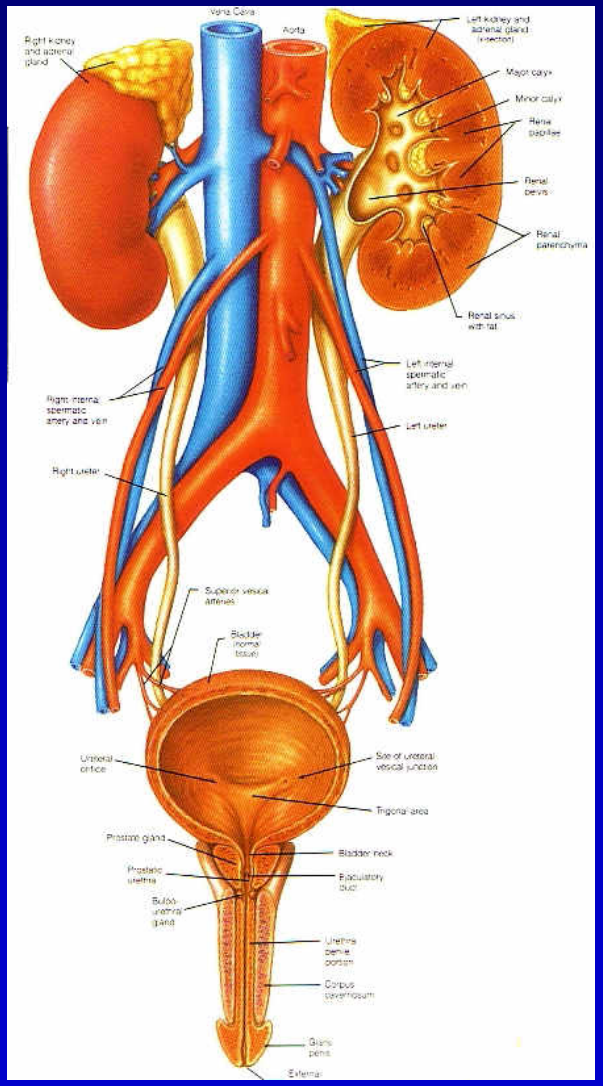
General Urology

Prof. Dr. László Farkas

Head of Department
Urology Clinic
Medical School
Pécs University

Genitourinary Tract

- **General consideration:**
  - Anatomy
  - Physiology
  - Physical Examination
  - Laboratory Examination



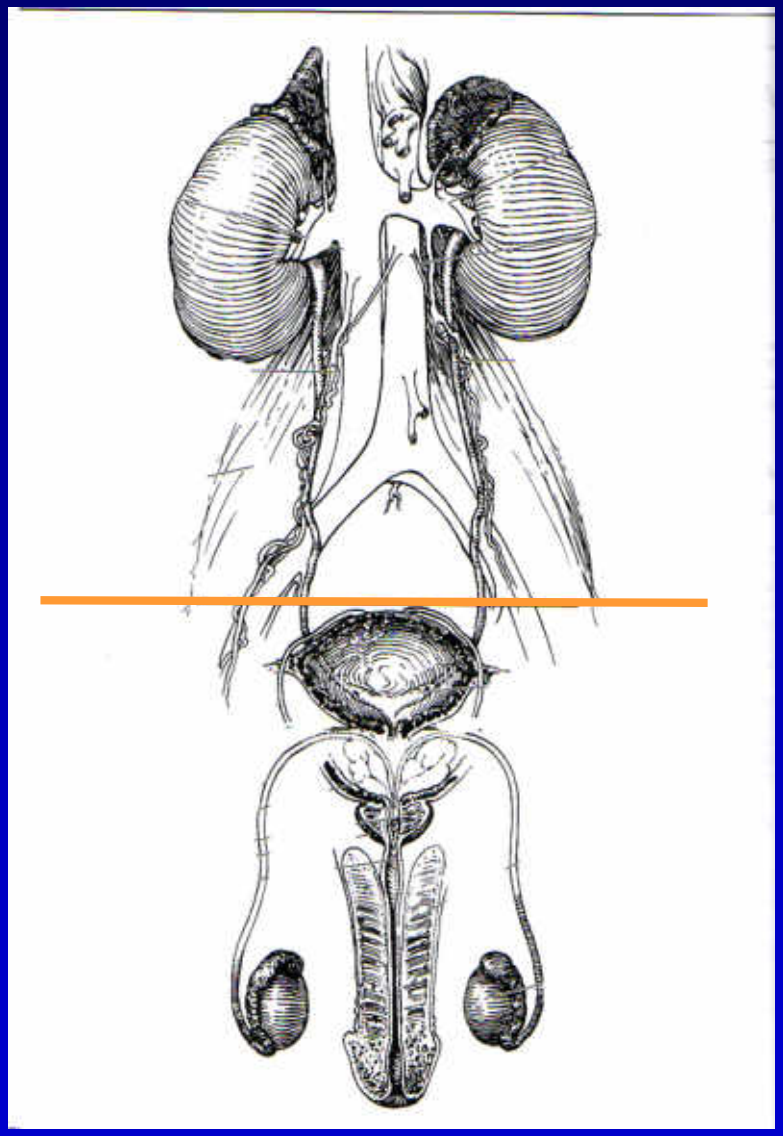
Genitourinary Tract

I. Retroperitoneal organs

- Adrenal glands
- Kidneys
- Ureters
- Aorta & vena cava
- Muscles
- Nerves & lymphatics

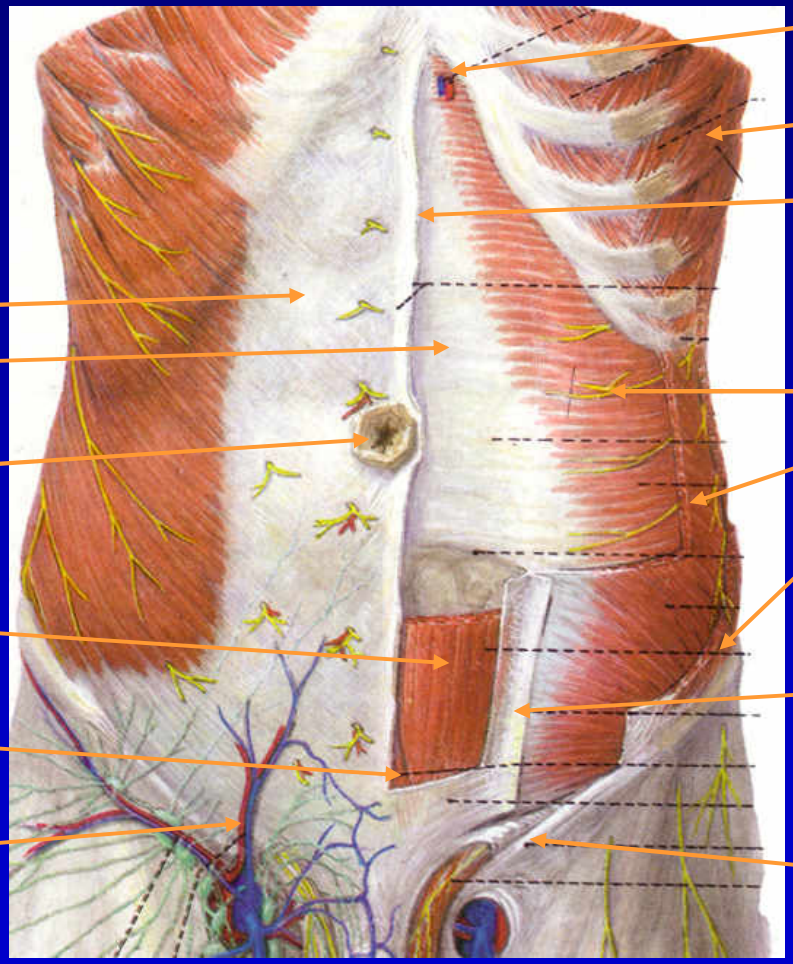
II. Pelvic & perineal organs

- Urinary bladder
- Urethra
- Male urogenital system
- Vessels
- Nerves & lymphatics



General Overview

❖ Anterior abdominal Wall



Rectus sheath:
- Ant. layer
- Post. layer

Umbilicus

Rectus abdominis m.

Pyramidalis m.

Superf. Epigastric a. & v.

Sup. epigastric a. & v.

Serratus ant. muscle

Linea alba

Abdominis muscles:
- Transversus
- Obliquus internus
- Obliquus externus

Aponeurosis of obl. ext. abdominis m.

Inguinal ligament

General Overview

❖ Inguinal canal

Aponeurosis of obl. Ext. abd. M.

