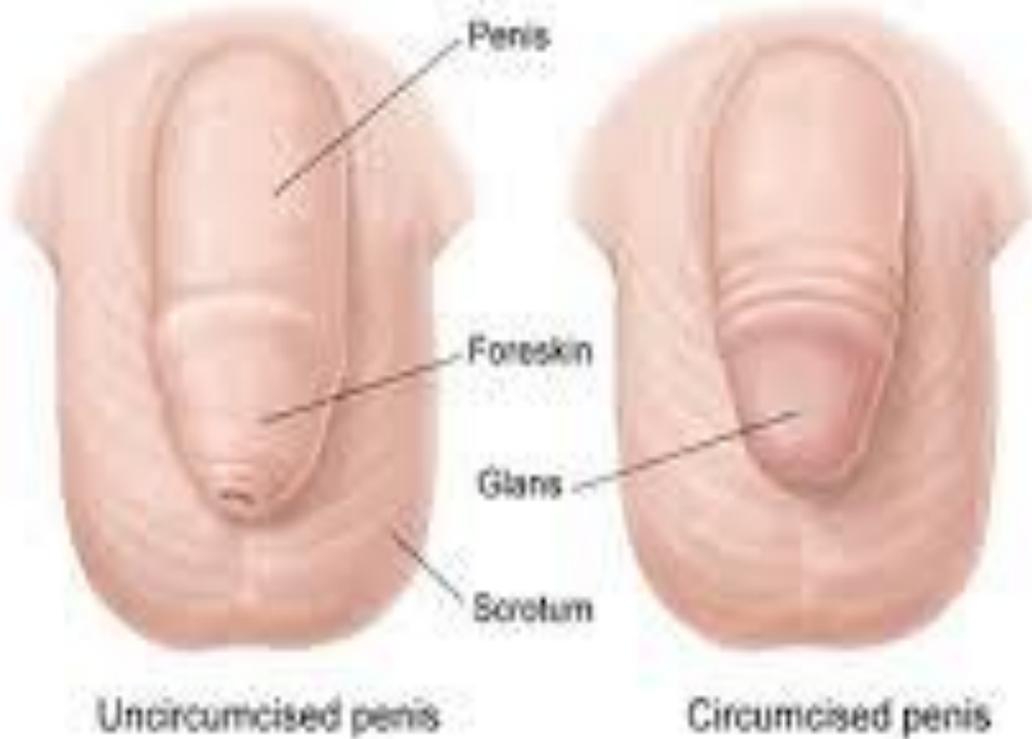
The fascia of the penis

The superficial penile fascia is devoid of fat (like the scrotum) but rich in loose connective tissue to allow free movement of skin over the shaft of penis.



