

**The University Of Jordan  
Faculty Of Medicine**



# 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**

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



**A 23 years old male patient complaining of dull recurring pain and swelling in his left scrotum .**

**What is your provisional diagnosis and why its on the left side .**

## 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 involuntary muscle fibers called dartos muscle .

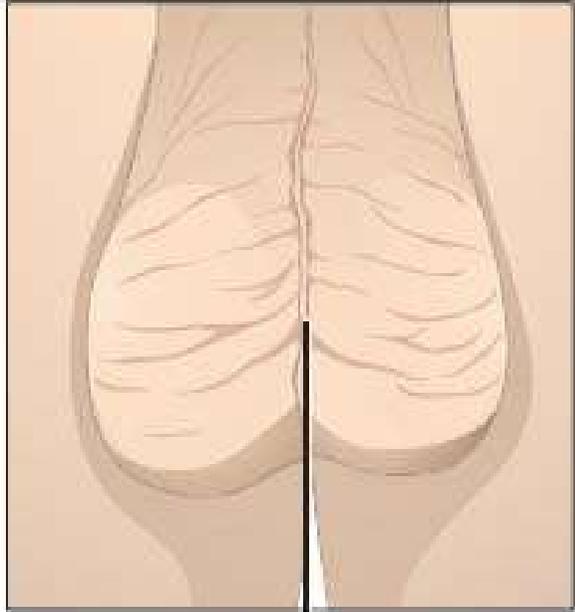
The muscle aids heat regulation of testis and scrotum.

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

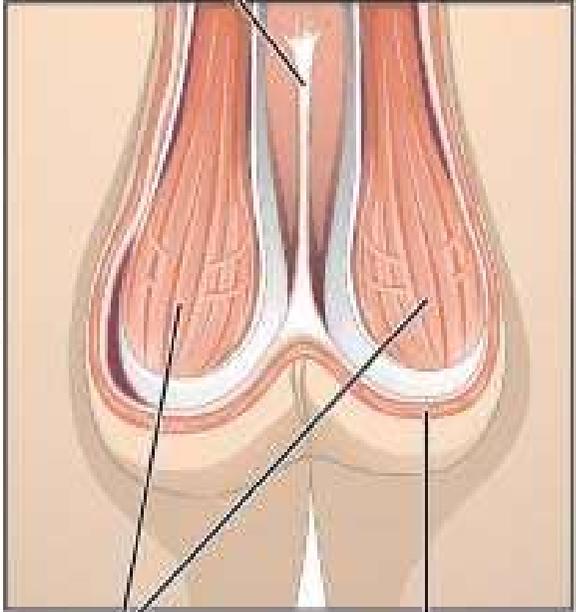
**External view of scrotum**

**Muscle layer**

**Deep tissues**



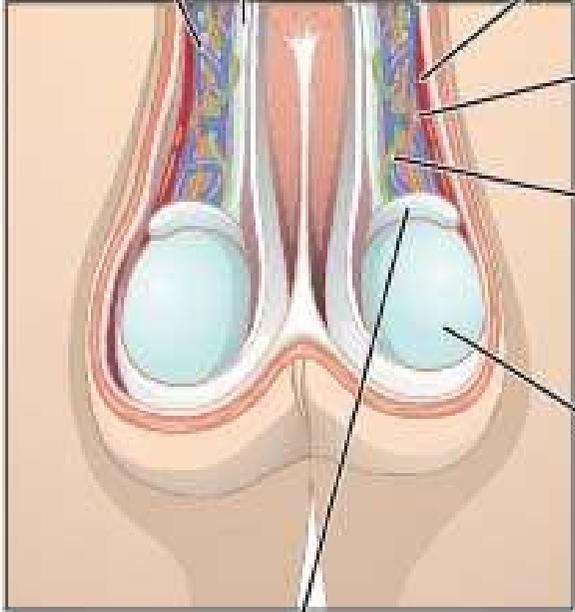
Raphe



Scrotal septum

Cremaster muscles

Dartos muscles



Plexus of testicular veins

Ductus deferens

Spermatic cord

Testicular artery

Autonomic nerve

Lymphatic vessel

Testis

Epididymis

## 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 :

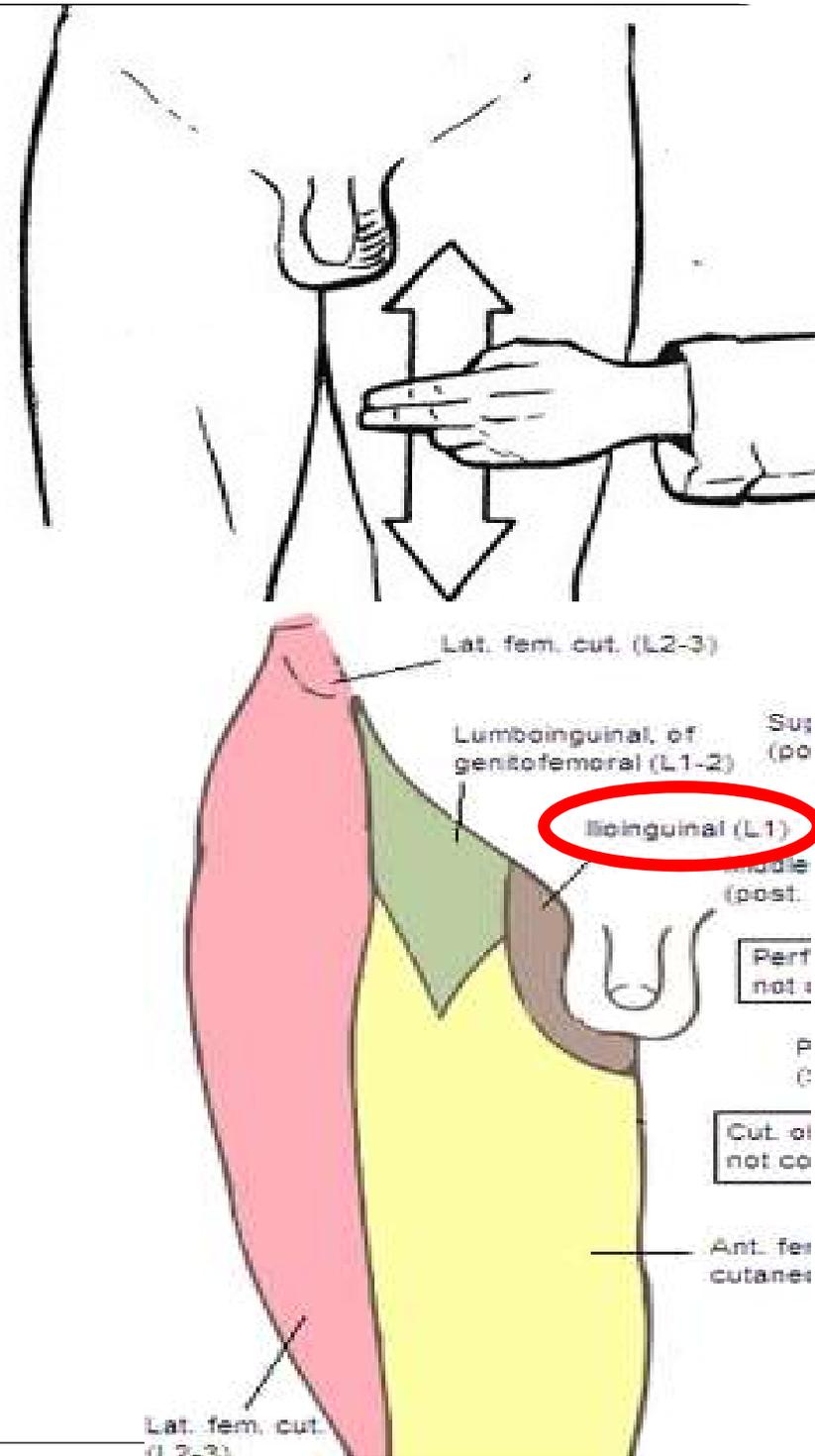
Contraction of the cremaster muscle is caused by lightly stroking the skin on the medial aspect of the superior part of the thigh leads to rapid elevation of the testis on the same side

### **Afferent:**

Ilioinguinal nerve

### **Efferent :**

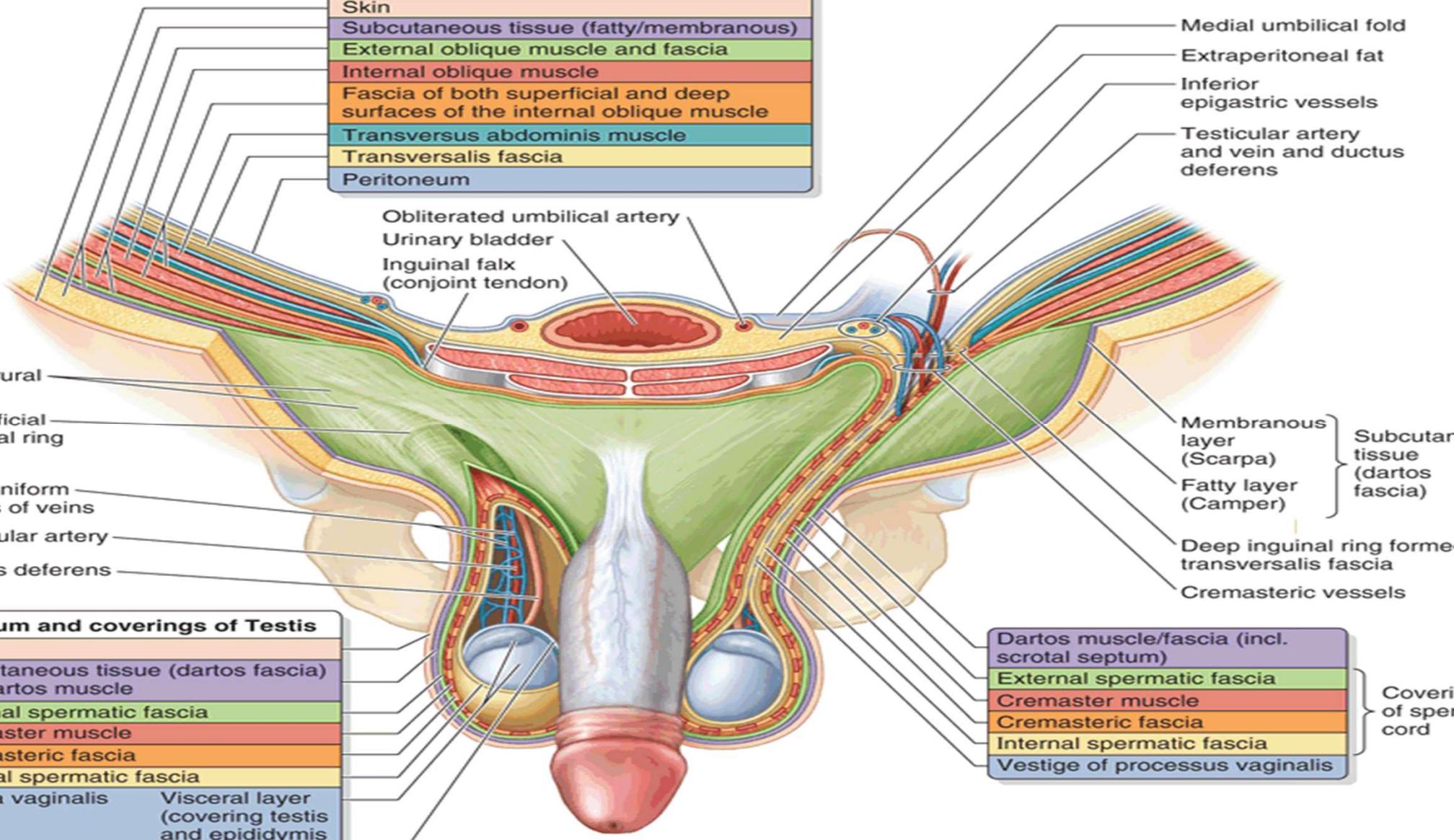
Genital branch of the genitofemoral nerve



## 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	Cremasteric 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

Layers of anterior abdominal wall	
Skin	
Subcutaneous tissue (fatty/membranous)	
External oblique muscle and fascia	
Internal oblique muscle	
Fascia of both superficial and deep surfaces of the internal oblique muscle	
Transversus abdominis muscle	
Transversalis fascia	
Peritoneum	



Obliterated umbilical artery  
 Urinary bladder  
 Inguinal falx (conjunct tendon)

Medial umbilical fold  
 Extraperitoneal fat  
 Inferior epigastric vessels  
 Testicular artery and vein and ductus deferens

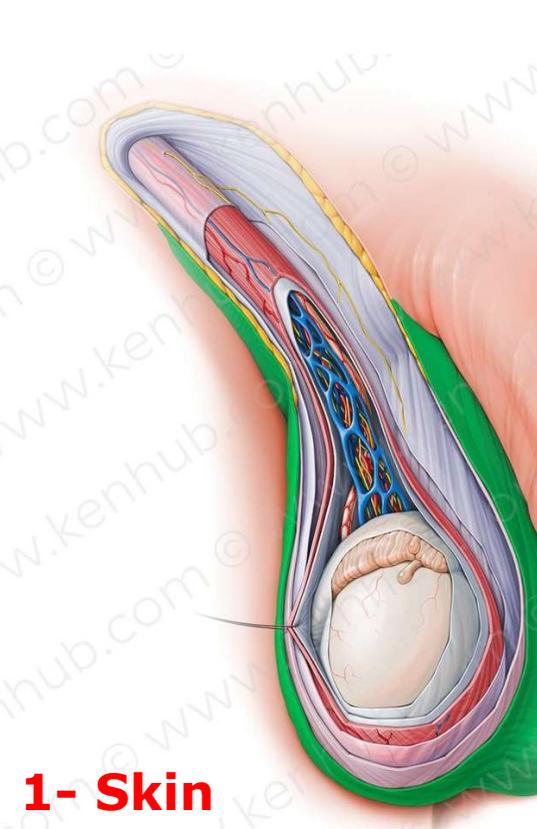
Intercrural fibers  
 Superficial inguinal ring  
 Pampiniform plexus of veins  
 Testicular artery  
 Ductus deferens

Membranous layer (Scarpa)  
 Fatty layer (Camper)  
 Deep inguinal ring formed by transversalis fascia  
 Cremasteric vessels