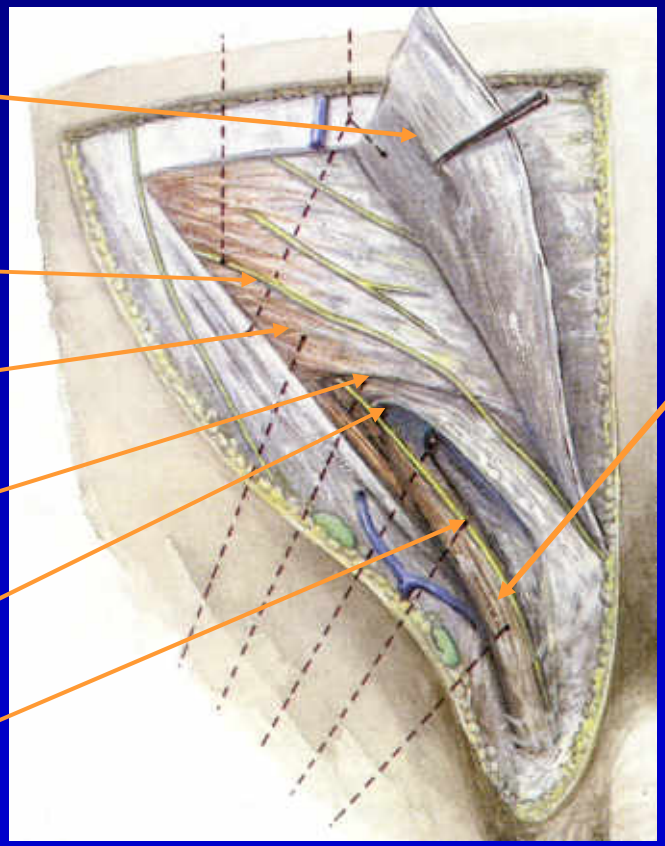
Iliohypogastric nerve

Obl. Intrn. Abd. M.

Transversus abd. m.

Internal inguinal ring

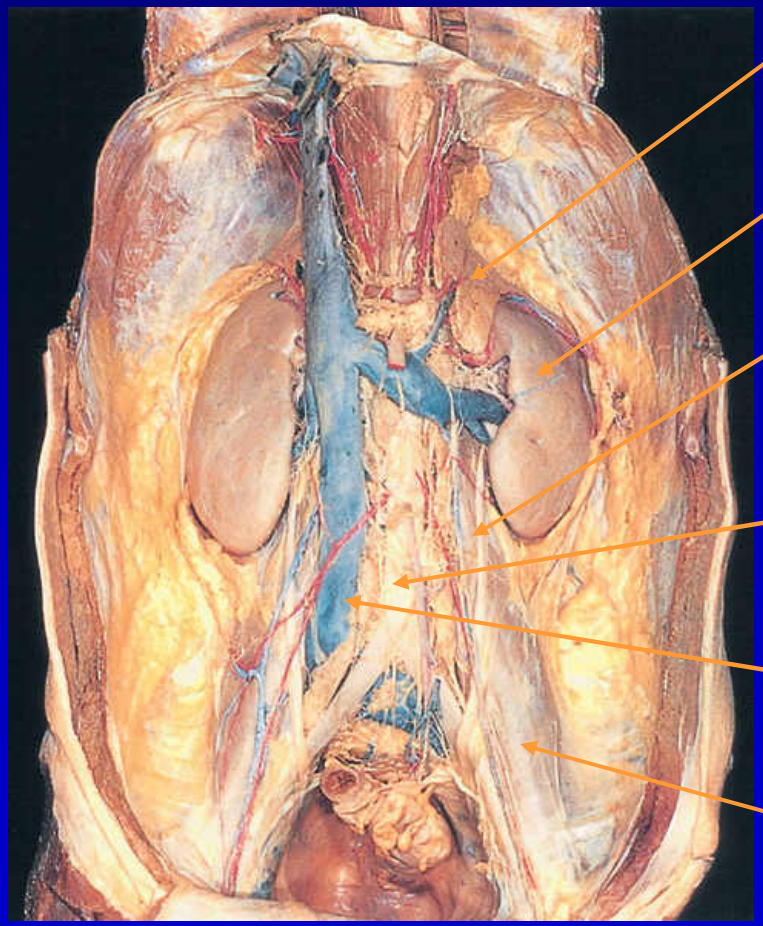
Ilioinguinal nerve

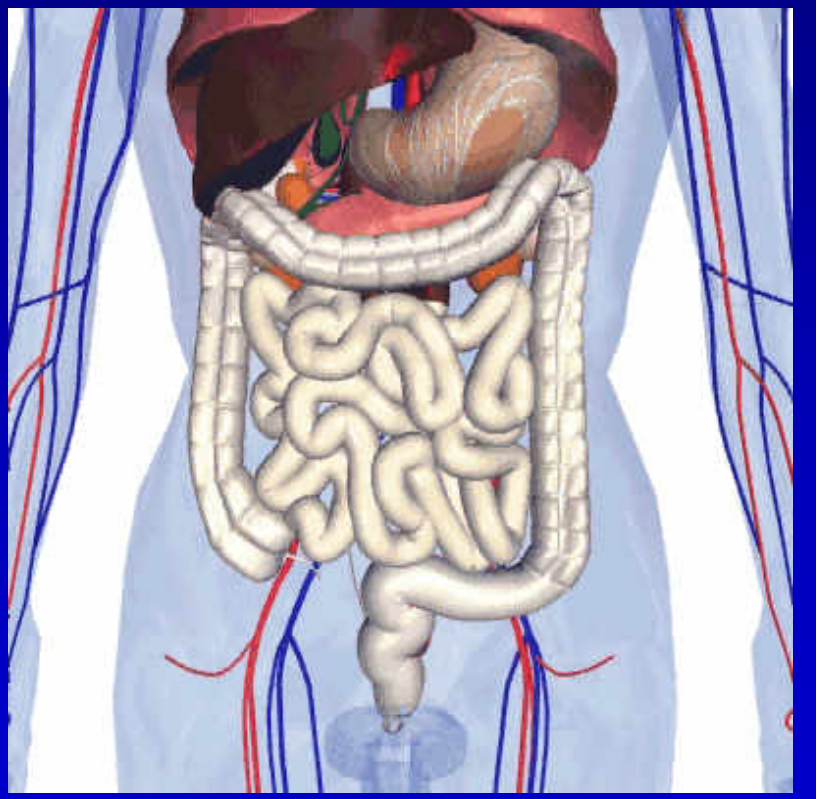


Spermatic cord:

- Ductus deferens
- Cremaster muscle
- Internal spermatic a.
- External spermatic a.
- Vas deferens a.
- Pampiniform plexus
- Lymphatics
- Nerves

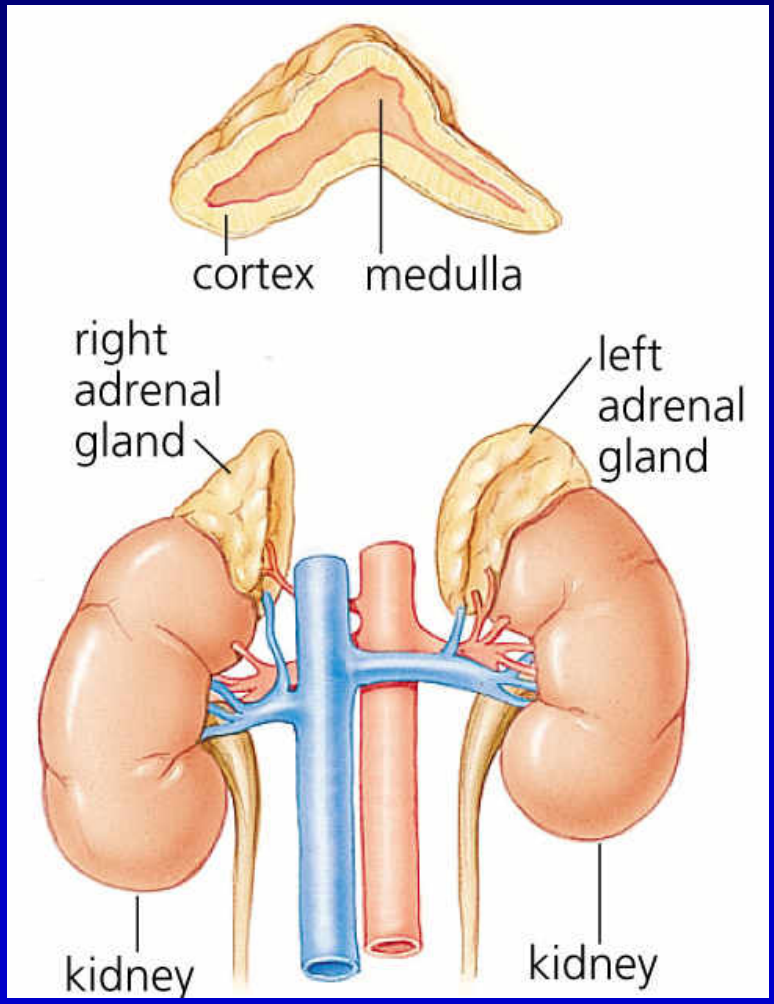
I. Retroperitoneum





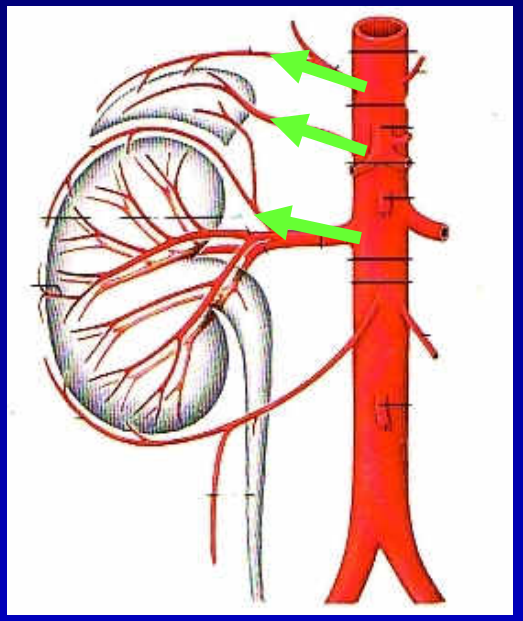
Adrenal (suprarenal) glands

- **Location:**
  - Superomedial to each kidney
  - Lies within the perirenal (Gerota's) fascia
  - 5 grams, 3.5 cm
- **Microscopic anatomy:**
  - Outer cortex (3 zones):
    - Glomerulosa: Aldosterone
    - Fasciculata: Glucocorticoids
    - Reticularis: Sex steroids
  - Inner medulla
    - Secreting catecholamines