Circumcision

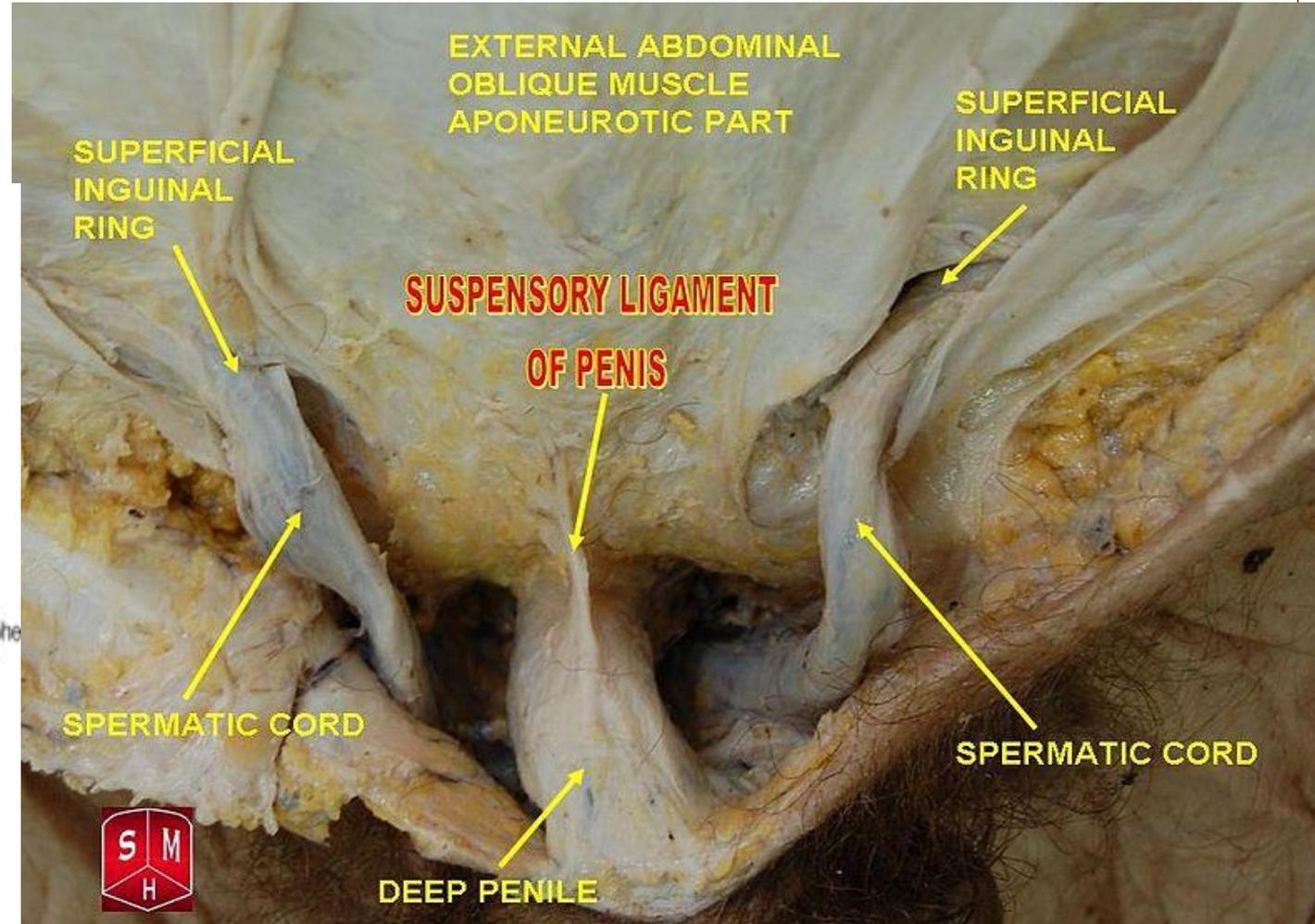
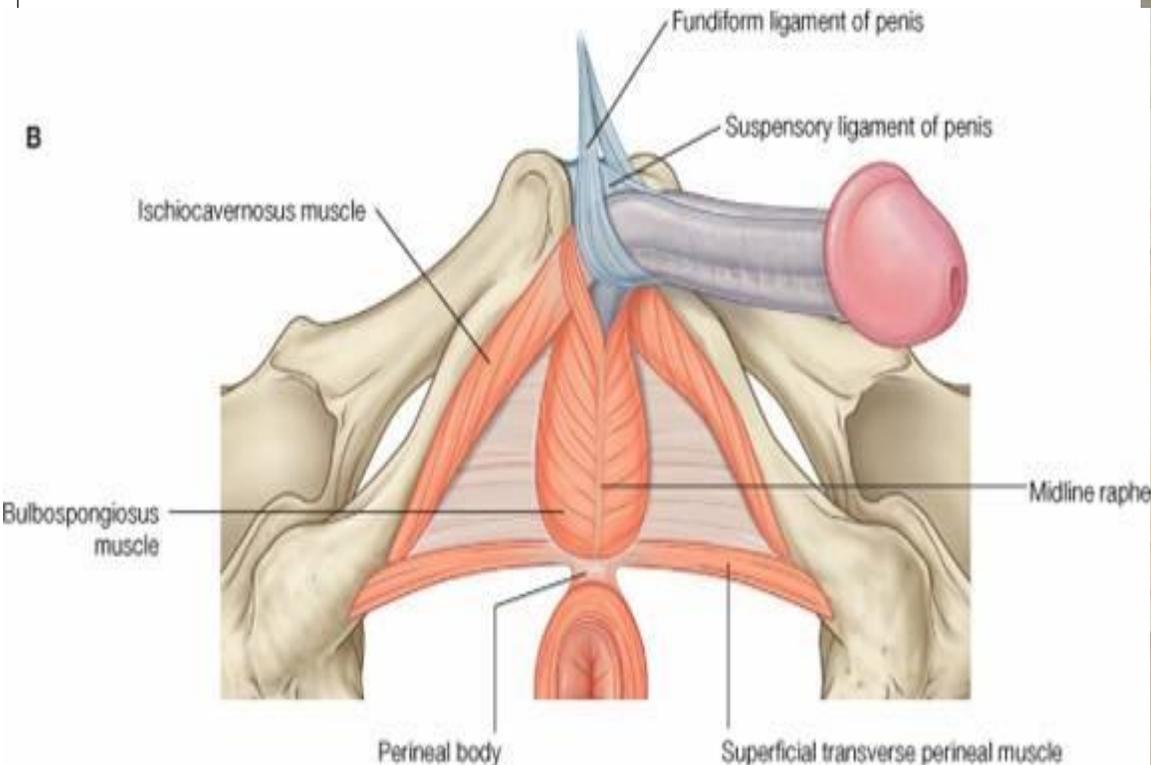
is the operation of removing the greater part of the prepuce, or foreskin.