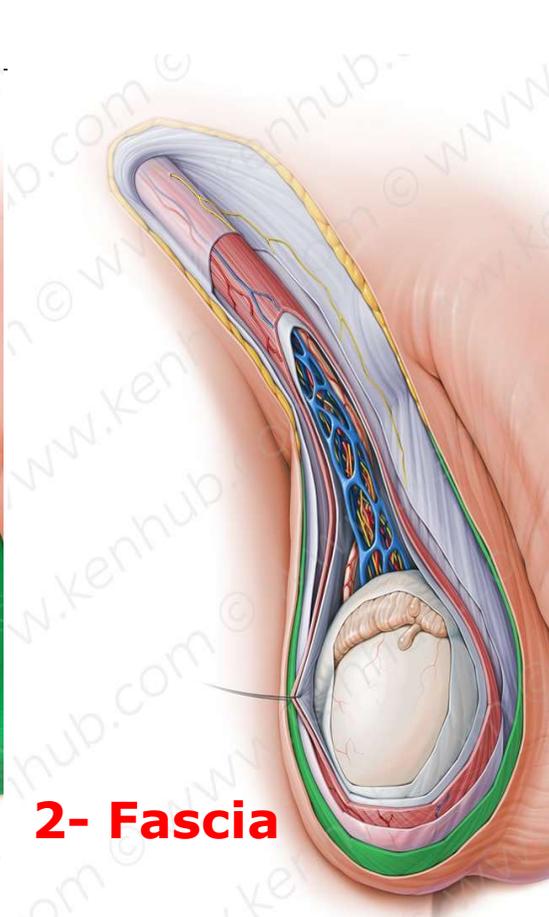
Scrotum and coverings of Testis	
Skin	
Subcutaneous tissue (dartos fascia) and dartos muscle	
External spermatic fascia	
Cremaster muscle	
Cremasteric fascia	
Internal spermatic fascia	
Tunica vaginalis	
Visceral layer (covering testis and epididymis)	
Parietal layer	

Dartos muscle/fascia (incl. scrotal septum)
External spermatic fascia
Cremaster muscle
Cremasteric fascia
Internal spermatic fascia
Vestige of processus vaginalis

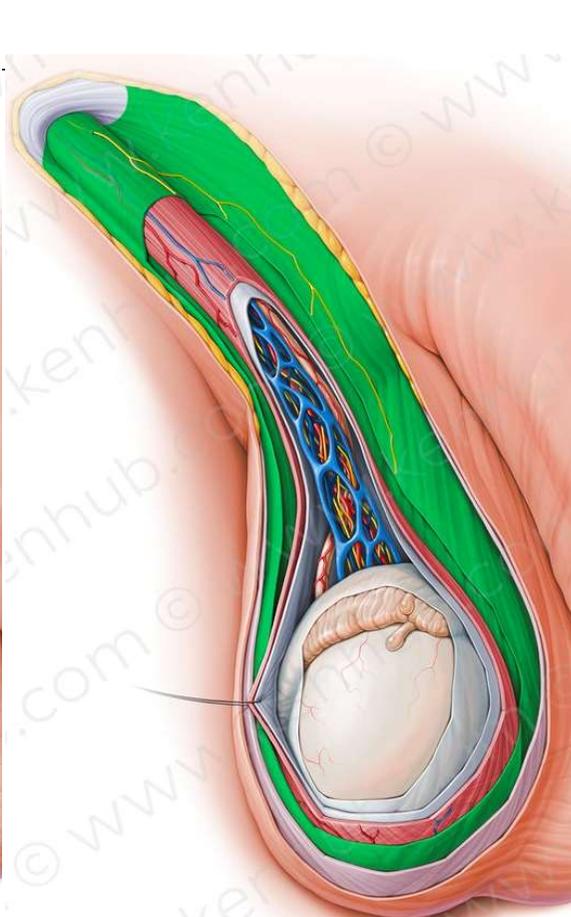
Coverings of spermatic cord



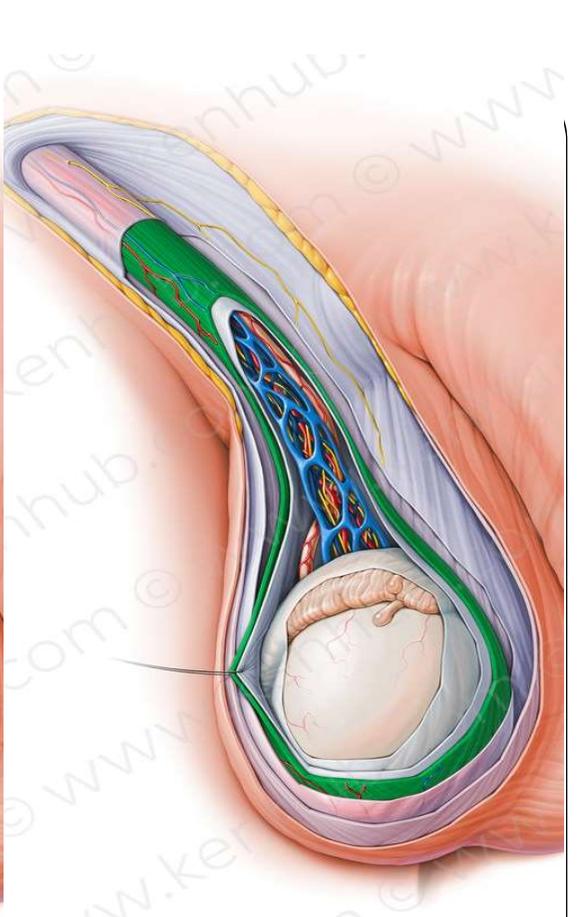
**1- Skin**



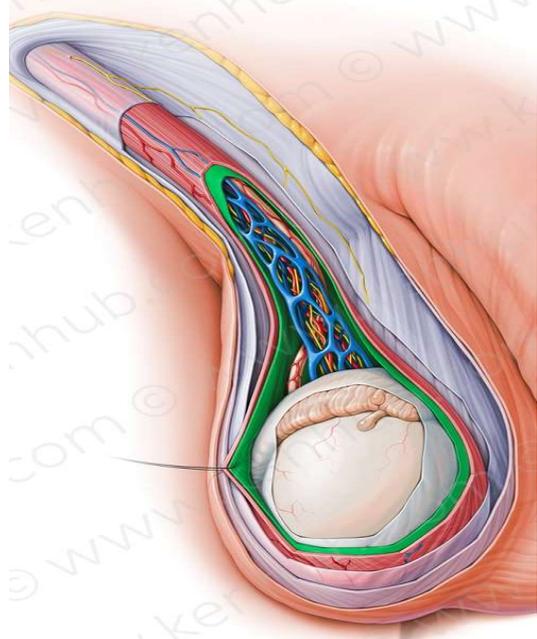
**2- Fascia**



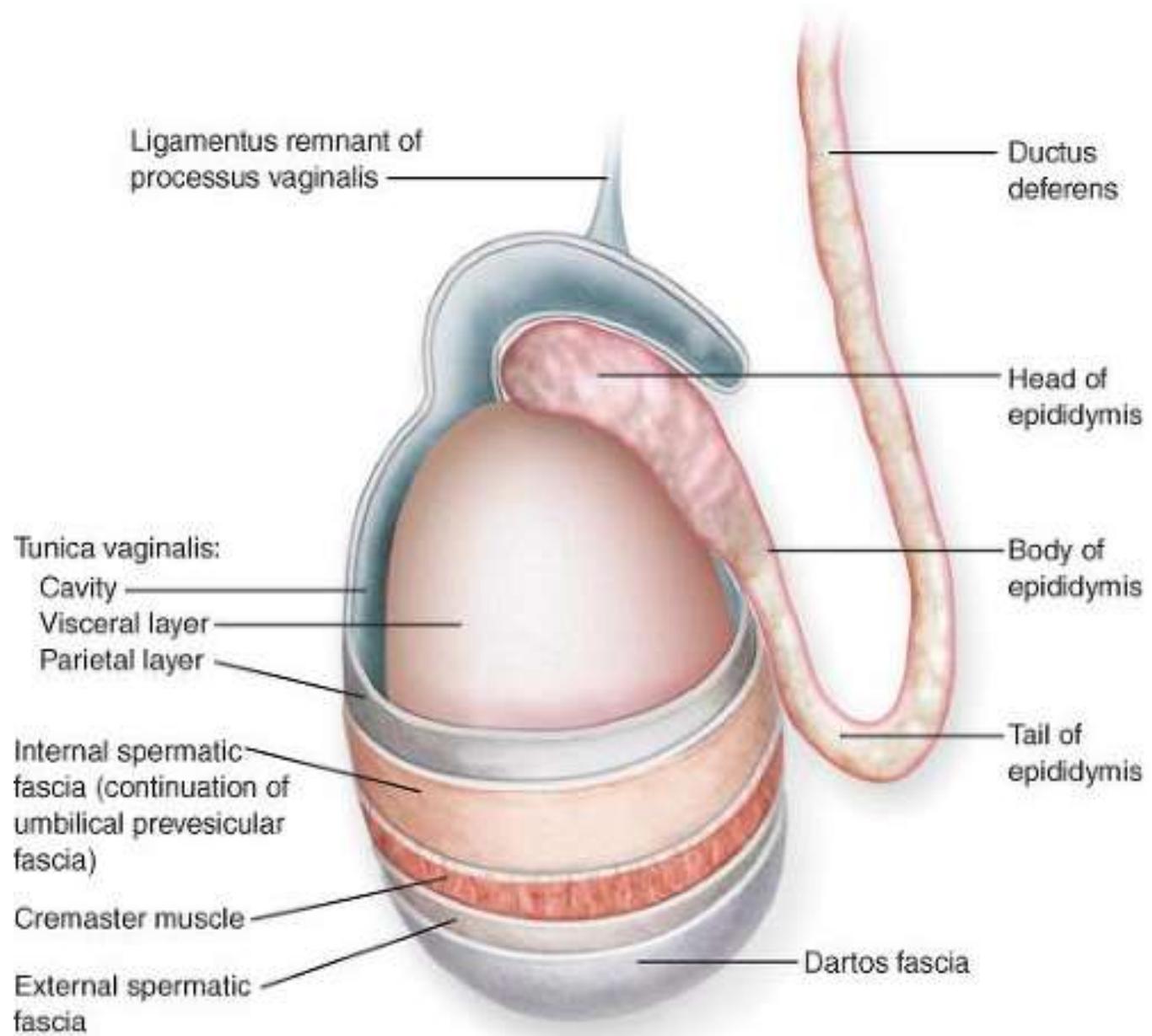
**3-External spermatic fascia**



**4-Cremaster muscle**



**5-Internal spermatic fascia**



## Blood supply :-

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

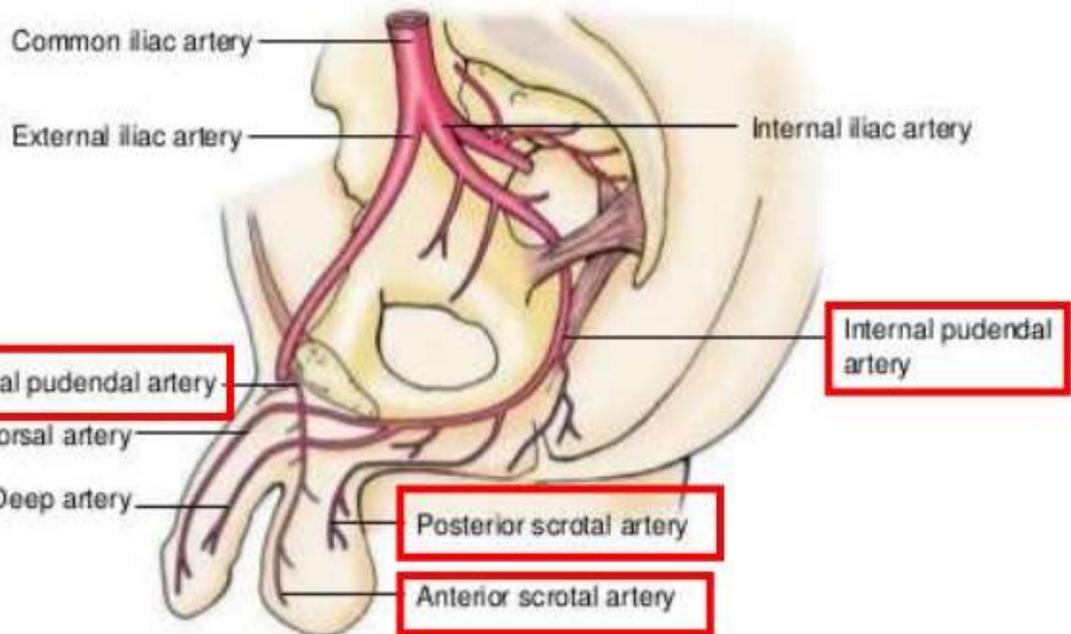
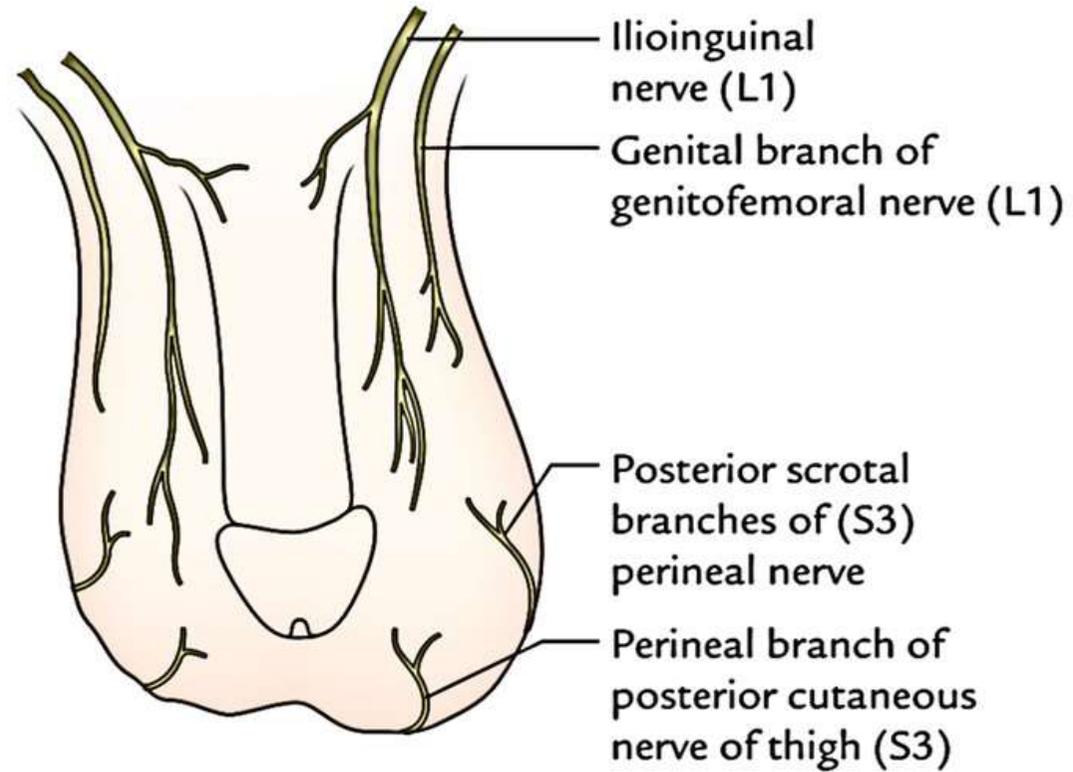
## Nerve supply :-

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

## Lymphatic drainage :-

Superficial inguinal lymph nodes.