Adrenal (suprarenal) glands

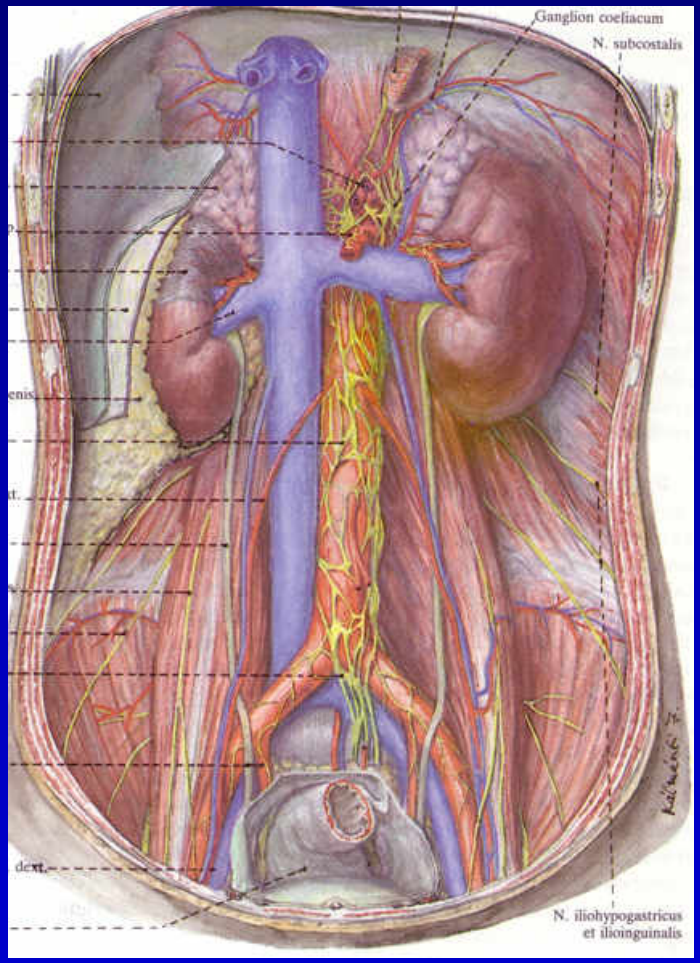
- **Arterial supply:**
  - Each side has 3 aa.:
    - Sup adrenal a.: From inf. phrenic a.
    - Middle adrenal a.: From aorta
    - Inferior adrenal a.: From renal a.



- **Venous drainage:**
  - From right side:
    - Right adrenal v.: Into vena cava
  - From left side:
    - Left adrenal v.: Into left renal v.

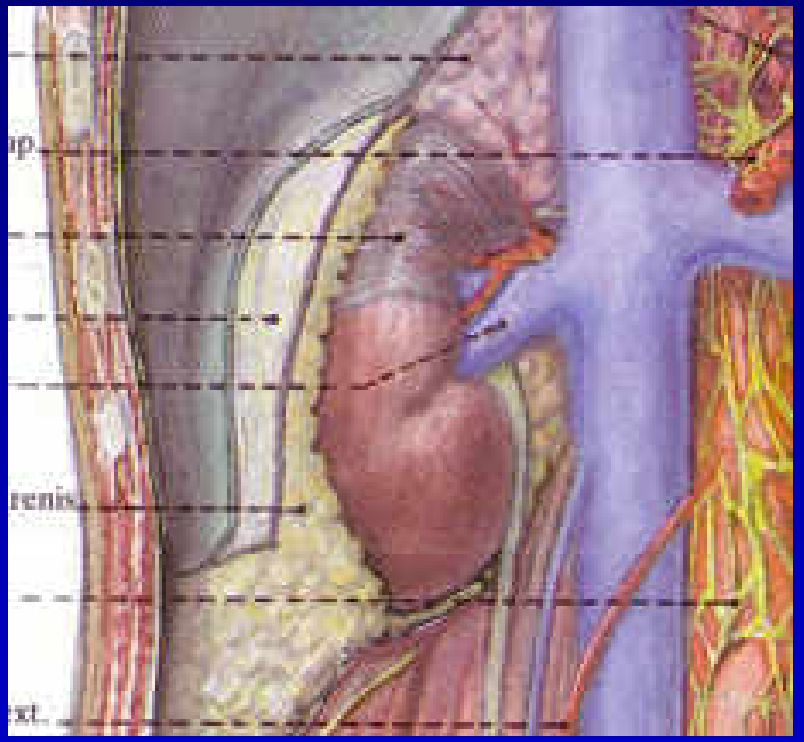
Kidneys

- **Anatomy:**
  - Paired, bean-shaped
  - Each lie along the psoas muscle
  - Between 12th Th. & 3rd L. vertebra
  - Rt. Kidney is lower
  - Each weighs ~ 150 gr.
  - 12 cm x 6 cm x 3 cm



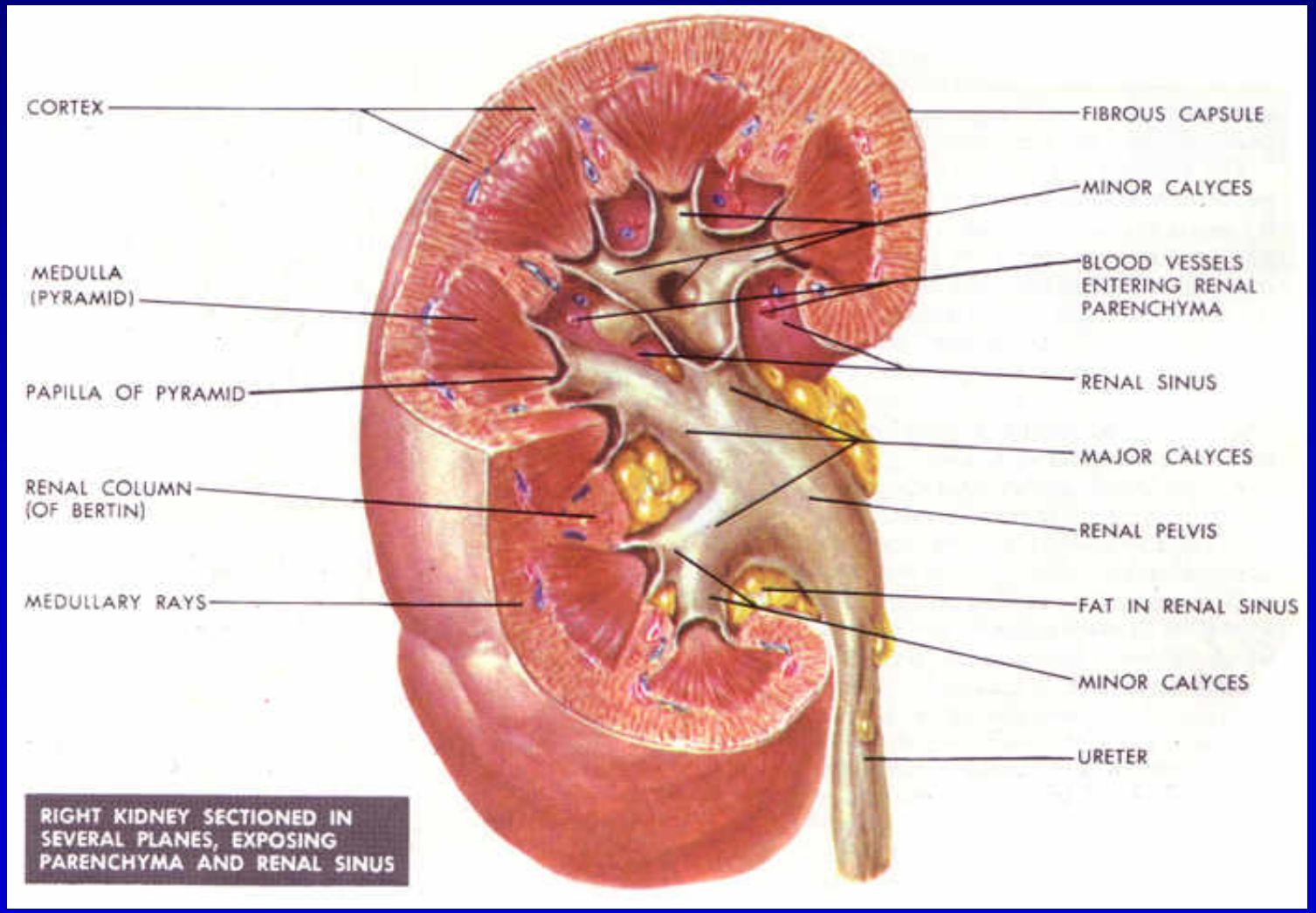
Kidneys

- **Supporting organs:**
  - Renal capsule
    - This capsule holds suture unlike the parenchyma
  - Perirenal fat
  - Perirenal fascia (Gerota's)
    - Fused medially with the other side, and opened inferiorly. Closed on other directions!!!
  - Pararenal fat
  - Vascular pedicle
  - Abdominal muscle tone
  - Abdominal viscera