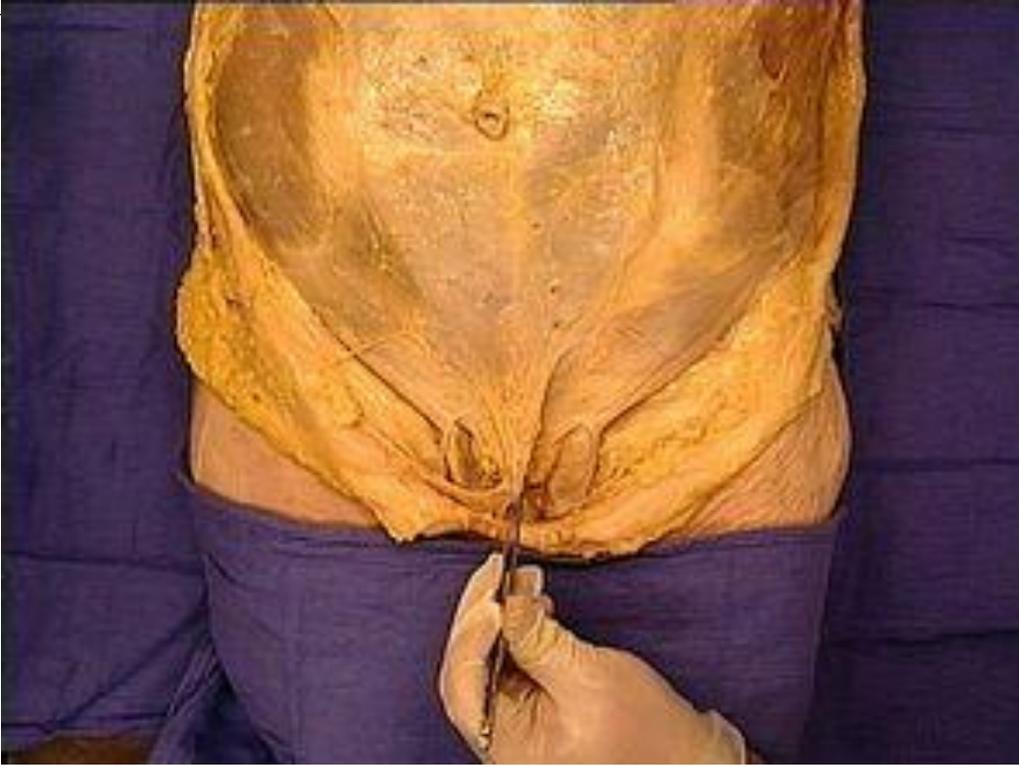


The ligaments of the penis

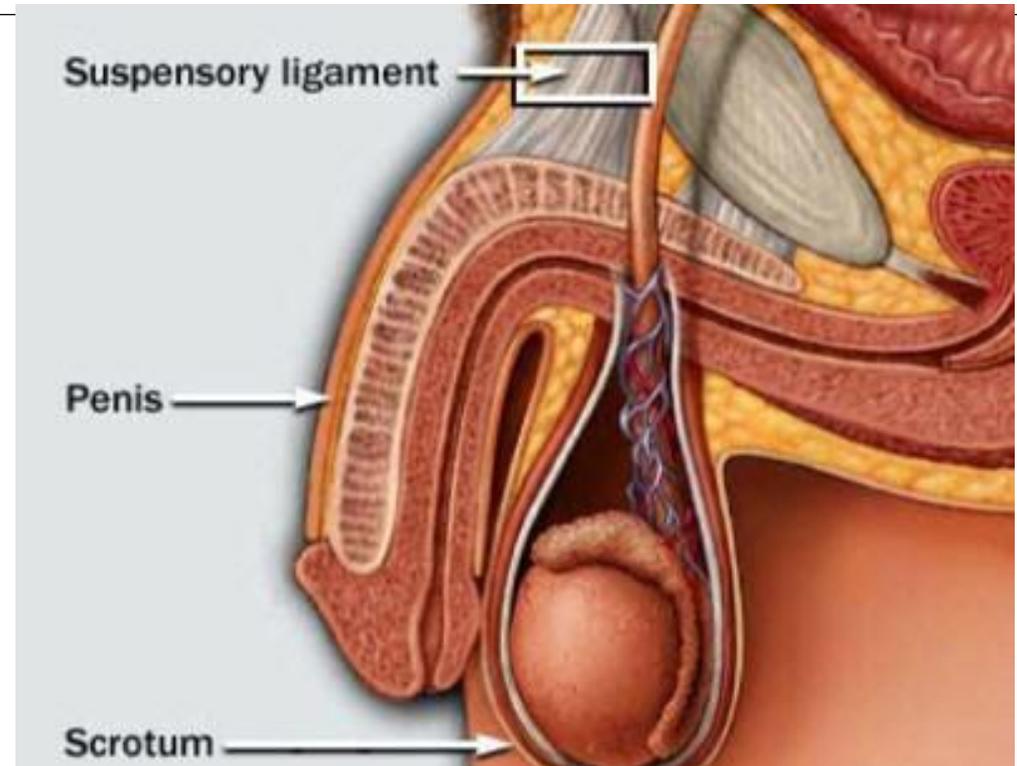
Fundiform ligament: arise from the lower part of the linea alba, its fibers split to surround the proximal part of the penile shaft to insert into the midline raphe of the scrotum.

Suspensory ligament: (deep to the fundiform ligament), extends from the symphysis pubis and blends below with fascia penis.





Fundiform ligament



Suspensory ligament

Arteries of the penis

All are branches of internal pudendal artery and all are paired (right and left).