**Blood supply of scrotum:**



# Testis

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- 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

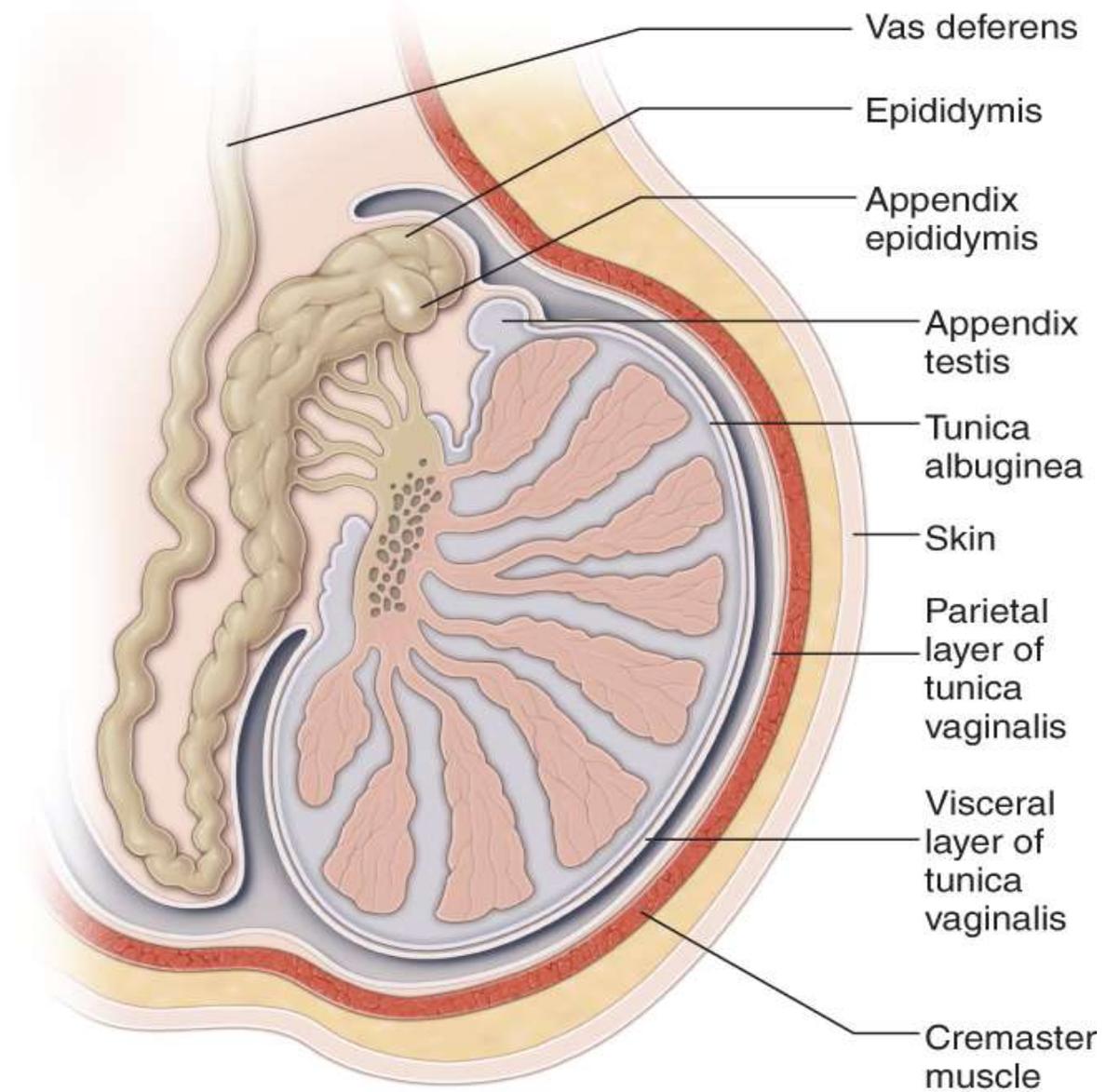
It has parietal and visceral layers with a cavity in between .

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.

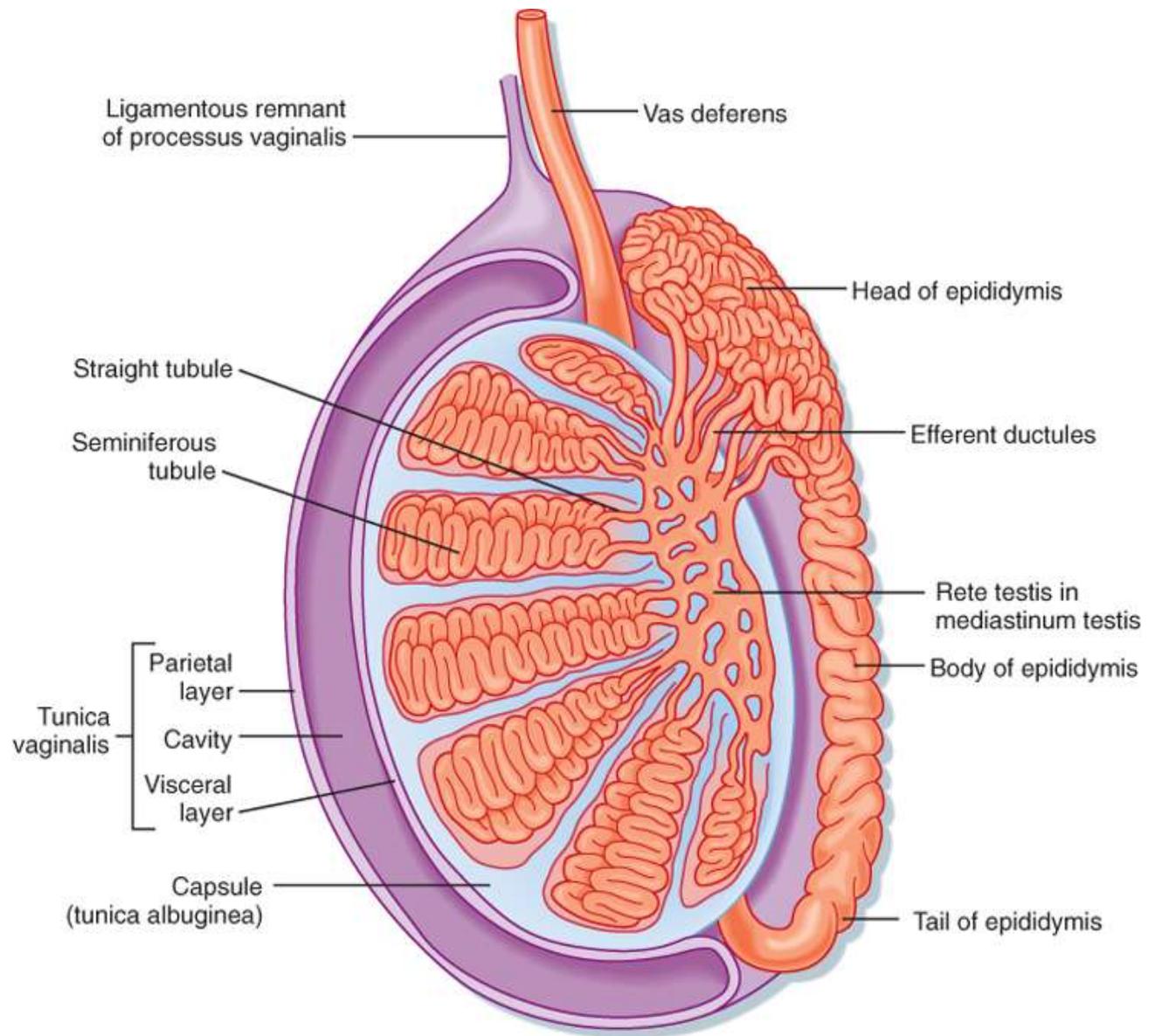
**3. Tunica vasculosa:** It is formed of vascularized connective tissue, deep to the tunica albuginea and extends between the lobules of the testis

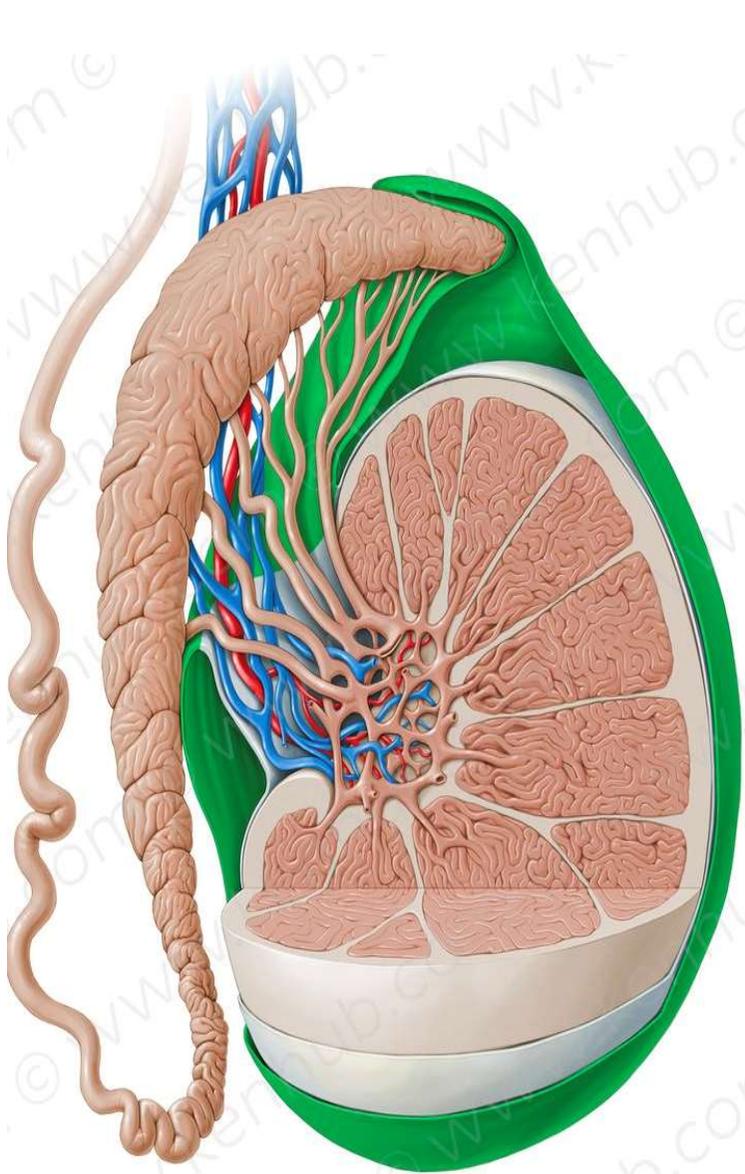


Source: Ma OJ, Mateer JR, Reardon RF, Joing SA: *Ma and Mateer's Emergency Ultrasound, Third Edition*: [www.accessemergencymedicine.com](http://www.accessemergencymedicine.com)  
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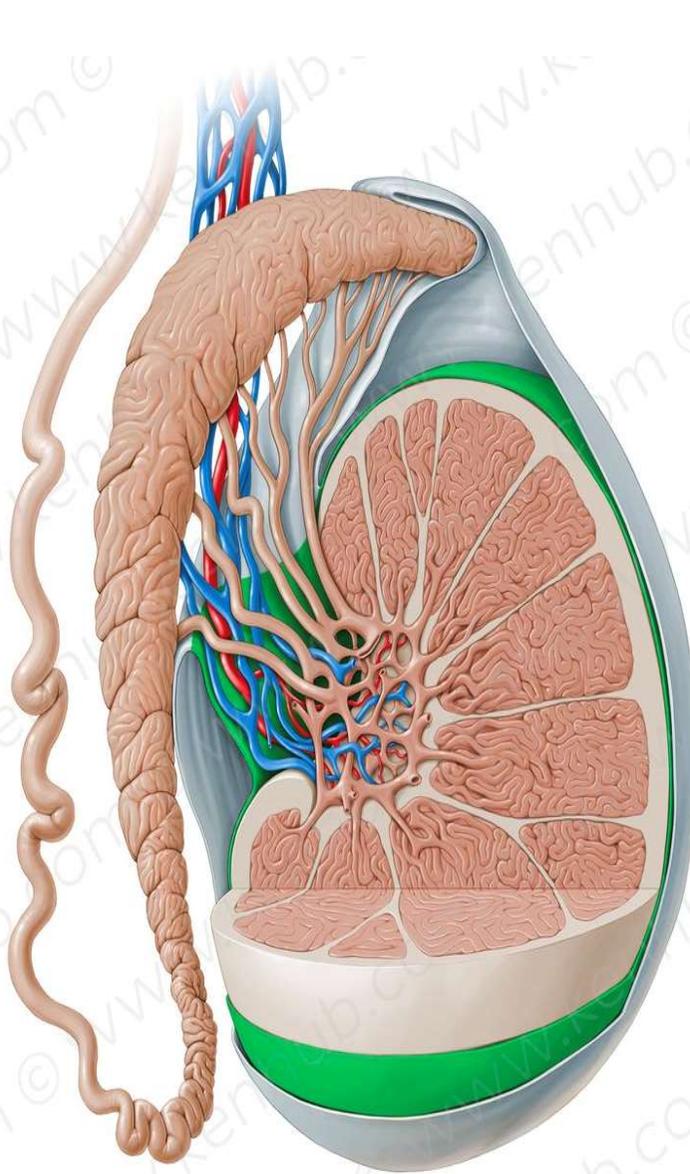
## Structure of the testis

- 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 .