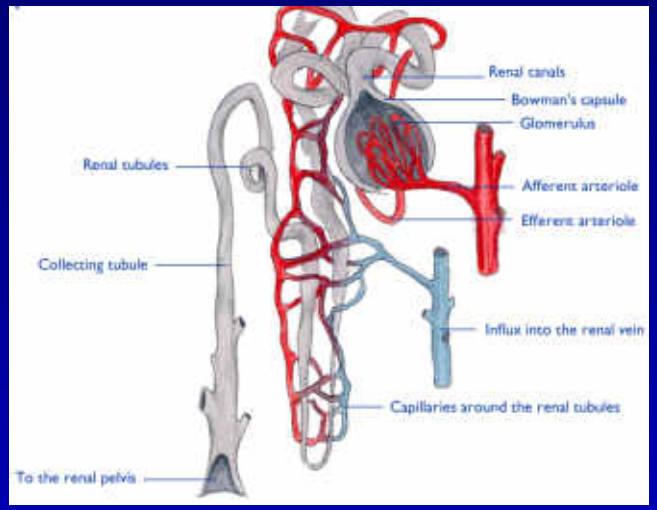
Kidneys

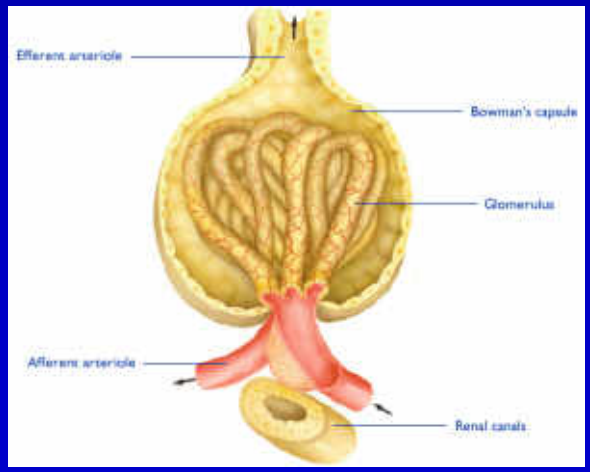
- **Structural details**



Kidneys

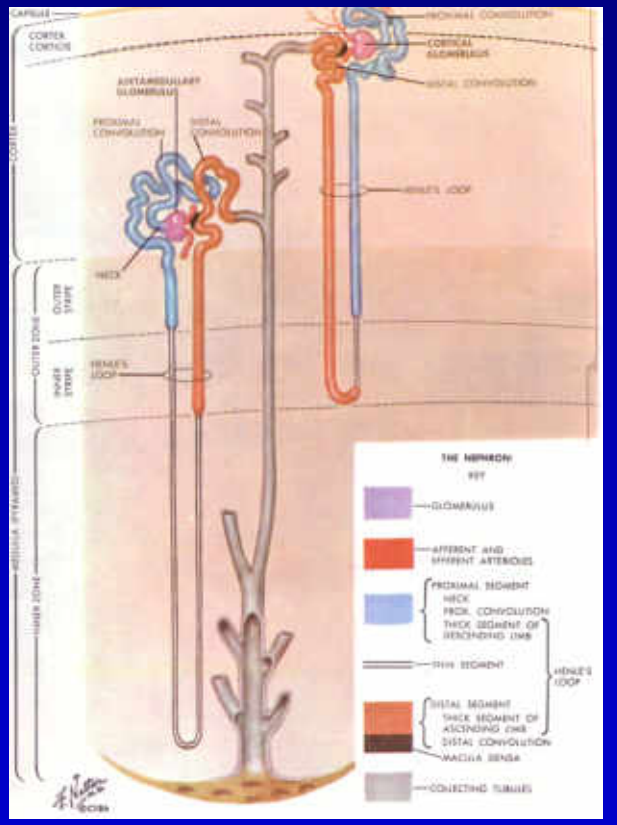
- **Microscopic anatomy**
  - Nephron is functioning unit of the kidneys (2 milions on each side)
  - It has 2 functions:
    - Secretory (mainly in cortex)
      - Bowman's capsule
      - Glomerulus
      - Juxtaglomerular apparutus
    - Excretory (mainly in medulla)
      - Proximal tubule
      - Loop of Henle
      - Distal tubule
      - Collecting duct





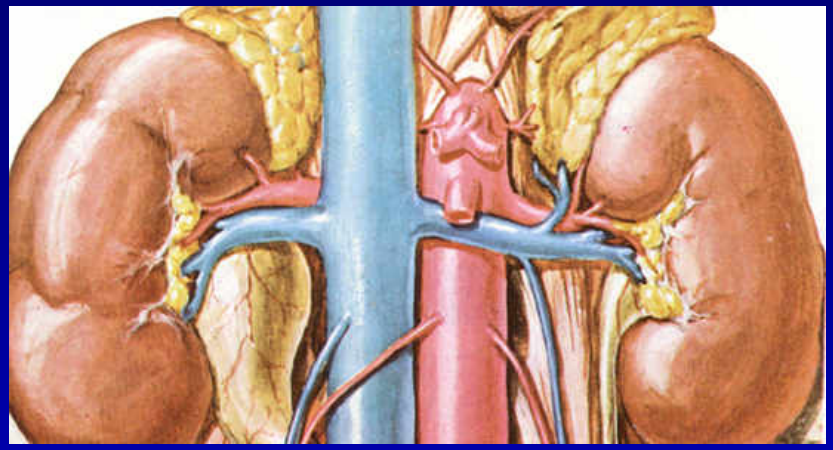
Kidneys

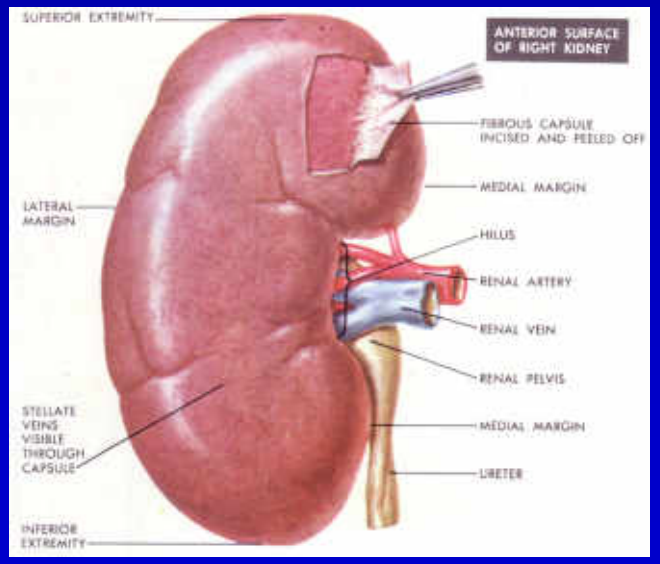
- **Physiology of the kidney**
  - Fluid balance
  - Electrolyte balance
  - Acid-base balance
  - Vitamin D metabolism
  - Production of renin
  - Production of erythropoietin