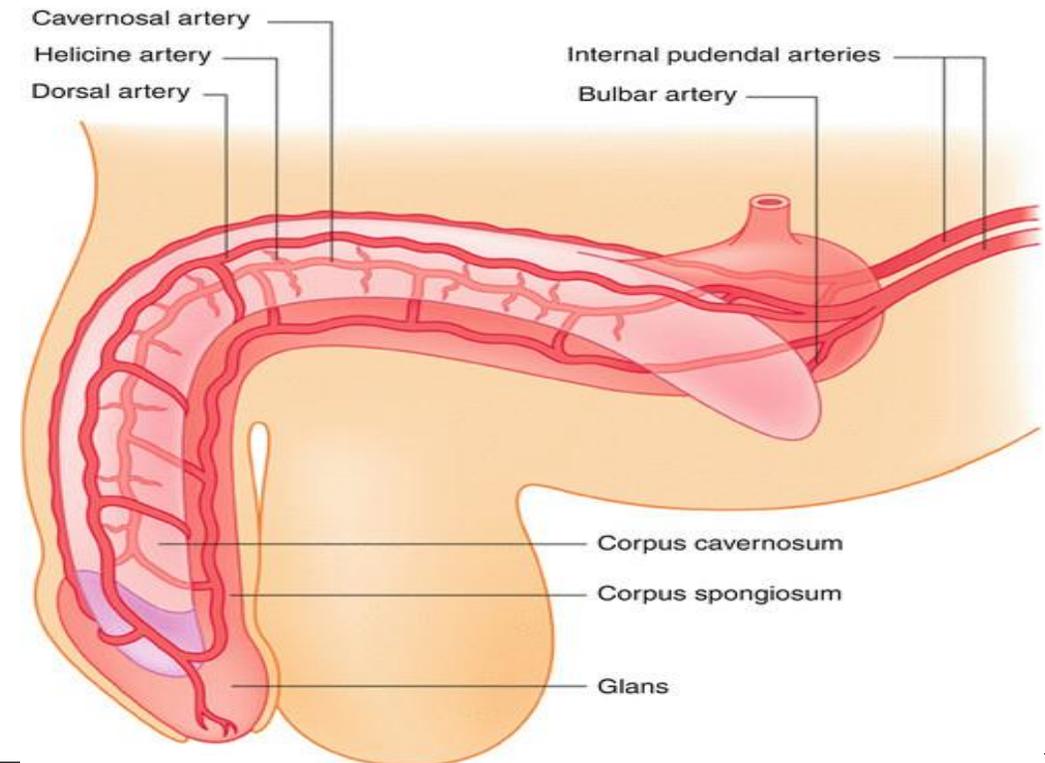
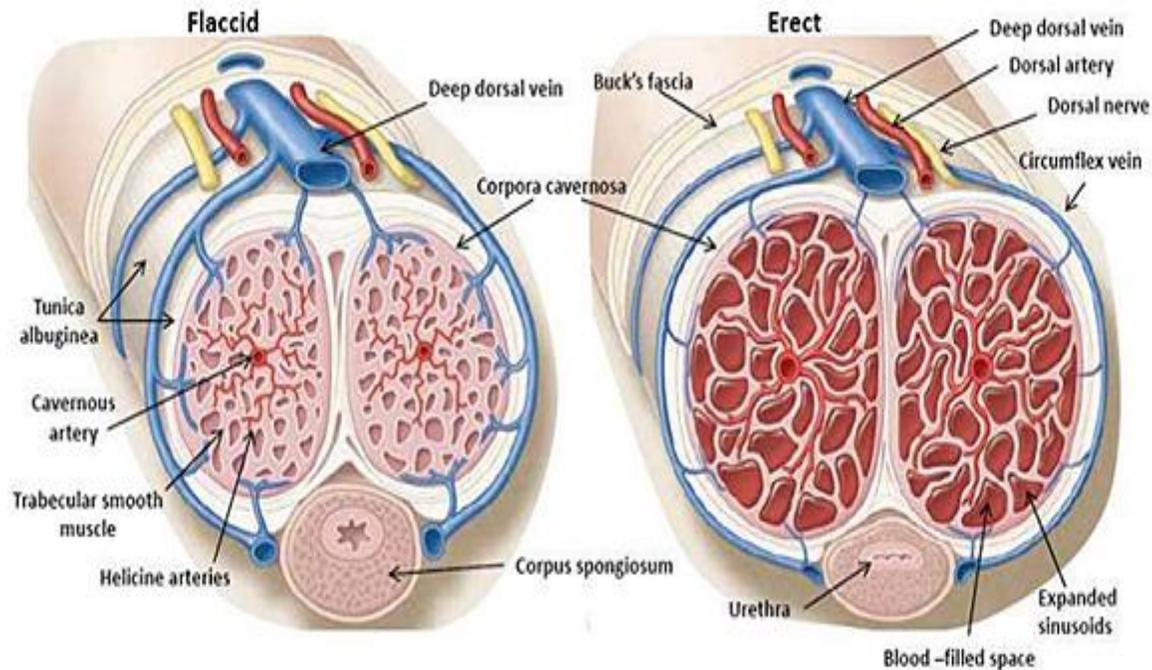
- **Dorsal artery** of the penis supplies the skin, fascia, and glans .
- **Deep artery** of the penis supplies the corpus cavernosum. with convoluted helicine arteries
- **Artery of the bulb** supplies the corpus spongiosum and glans penis

Venous drainage

By 2 dorsal veins which are superficial and deep;

1 . Superficial dorsal vein (superficial to the fascia penis); divides into right and left- Each ends in the corresponding superficial external pudendal vein.

2. Deep dorsal vein of the penis (deep to fascia penis), passes below symphysis pubis to terminate in prostatic venous plexus.



Lymph drainage

From the penis into **superficial inguinal lymph nodes** (with the scrotum).

From glans penis, lymphatics drain **directly** to gland of **Cloquet** in the femoral canal.

Nerves of the penis

1. Dorsal nerve of the penis (sensory), is a branch of pudendal nerve, runs **lateral** to the dorsal artery of the penis

2. Cavernous nerves (autonomic) arise from the inferior hypogastric plexus
,Parasympathetic fibers (S2,3,4) produce vasodilatation & erection of penis

THANK
YOU