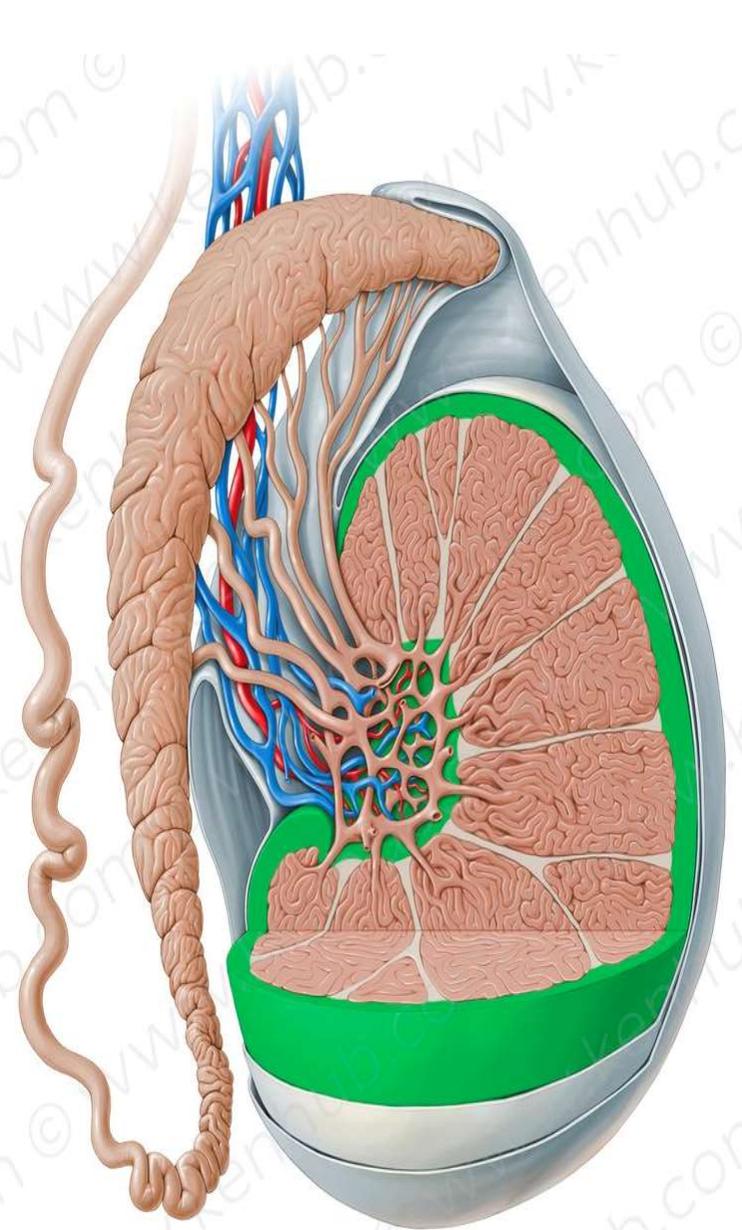




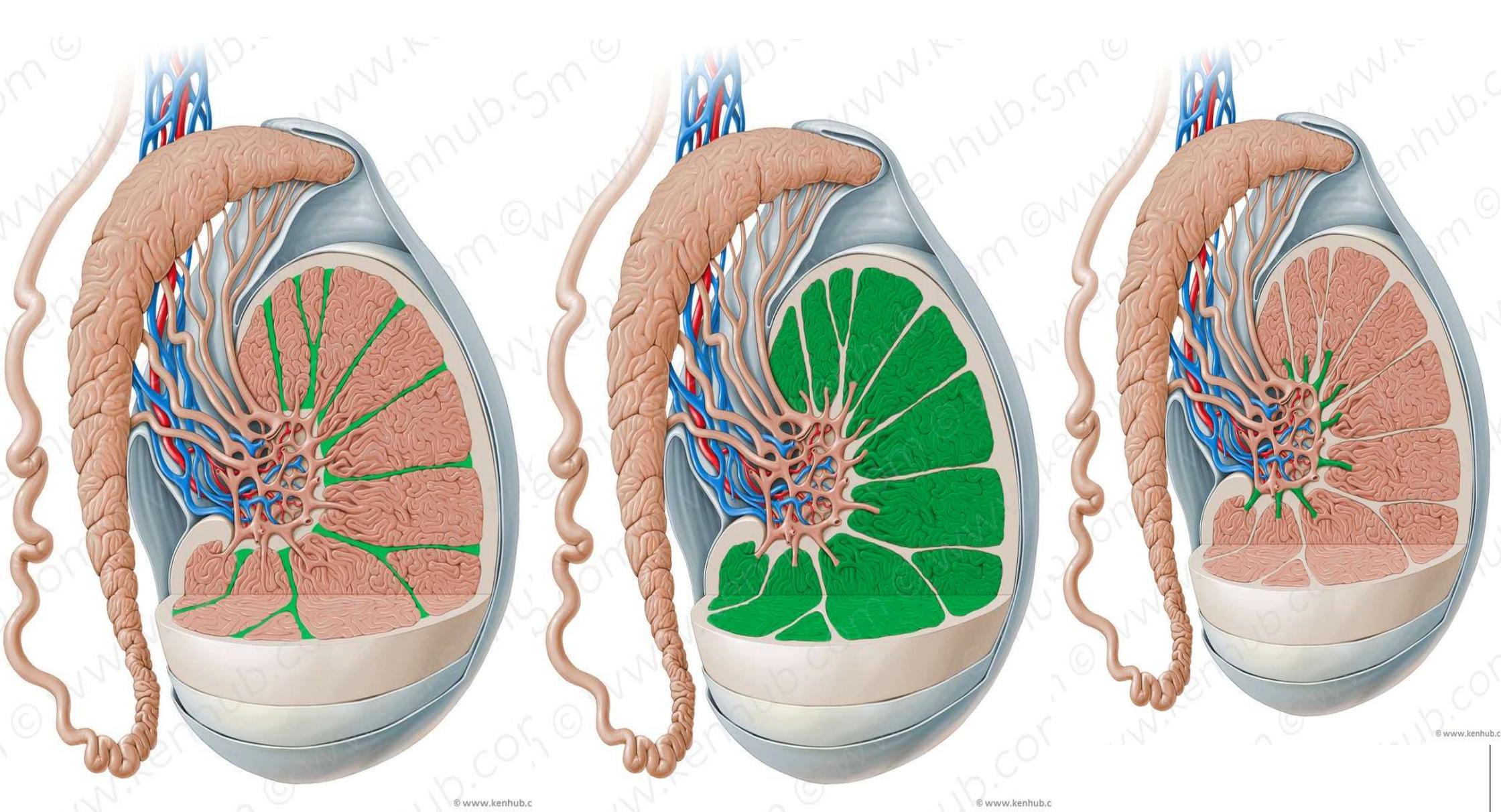
**Parietal layer of tunica vaginalis**



**Visceral layer of tunica vaginalis**



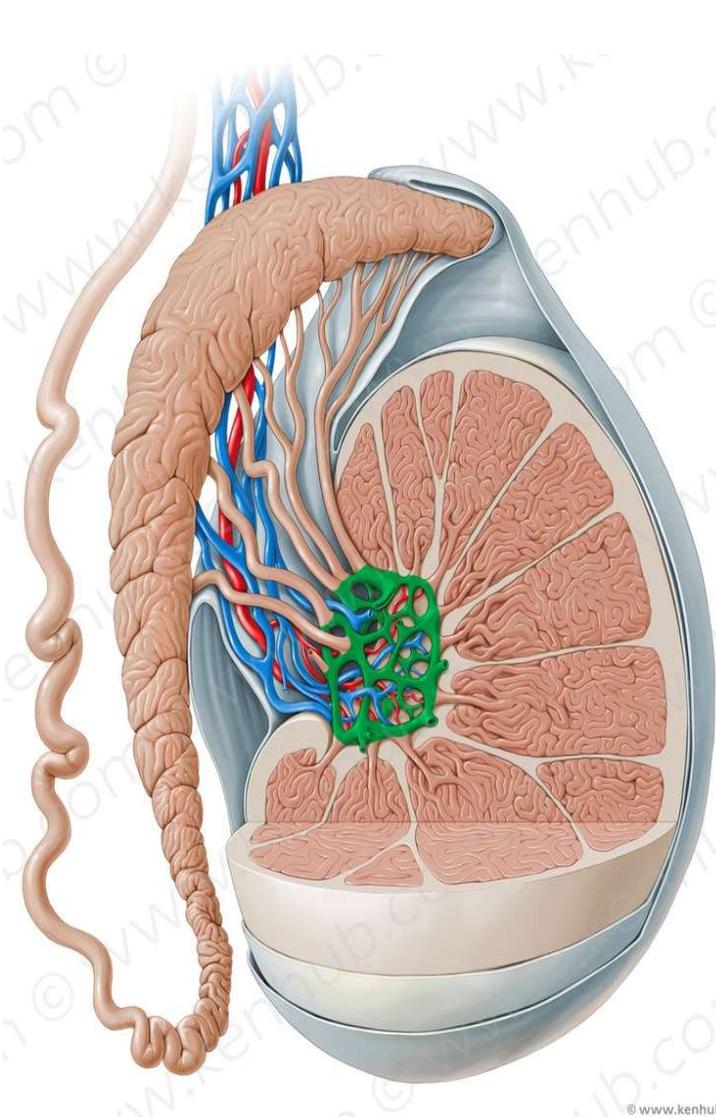
**Tunica albuginea of testis**



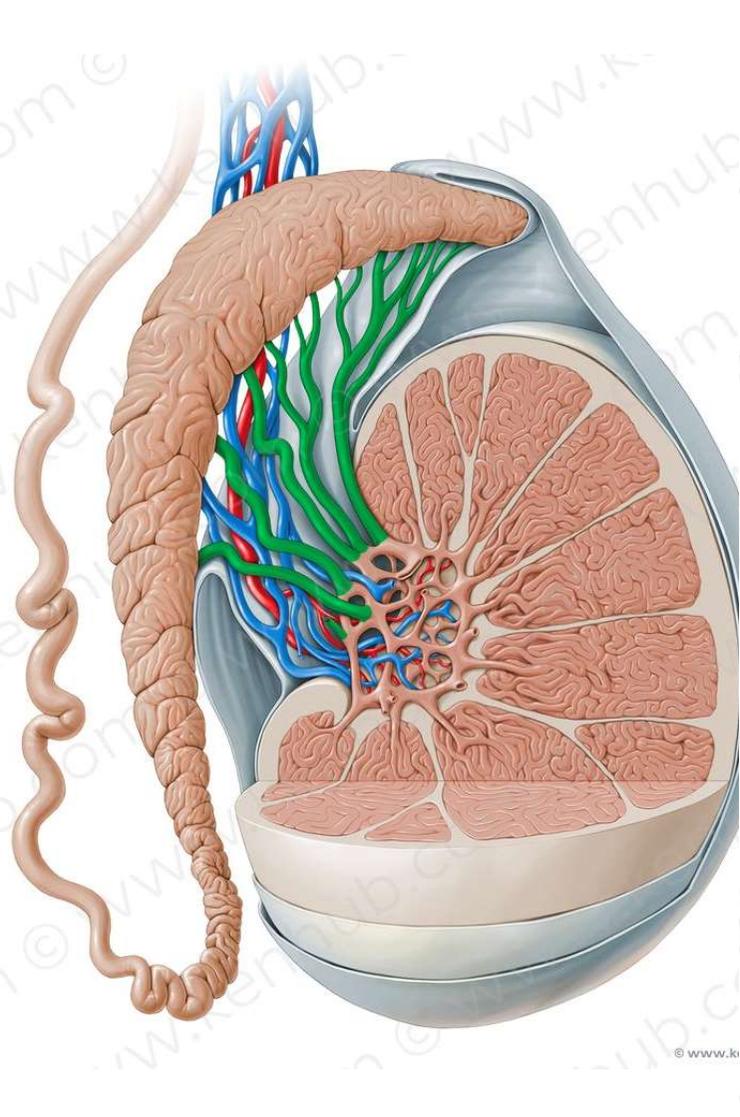
**Setae**

**Convoluted  
seminiferous  
tubules**

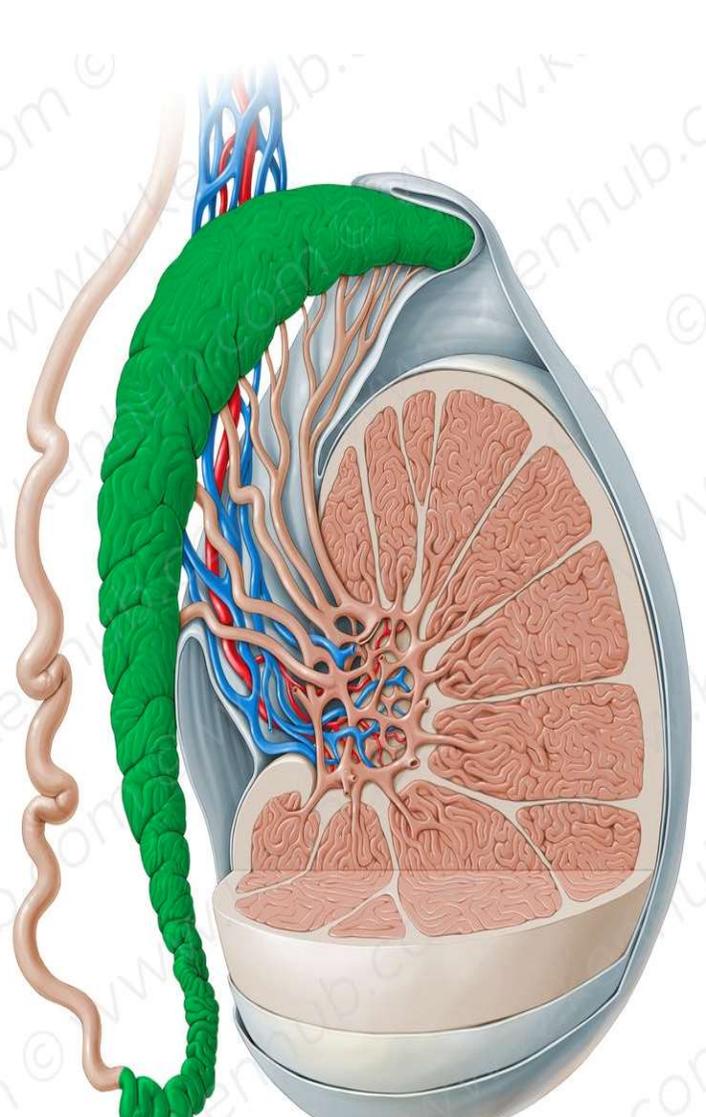
**Straight  
seminiferous  
tubules**



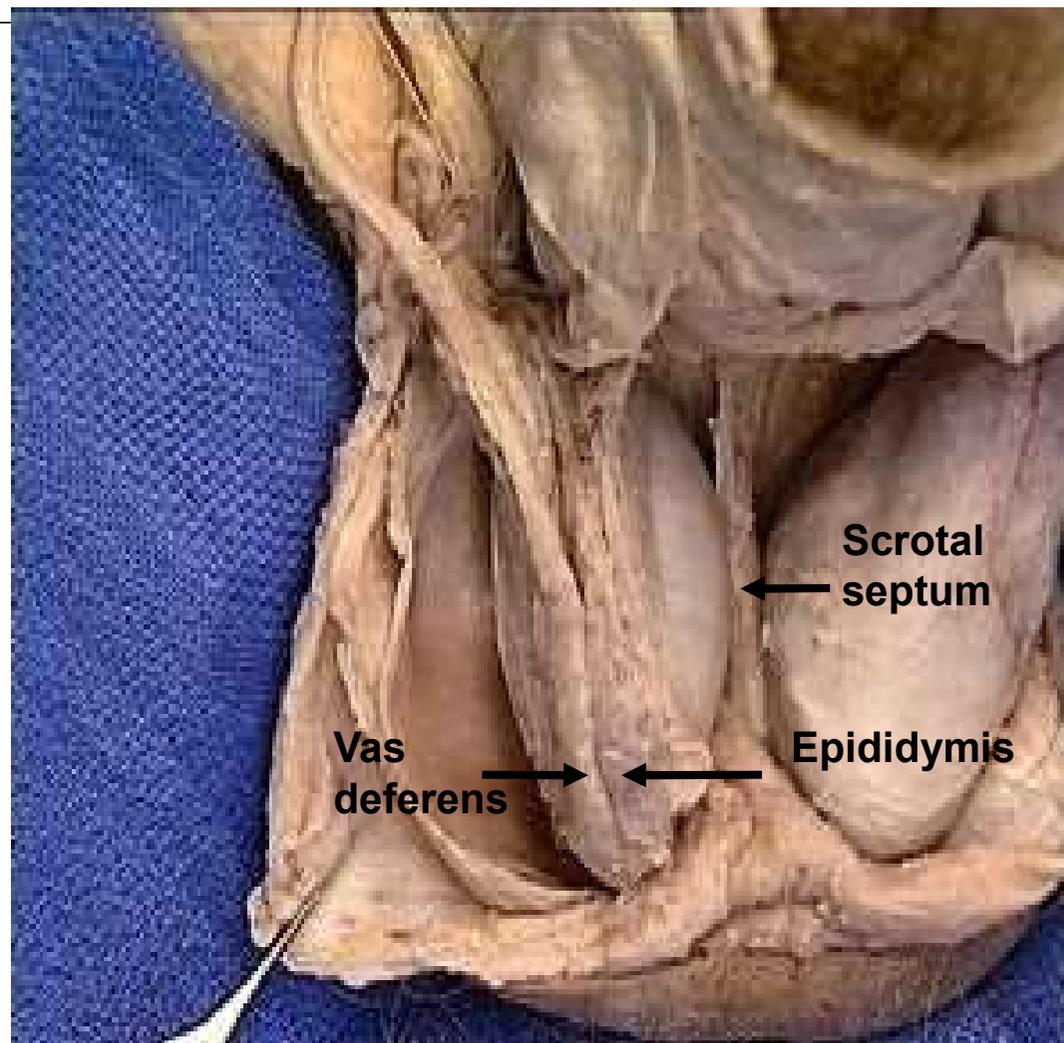
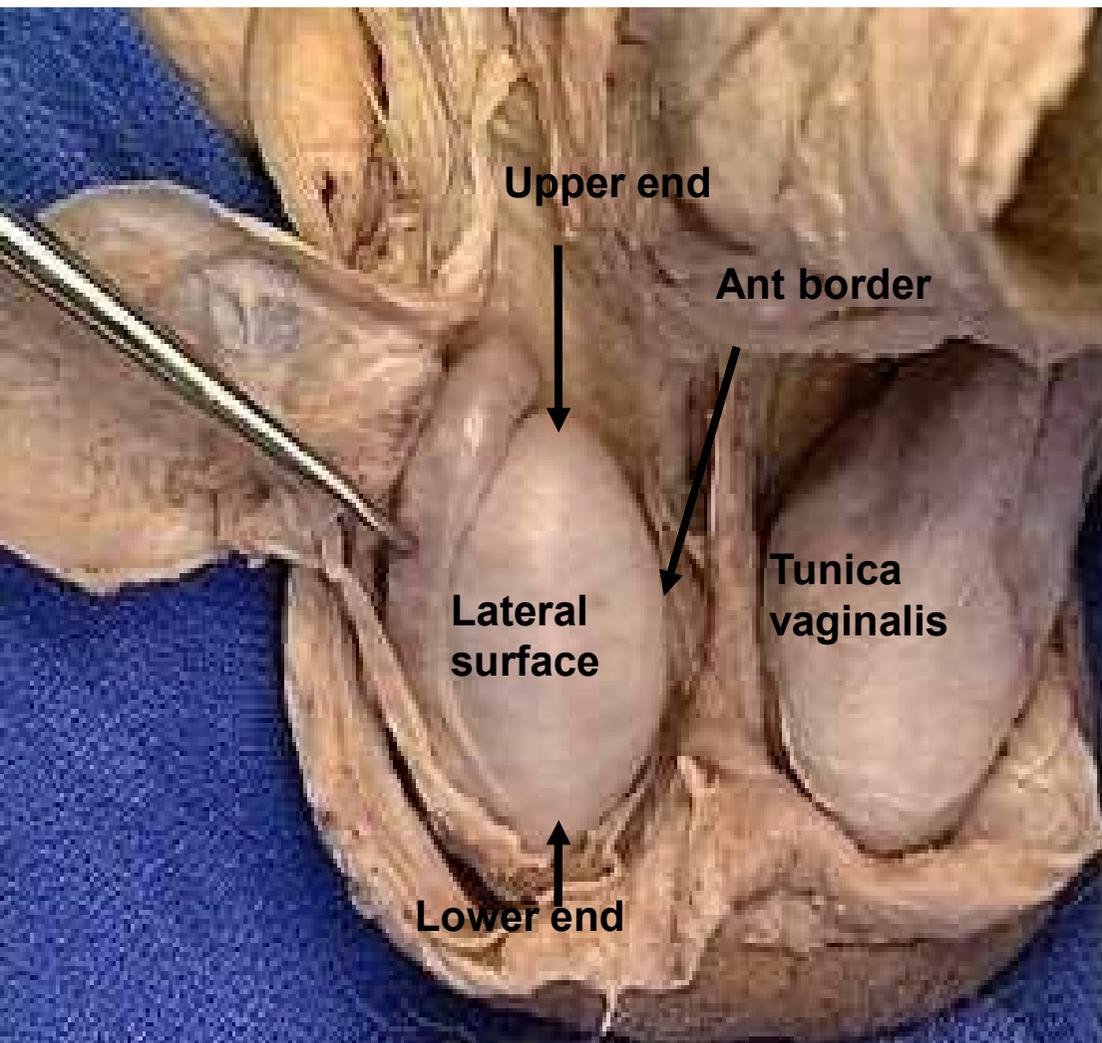