Kidneys

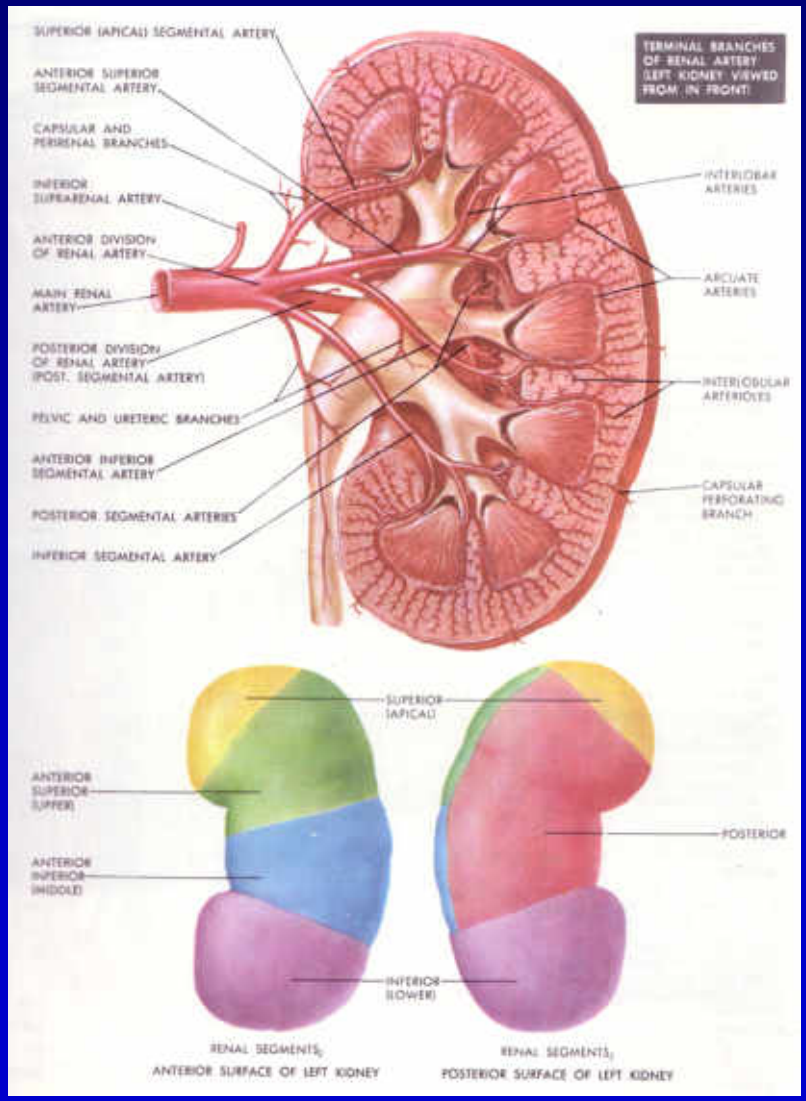
- **Blood supply**
  - Renal Hiulm: From ant. to post: VAU
  - Arterial supply
    - Usually one renal a. from the aorta on each side
    - It branches to segmental aa. before entering the kidney
    - They are all end arteries
  - Venous supply
    - Usually one renal v. to inf. V. cava on each side
    - Usually paired with arteries
    - Many collaterals & segments





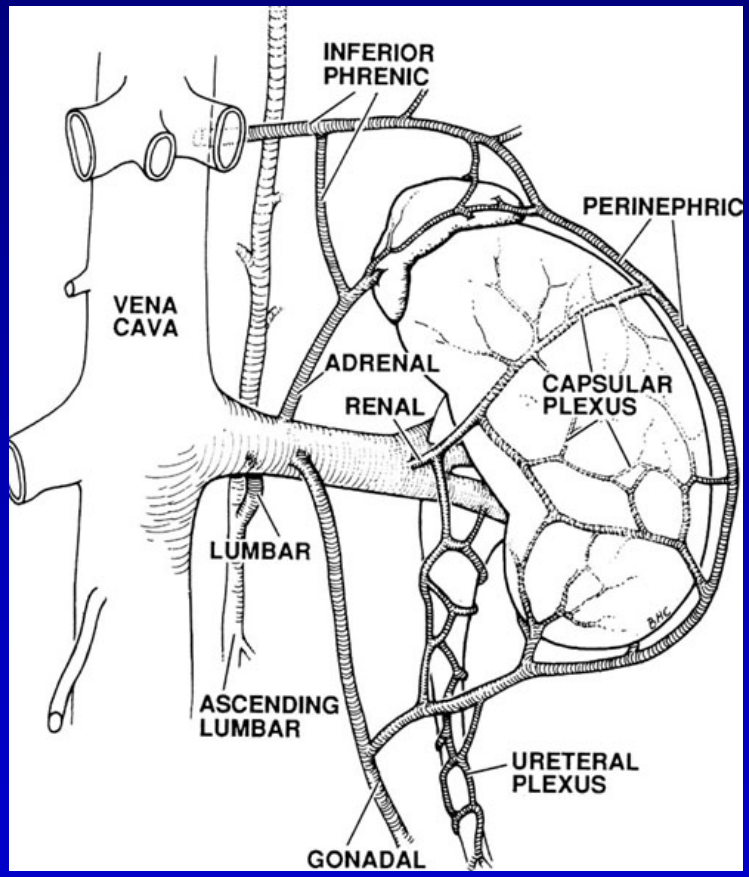
Kidneys

- **Blood supply**
  - Segmental aa.: Branch in the sinus of the kidney into:
    - Apical segmental a.
    - Ant. Sup. Segmental a.
    - Ant. Inf. Segmental a.
    - Post. Segmental a.
    - Inferior segmental a.
  - Each segmental a. supplies different segment of the kidney
  - Injury to one segmental a. causes infarction of the effected renal segment



Kidneys

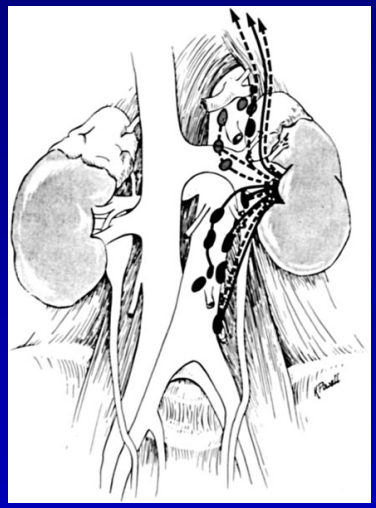
- **Blood supply**
  - Venous drainage of the left kidney is unique
  - It has potentially extensive collateral circulation
  - Left gonadal vein enters the left renal vein
  - Left adrenal vein also enters the left renal vein
  - Due to its longer length, there are more lumbar branches from the left renal vein



Kidneys

- ## Lymphatic drainage & innervations

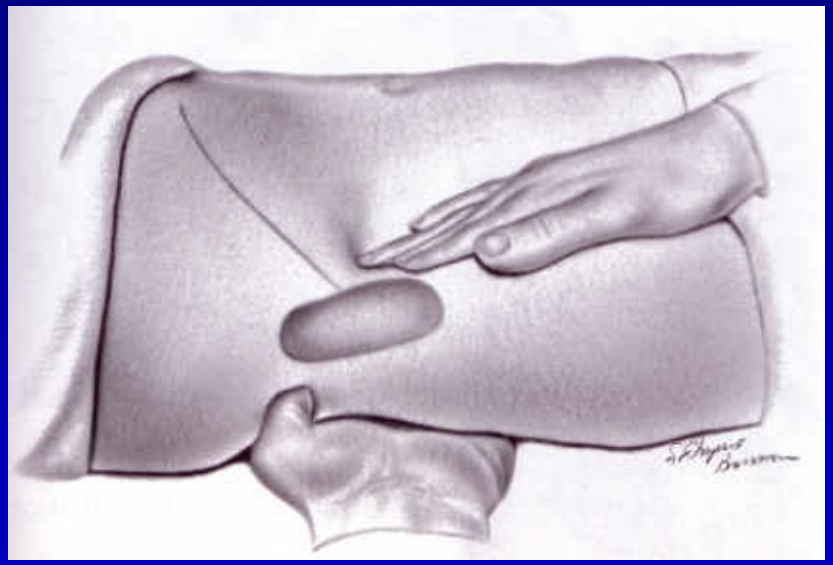
  - **Left kidney:**
    - **Lt. renal hilum ly. Nodes**
    - **Lt. lat. paraaortic ly. Nodes**
  - **Right kidney:**
    - **Rt. renal hilum ly. Nodes**
    - **Interaortocaval ly. Nodes**
    - **Right paracaval ly. Nodes**



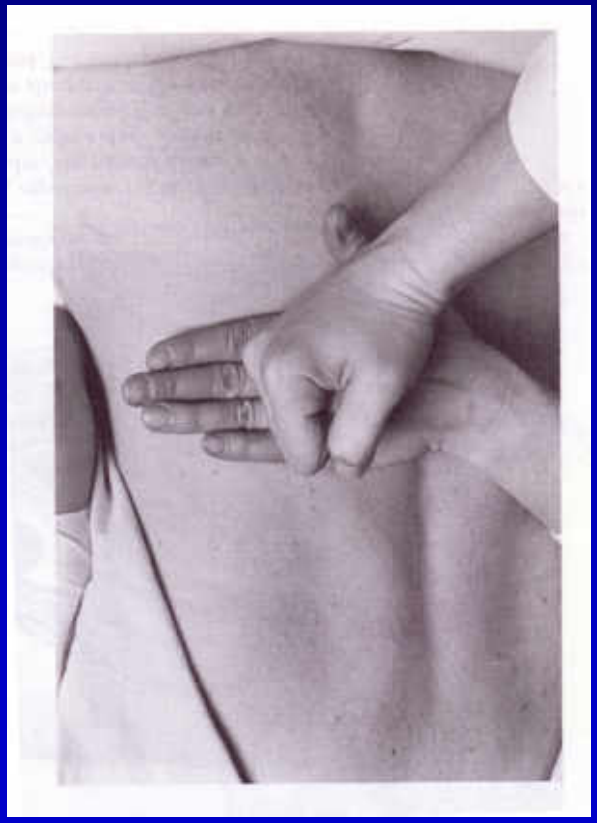
  - **Innervation:**
    - **Sympathetic from Th. XII - L. I.**
    - **Parasympathetic from Vagus nerve**
      - **Pain is originated from nocicepters located in the renal capsule (sensitive to distension)**

Kidneys

- **Physical examination**



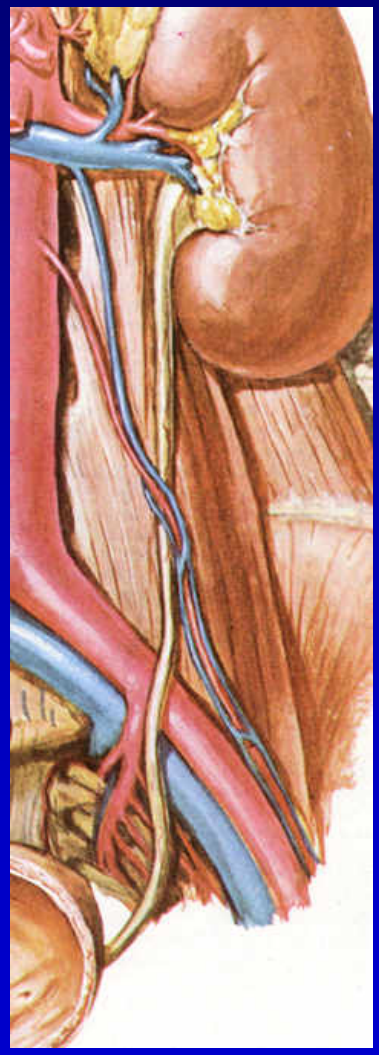
Palpation: Supine position



Percussion: Sitting position

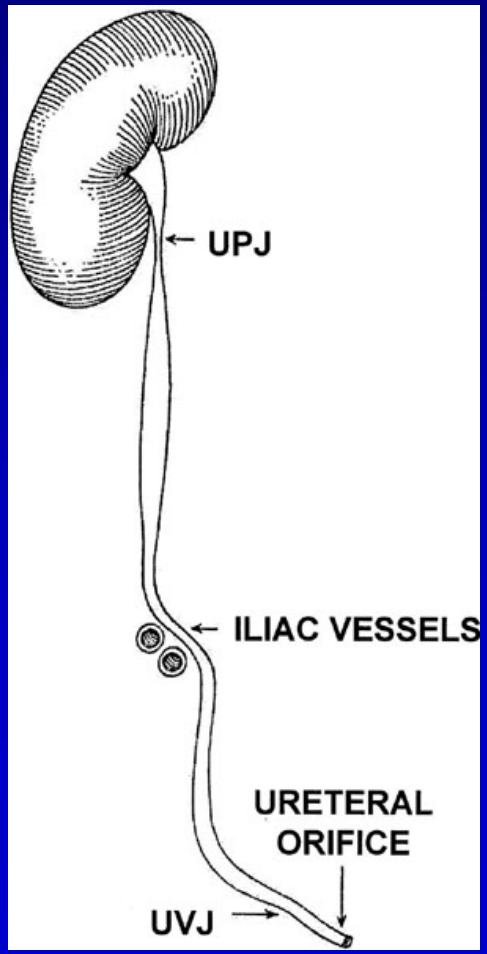
Ureters

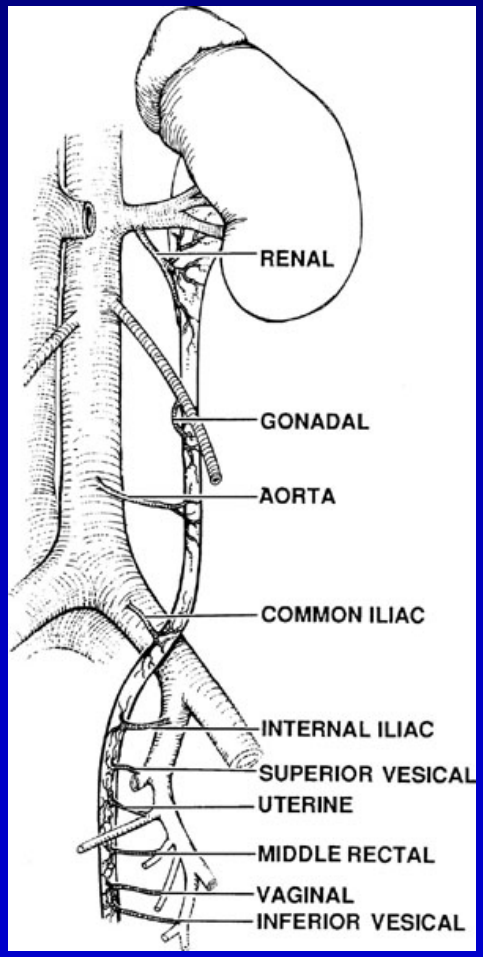
- **Anatomy**
  - Three segments:
    - **Upper:** Renal pelvis to upper border of sacrum
    - **Middle:** to lower border of sacrum
    - **Lower:** to the bladder
  - Each courses downward & medially toward the bladder
  - 22 - 30 cm in length
  - Lined by transitional epith. cells
  - Has peristaltic movements