**Rete testis**



**Efferent ductules**



**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.

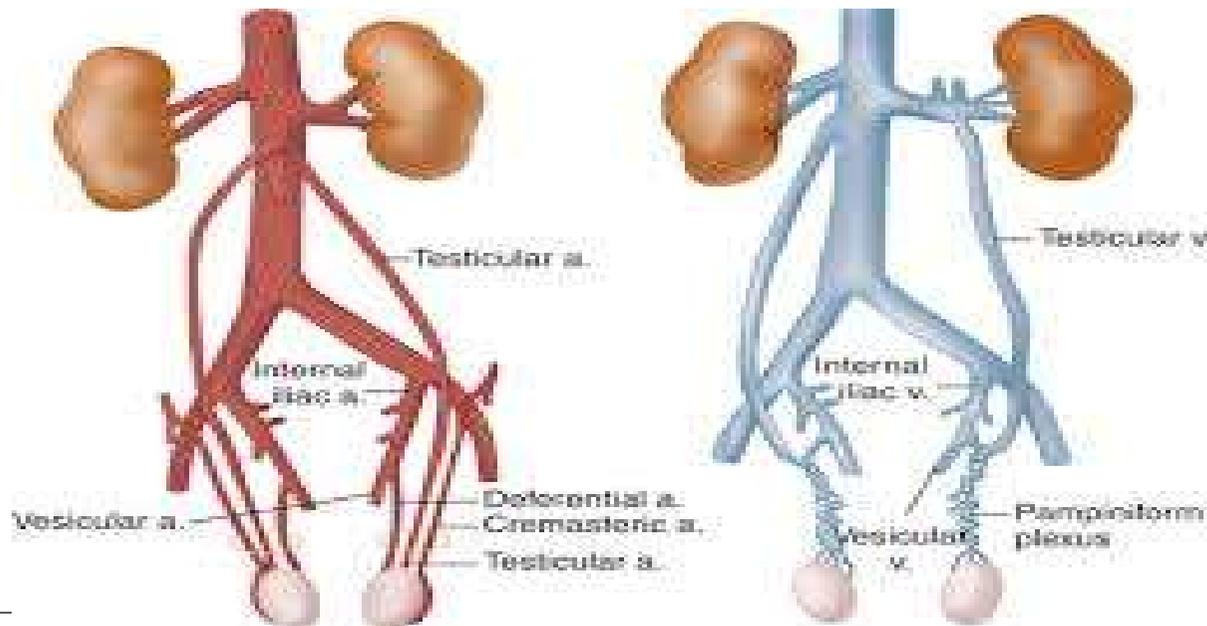


## Arterial blood supply of the testis and epididymis

- ✓ 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 cremastic 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** :

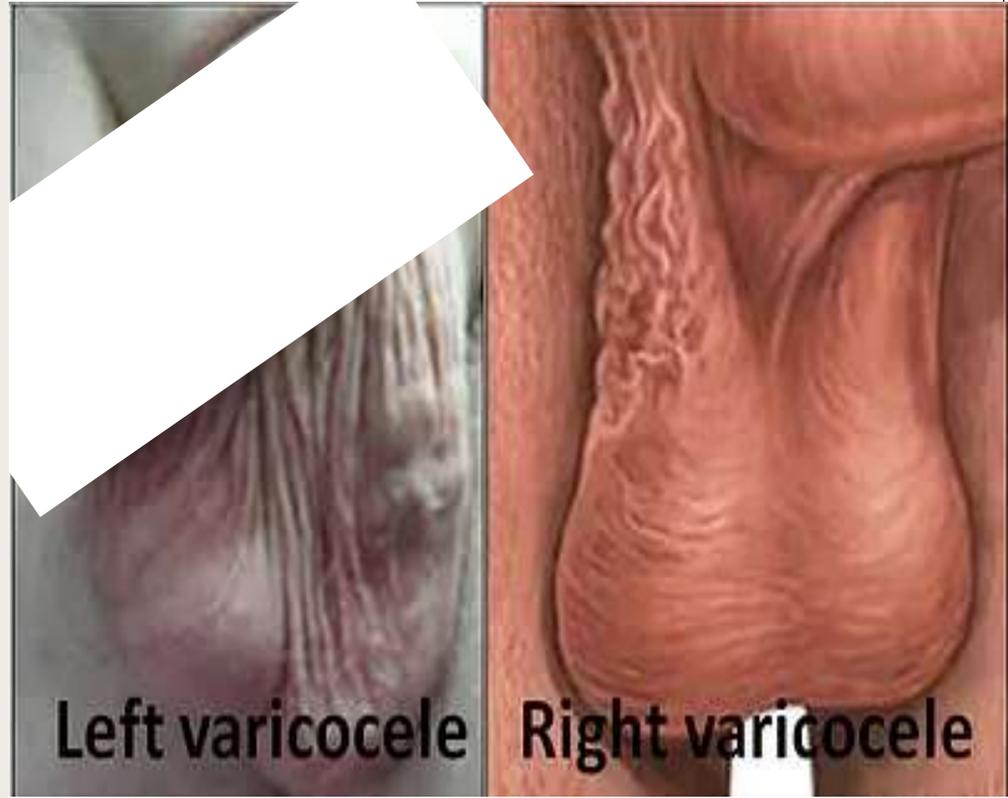
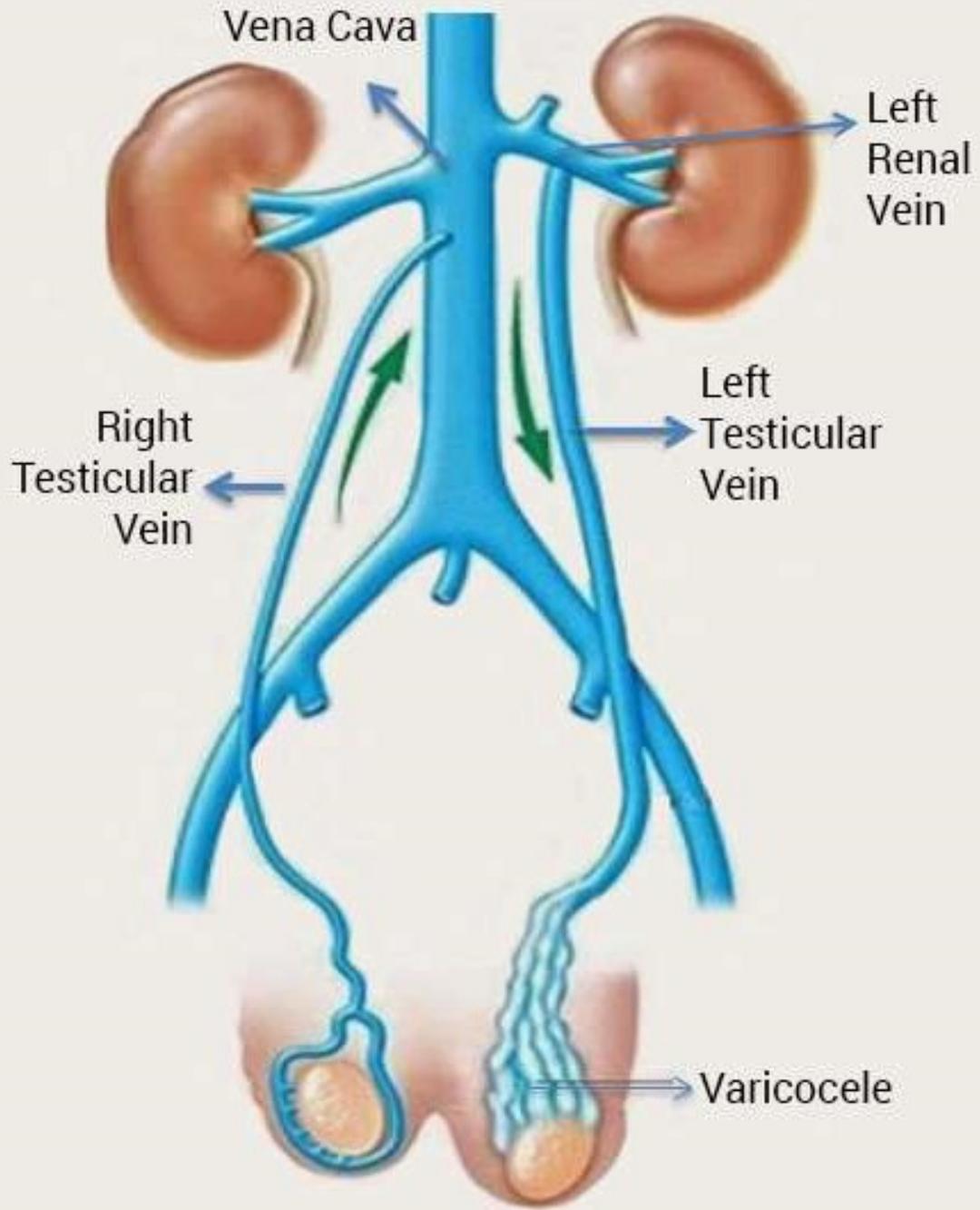
1-The right testicular vein joins the low-pressure inferior vena cava (by acute angle)  
The left vein joins the left renal vein, in which the venous pressure is higher (by right angle)