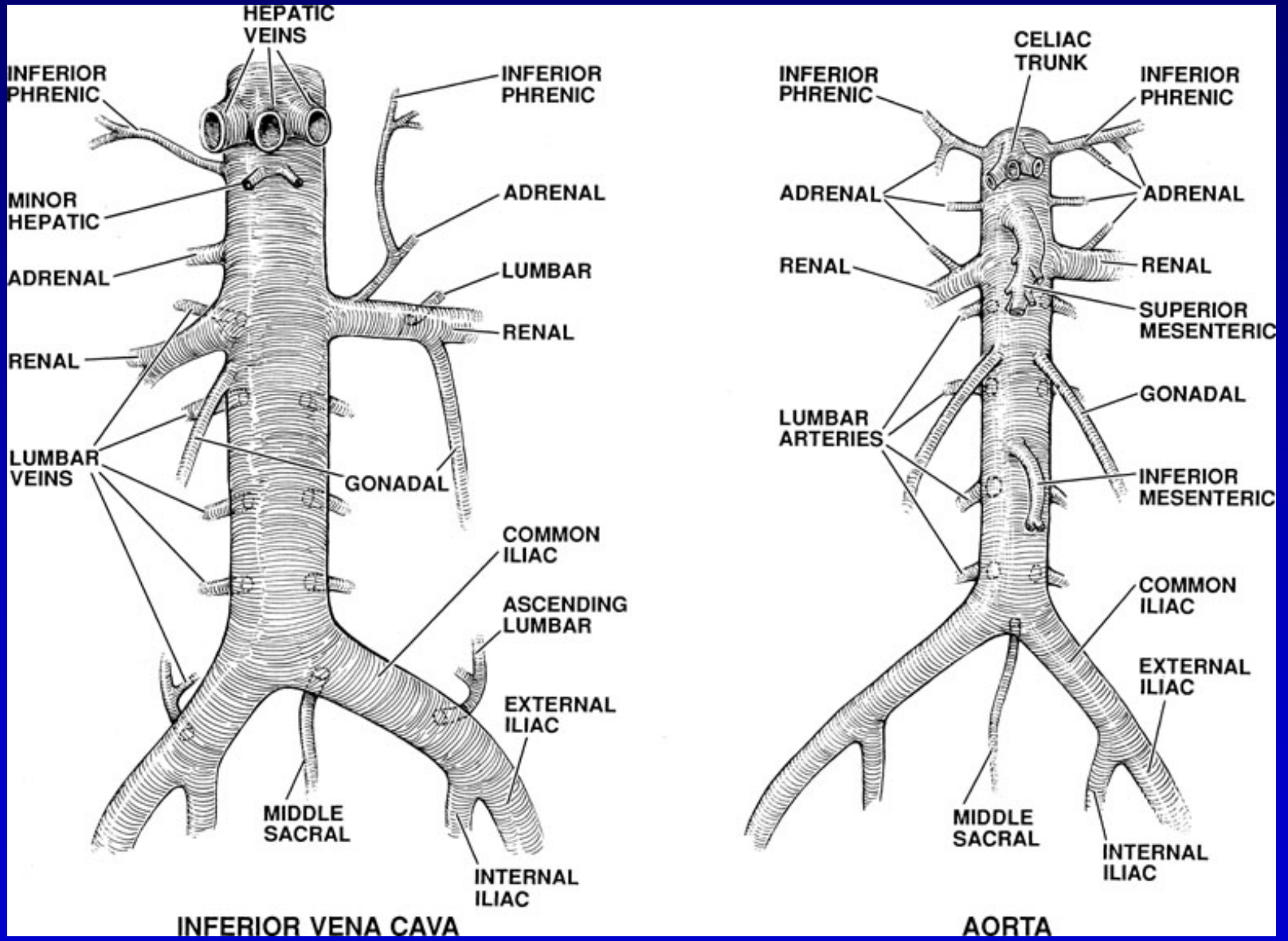
Ureters

- **Normal narrowing & blood supply**

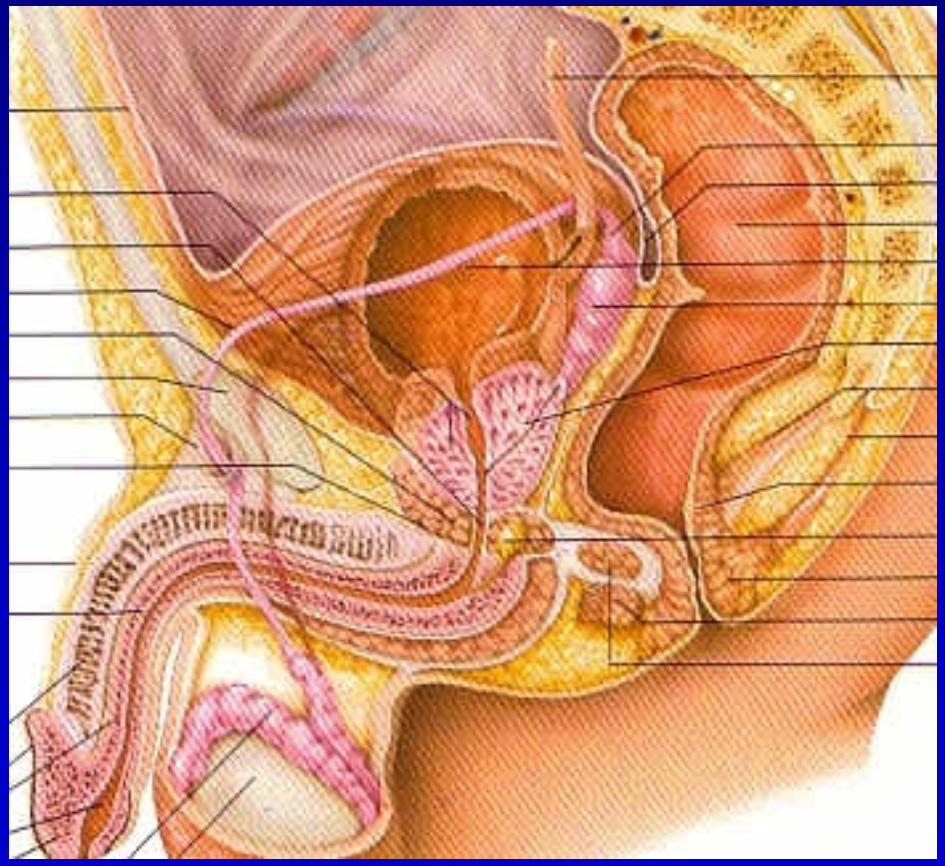


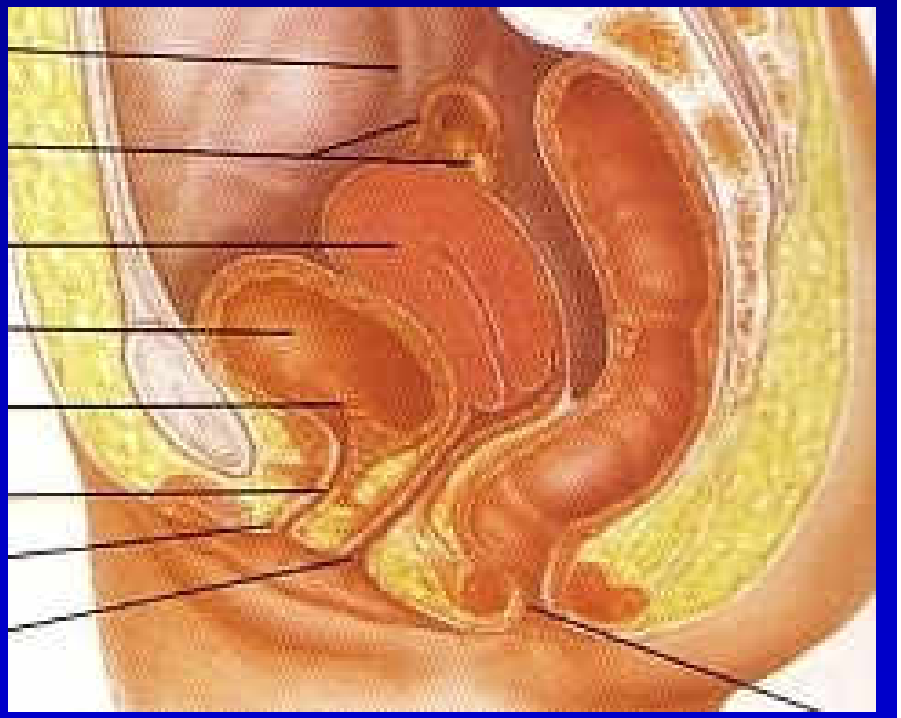


Aorta & vena cava



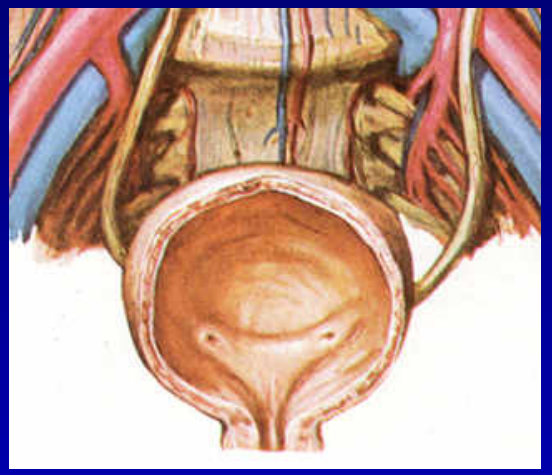
II. Pelvic & Perineal Organs

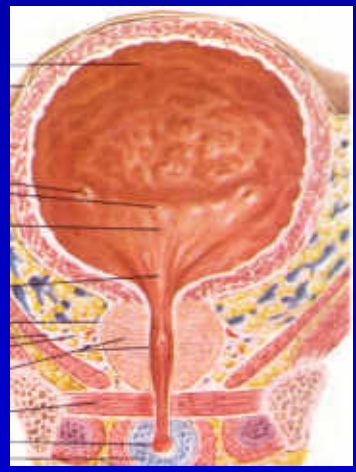




Urinary bladder

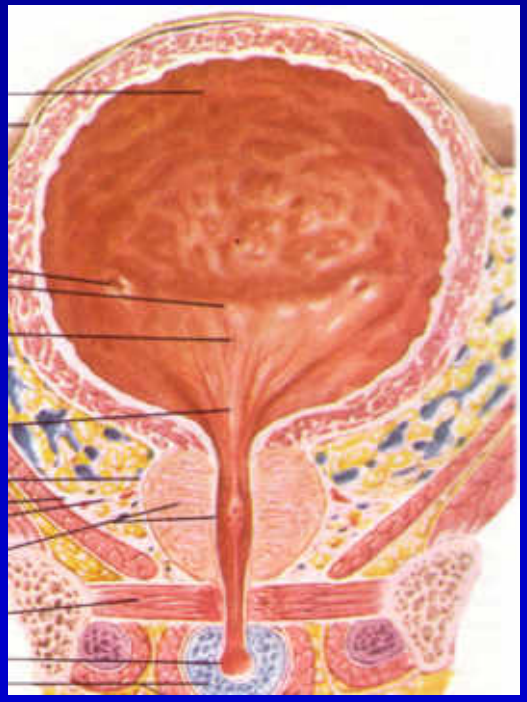
- **Anatomy**
  - A hollow muscular organ
  - Serves as a reservoir for urine
  - Adult normal capacity: 400–500 ml
  - When empty lies behind the pubic symphysis
  - Palpated only when it is full
  - Ureters enter the bladder posteroinferiorly
  - The orifices are situated at the ends of a crescent shaped interureteric ridge
  - Trigone is the area between 2 orifices & the bladder neck





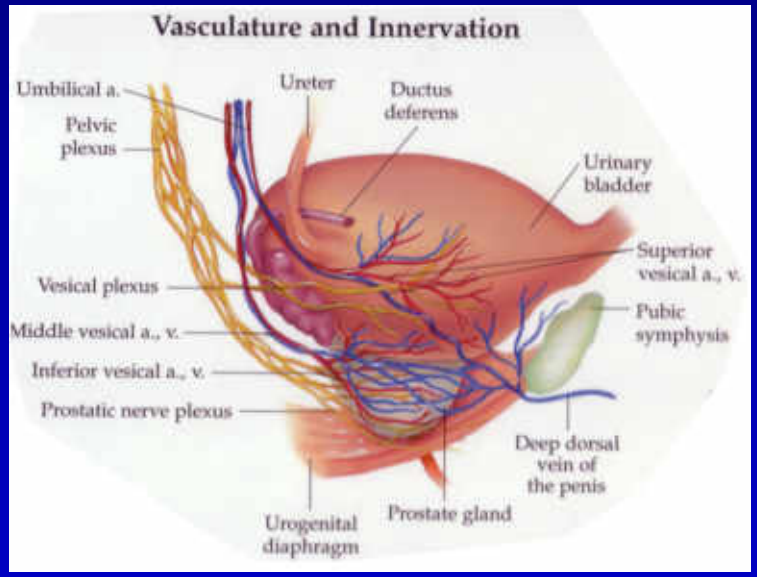
Urinary bladder

- **Microscopic anatomy**
  - Mucosa is of transitional epithelium
  - Beneath it in order:
    - Submucosal layer
    - Superficial muscle (inner half)
    - Deep muscle (outer half)
    - Perivesical fat
  - The muscular layers are:
    - Inner longitudinal
    - Middle circular
    - Outer longitudinal