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- The left renal vein is compressed between aorta and superior mesenteric artery

4- Left testicular vein may be compressed by heavy left colon

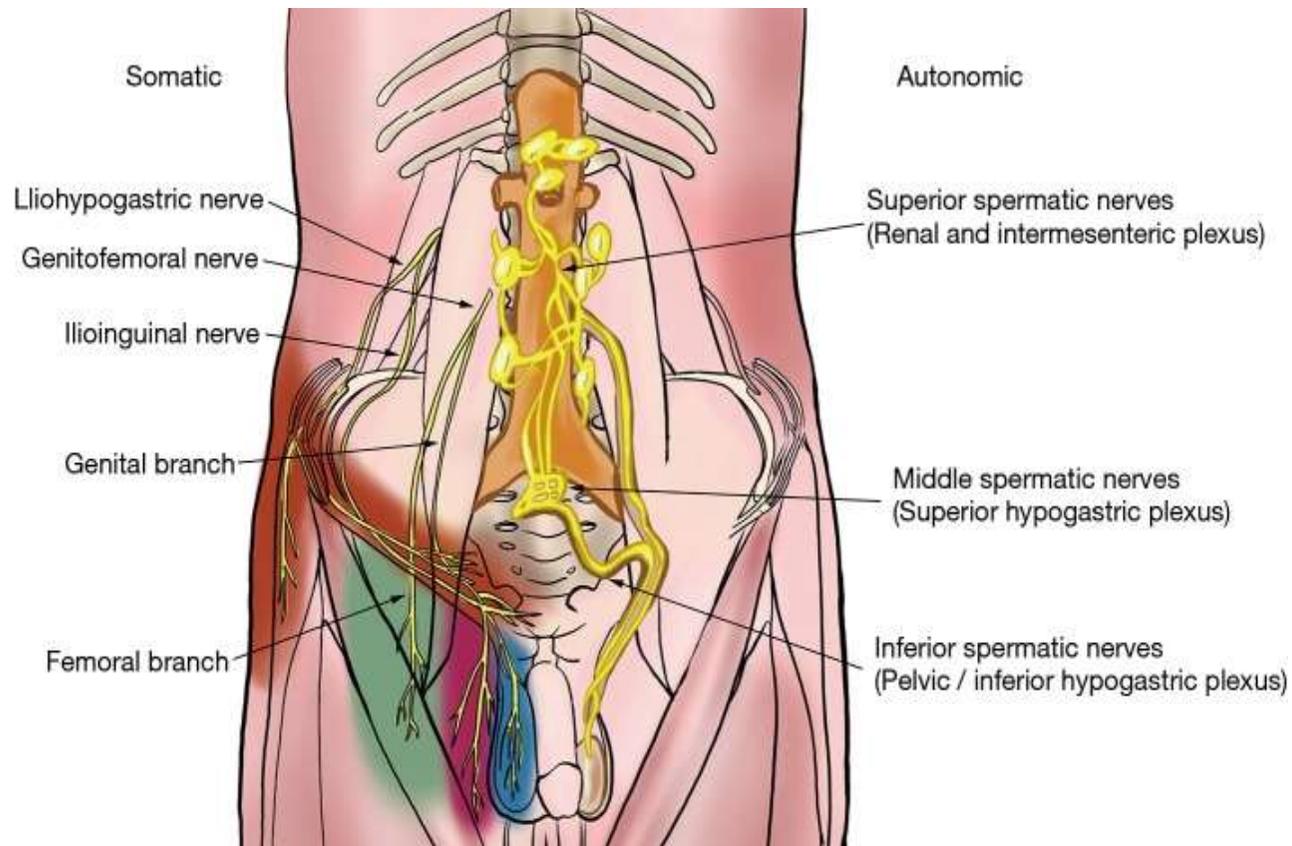
5-The left testis is lower than right one with elongated left testicular vein



## Nerve supply

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

**Lymphatic drainage** : Into lateral aortic lymph nodes.



## Thermoregulation of the testis

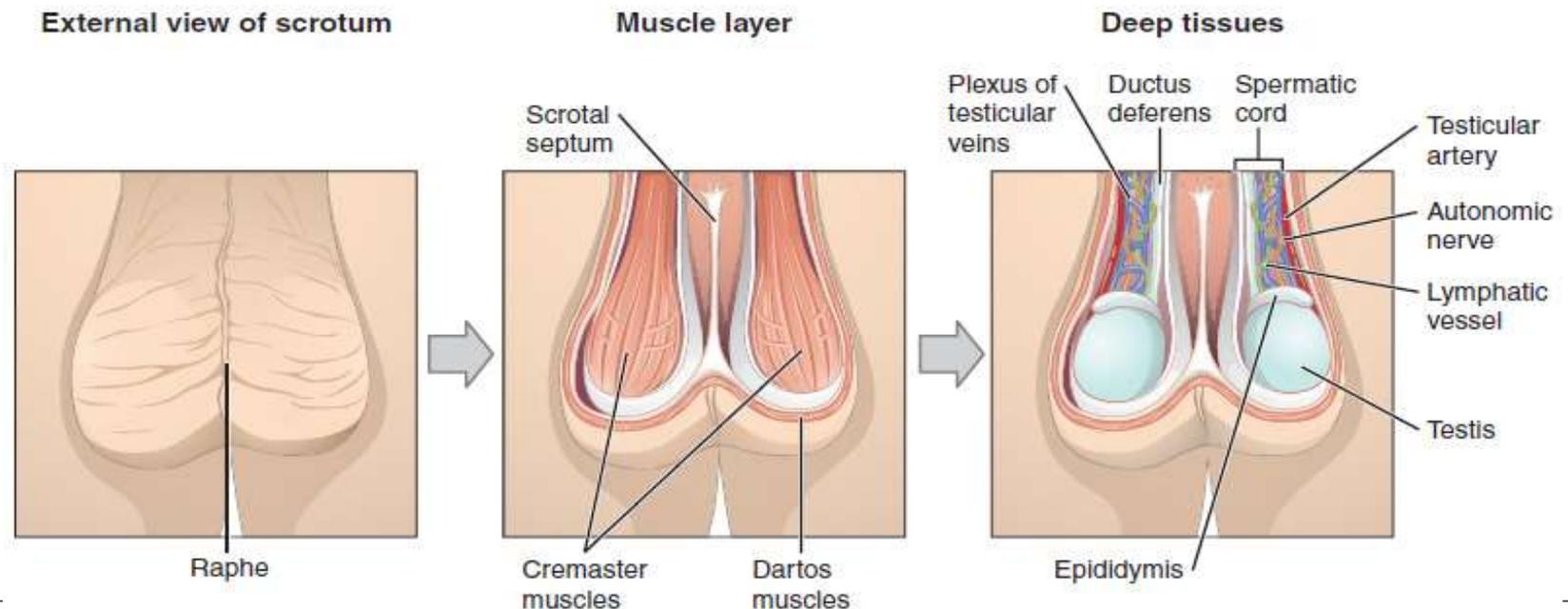
The process of spermatogenesis needs a temperature 2-3°C below the body temperature. This is achieved through the following 3 mechanisms;

**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.



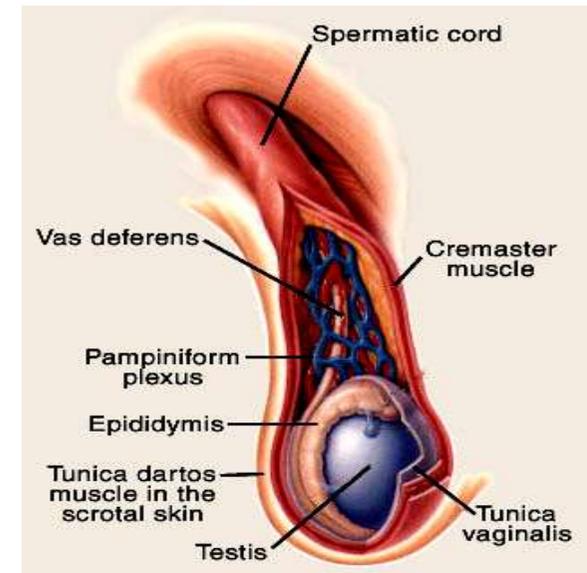
## The spermatic cord

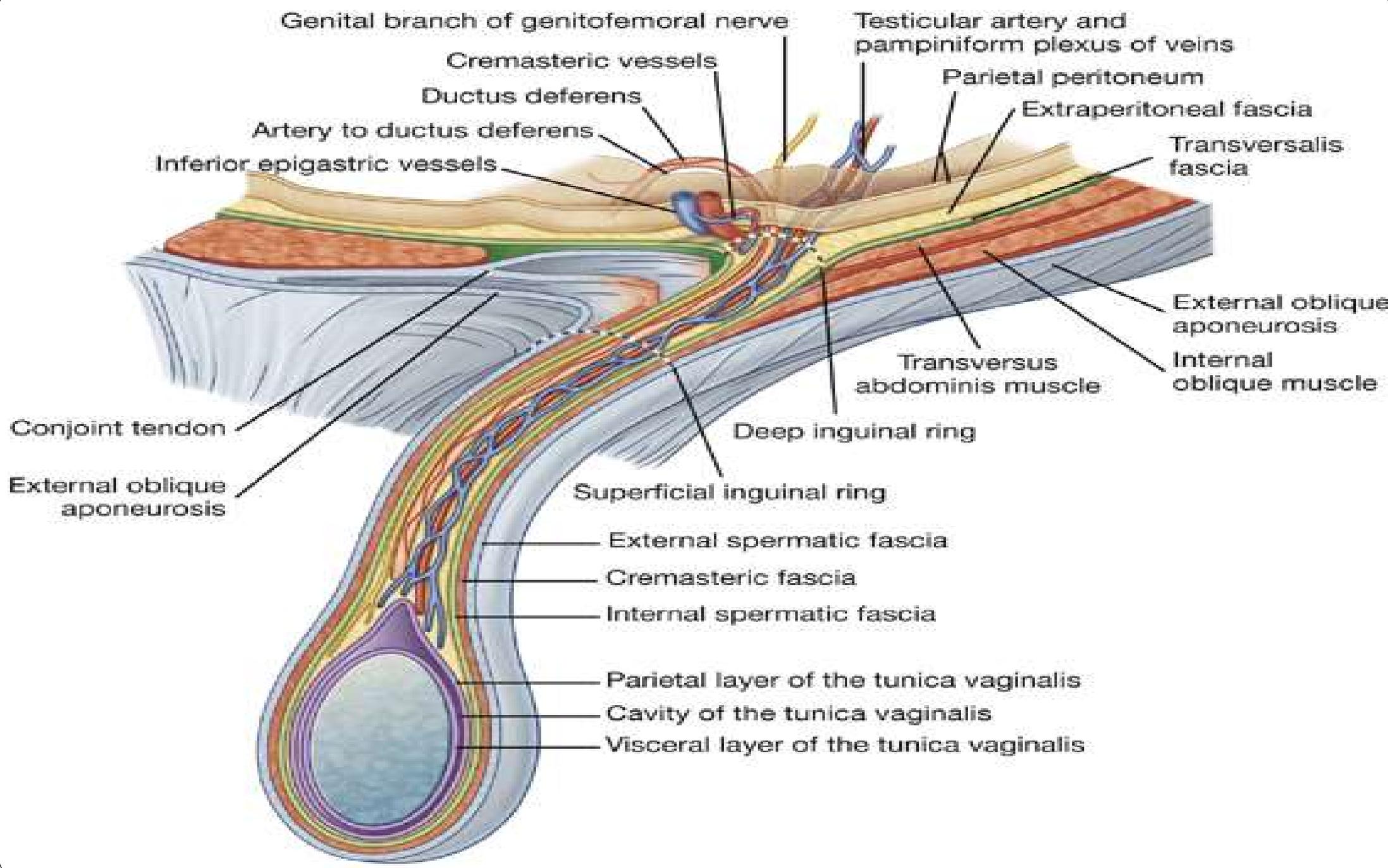
It is a group of structures which meet at deep inguinal ring and traverse the inguinal canal down to posterior border of the testis.

**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 (A, V, N, L)

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.





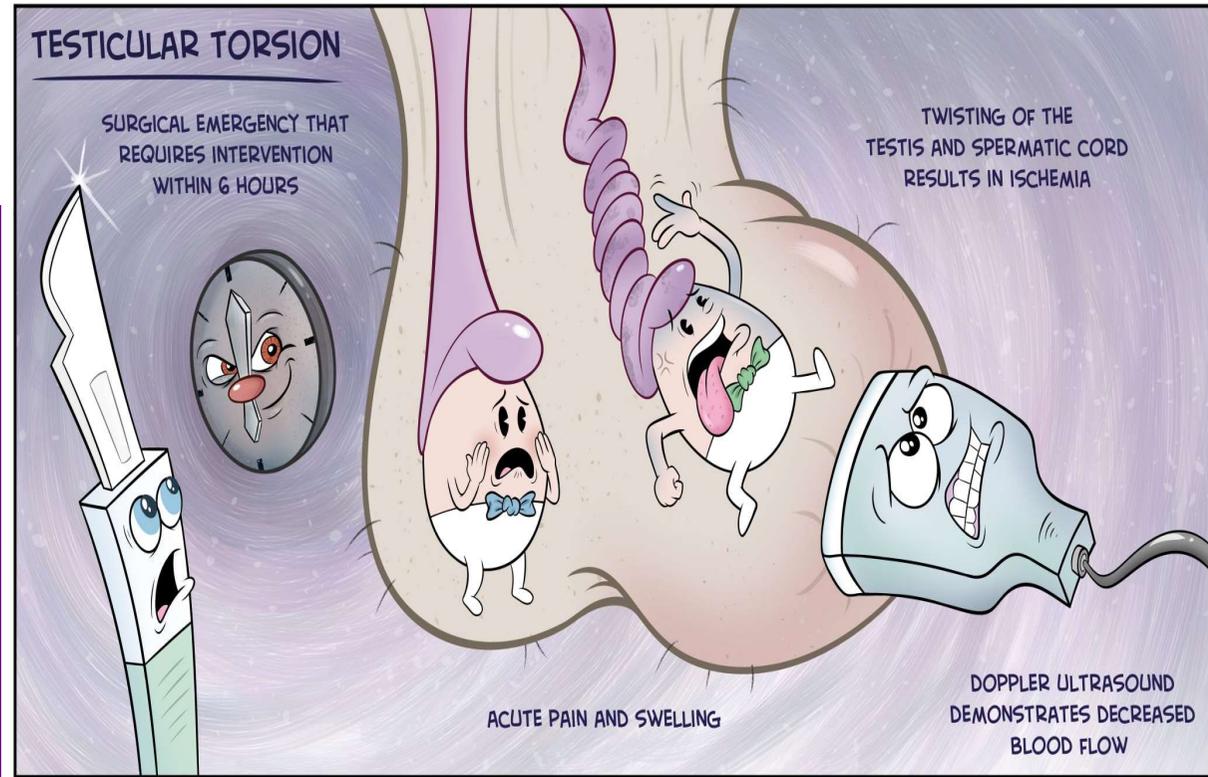
## Torsion of the Testis

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.

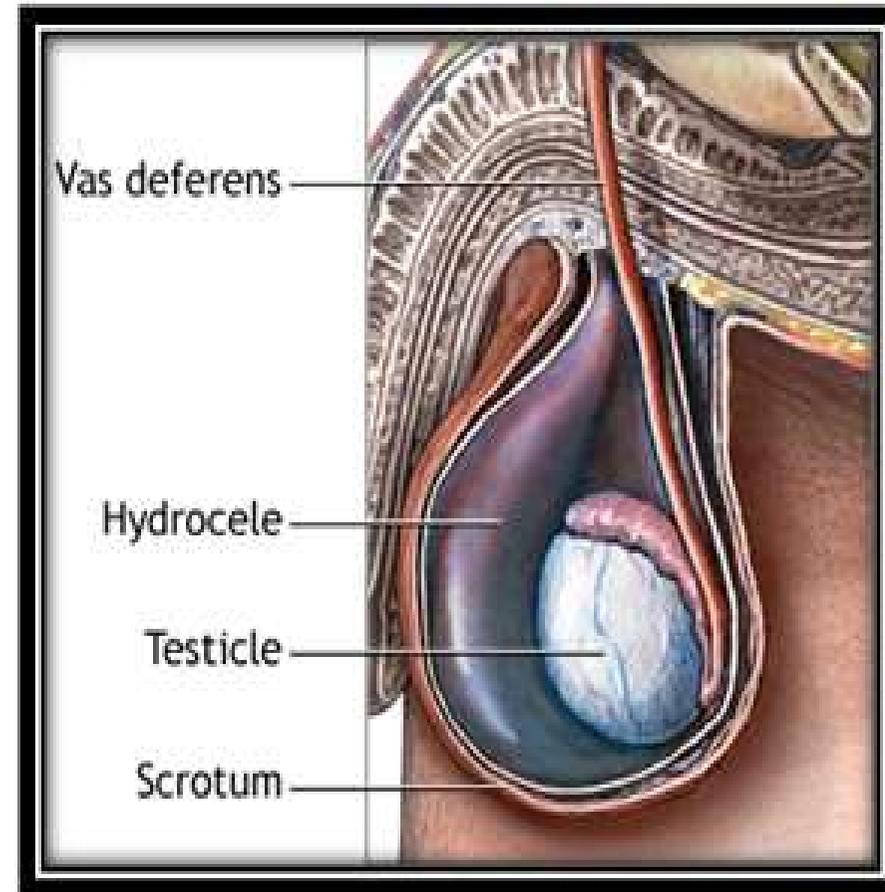


## Hydrocele

It is an accumulation of fluid within the tunica vaginalis.

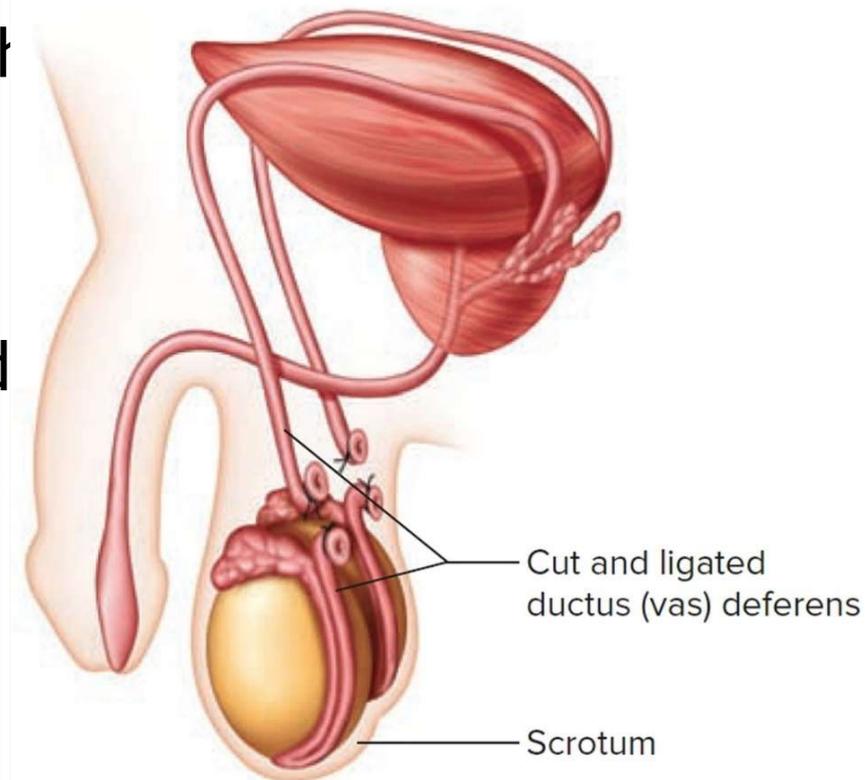
## Haematocele

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 joining the duct of the seminal vesicle 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 :**

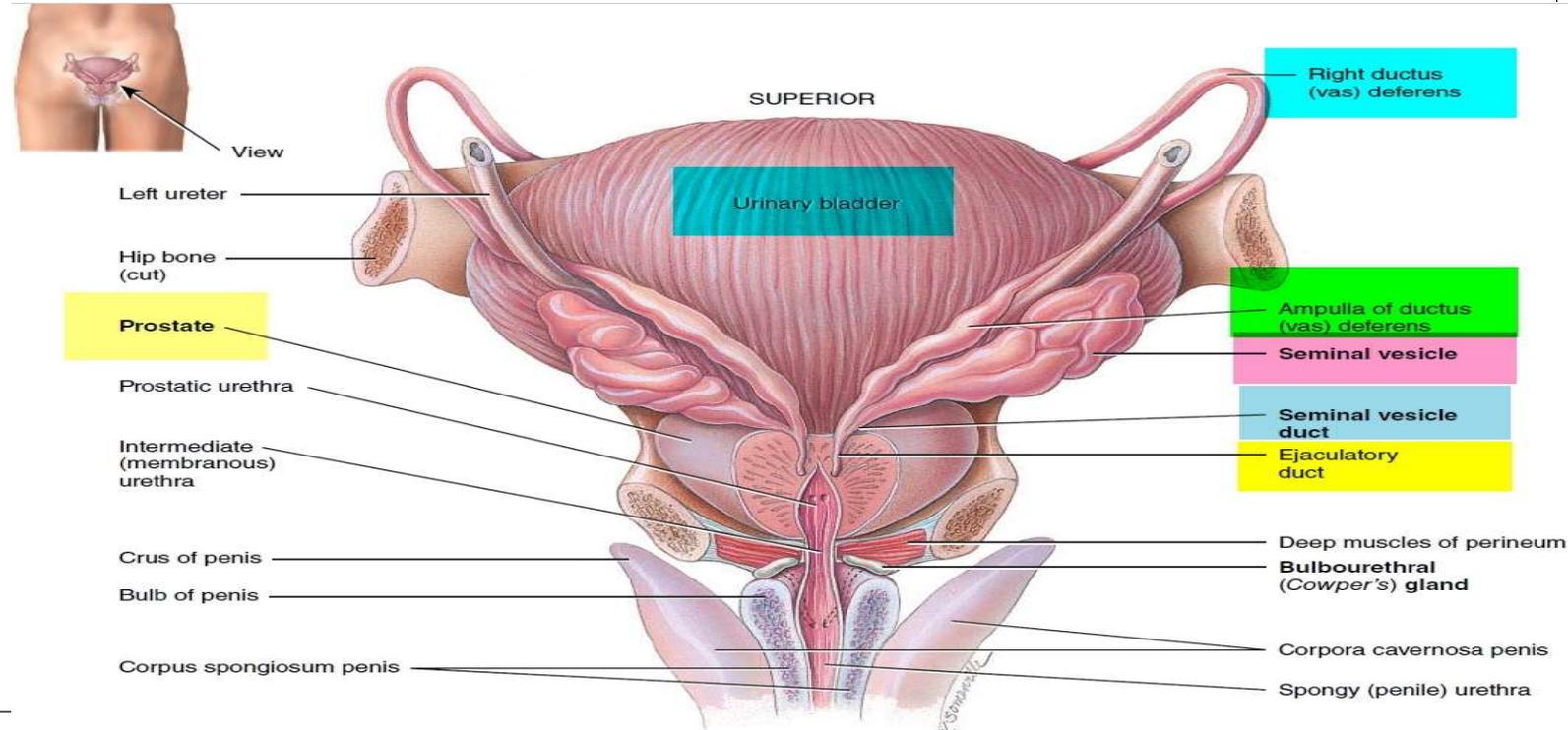
Its distal part lies in the scrotum and inguinal canal, its proximal part runs in the pelvis.

### **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 .



m

External iliac artery

nd

Inferior epigastric artery

Deep inguinal ring

Inguinal canal

Vas deferens

Superficial inguinal ring

Spermatic cord

of

Prostate

id

Vas deferens

Musculofascial pouch

Head of epididymis

Body of epididymis

Testis

Tail of epididymis

Scrotum

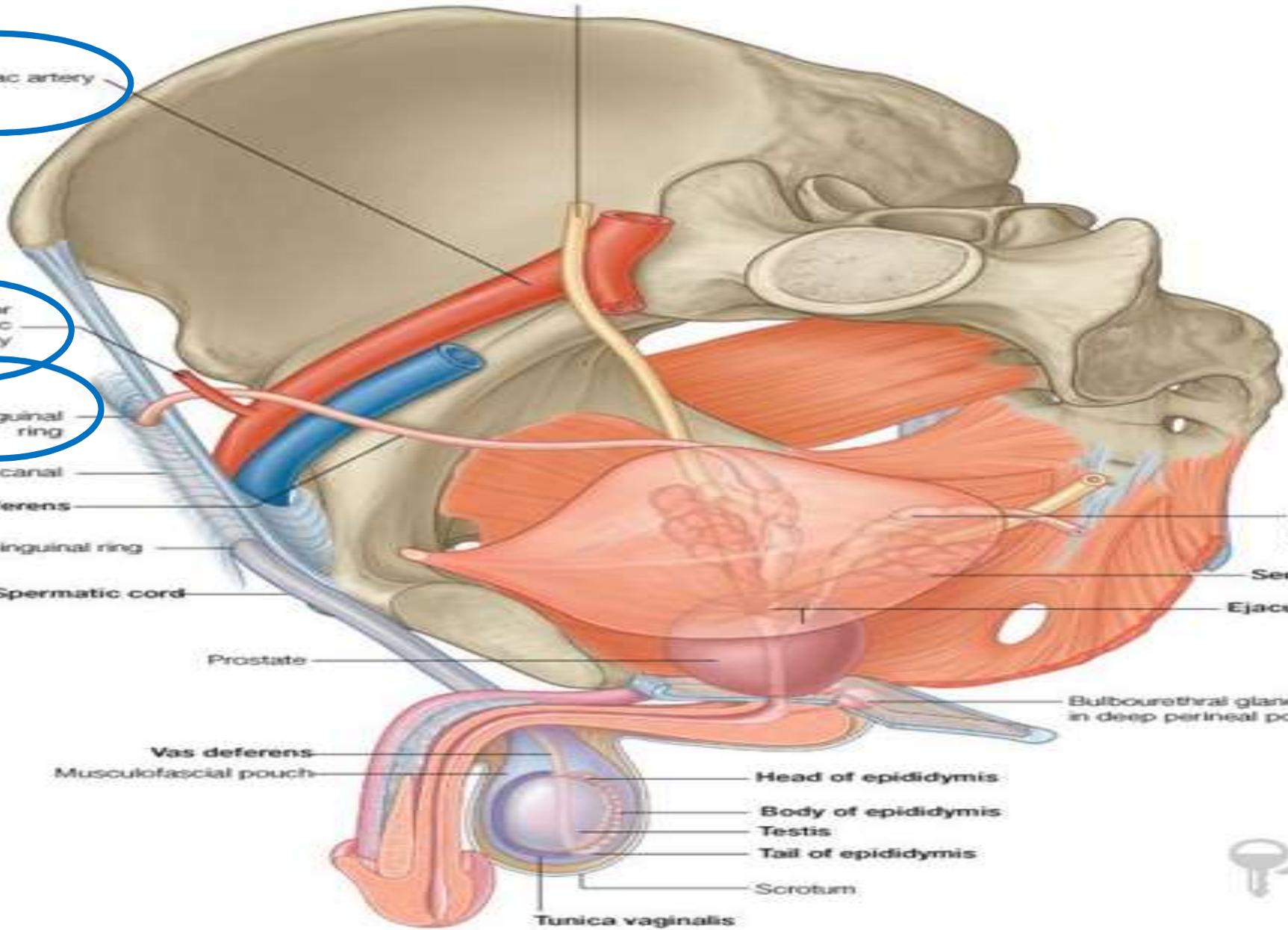
Tunica vaginalis

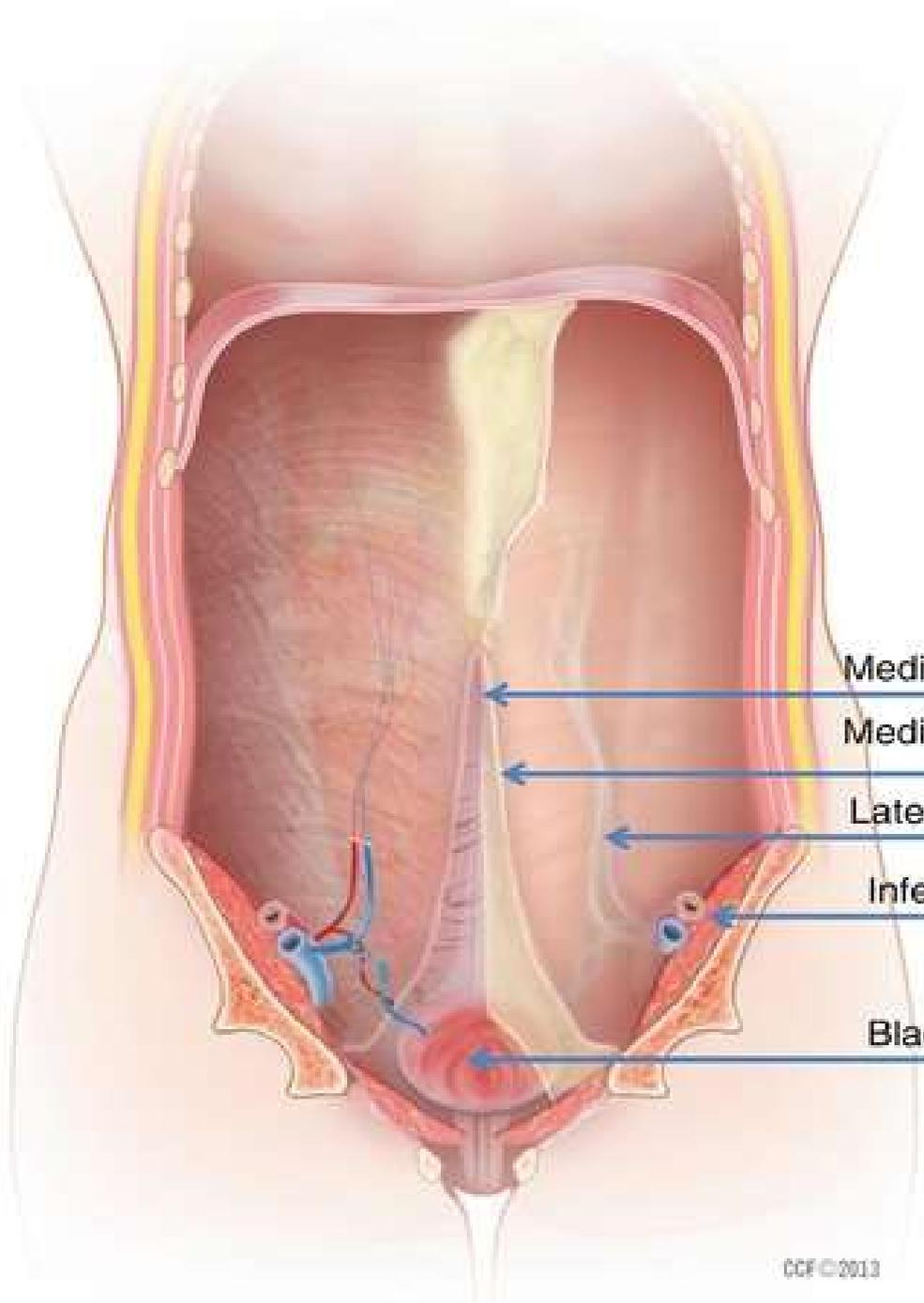
Ampulla of vas deferens

Seminal vesicle

Ejaculatory ducts

Bulbourethral gland in deep perineal pouch





**Median umbilical ligament**

**Medial umbilical ligament**

**Lateral umbilical ligament**

**Inferior epigastric vessels**

**Bladder**

## Vessels of the Vas:

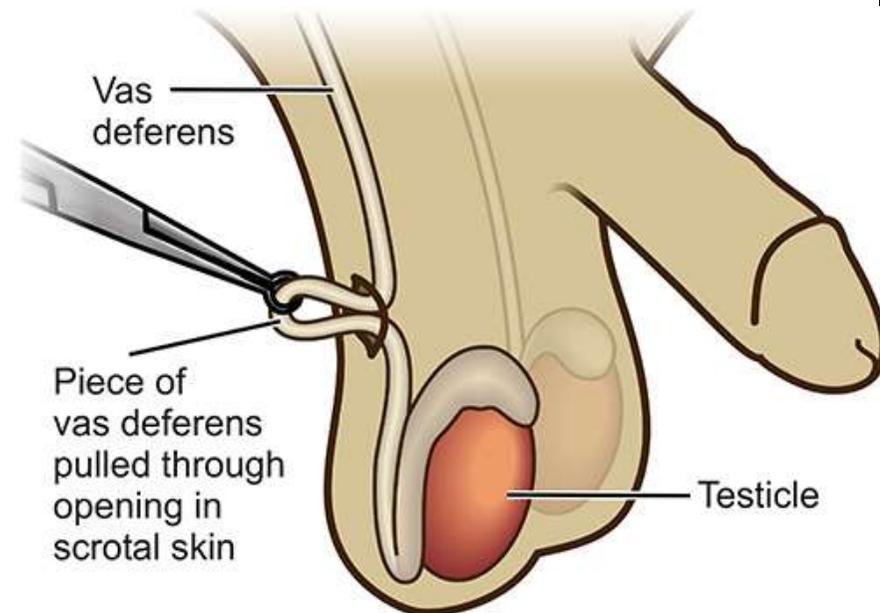
- ❖ Artery of the vas is derived from inferior vesical artery.
- ❖ It runs in the spermatic cord and anastomoses with the testicular artery.

**Veins :** join the vesical venous plexus.

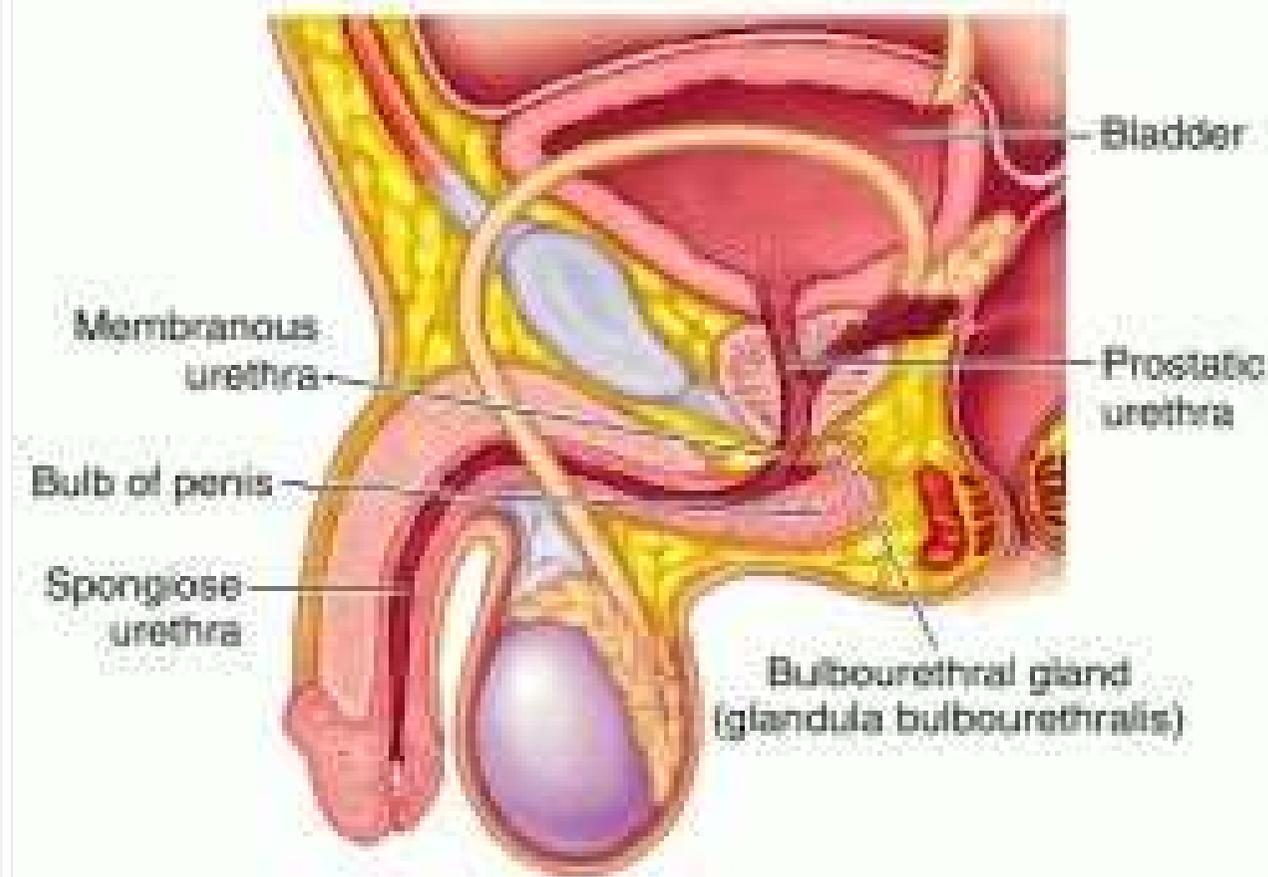
**Nerves :** are derived from prostatic nerve plexus which comes from the inferior hypogastric plexus.

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;

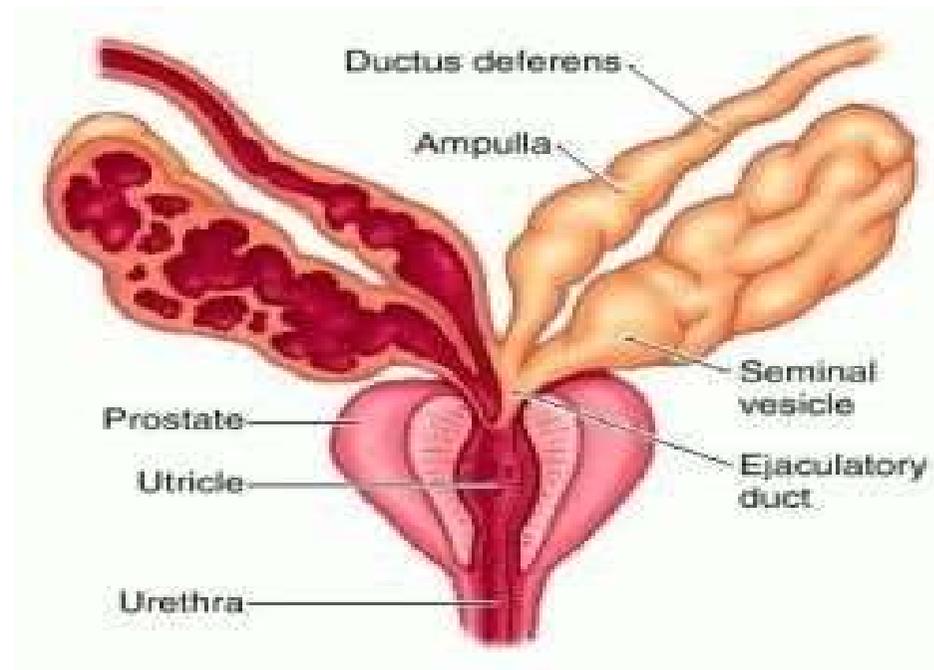
Anteriorly : Base of the bladder.

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).

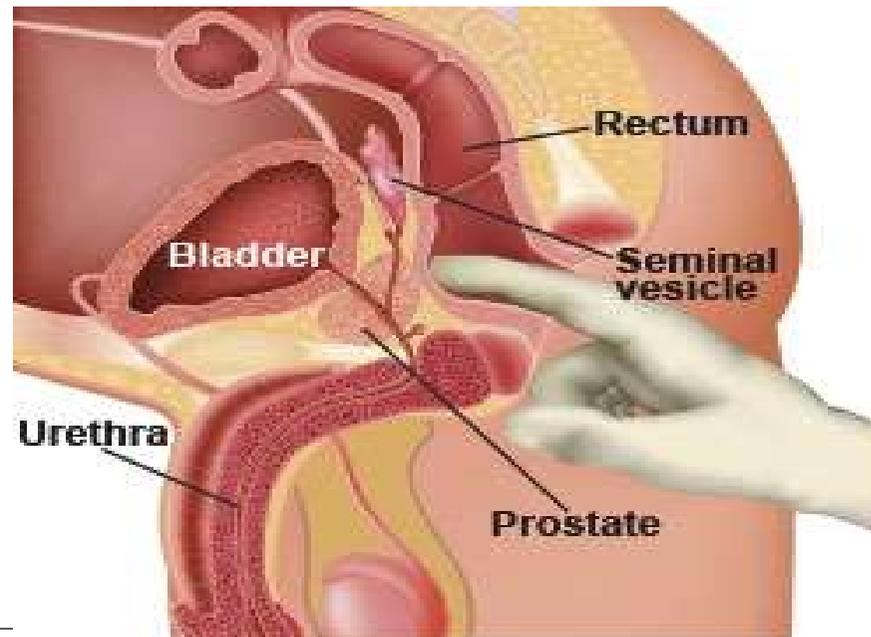
**Functions :**

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



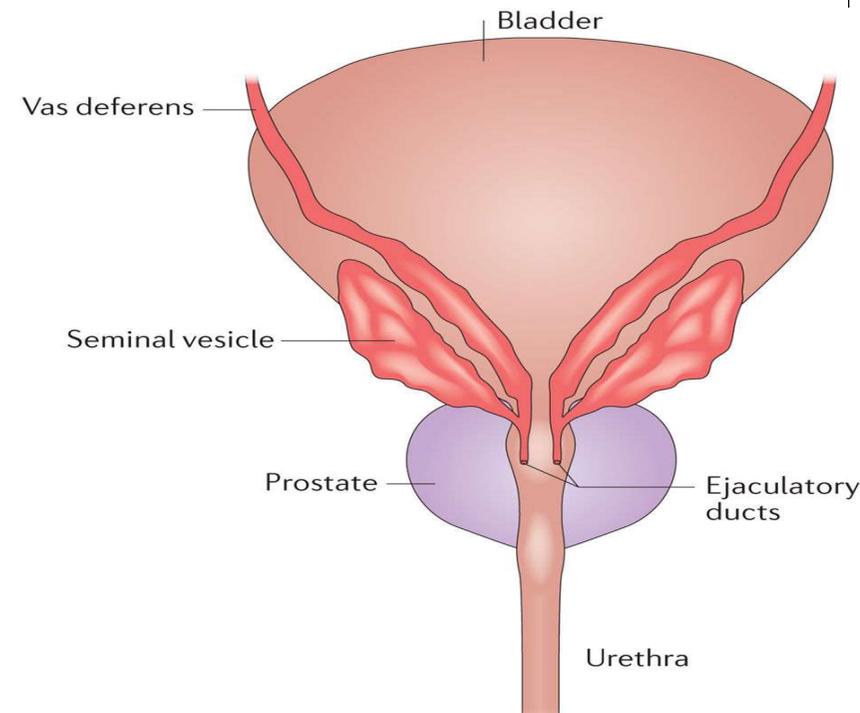
**Applied Anatomy :**

- ✓ The seminal vesicles when enlarged, could be felt on rectal examination.
- ✓ Abscess in he 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.