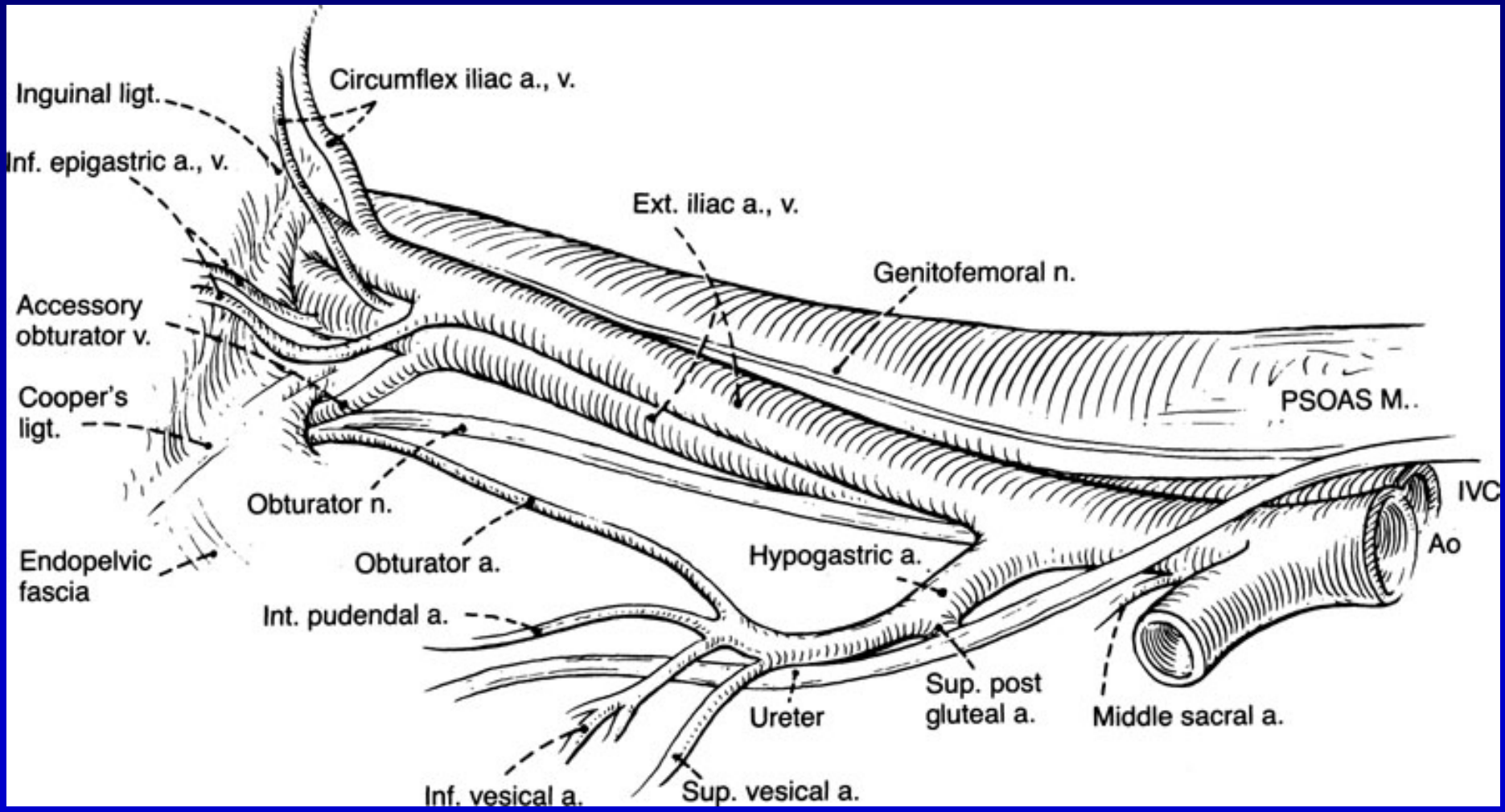


Urinary bladder

- **Blood supply & lymphatics**
  - Arterial supply:
    - Internal iliac a. (hypogastric)
      - Sup. Vesical
      - Middle vesical
      - Inferior vesical
  - Venous drainage:
    - Internal iliac v. (hypogastric)
  - Lymphatic drainage:
    - Vesical lymph nodes
    - External iliac
    - Internal iliac
    - Common iliac

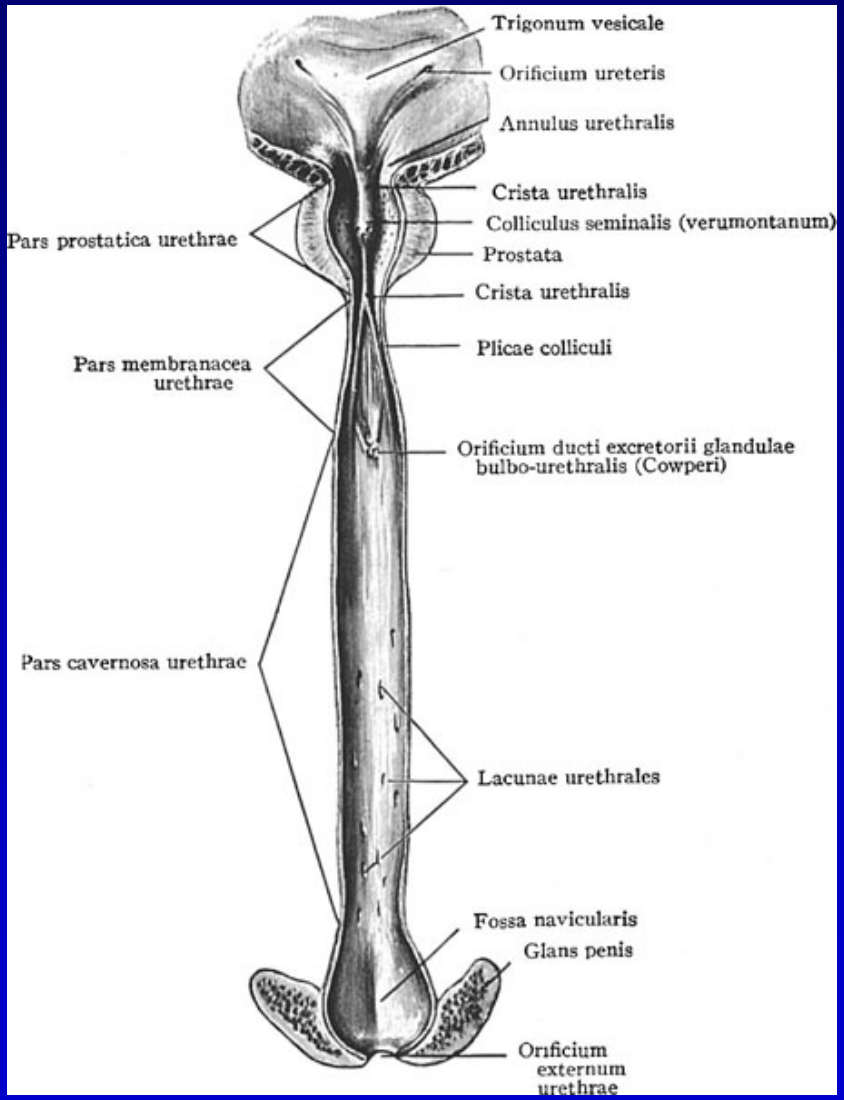


Pelvic blood vessels



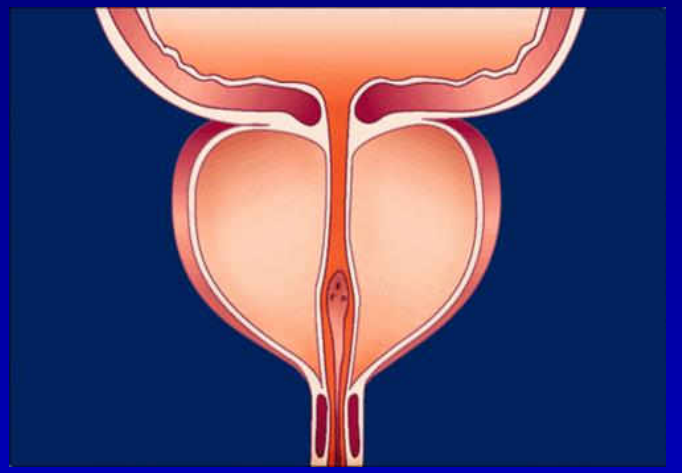
Urethra

- **Female urethra**
  - About 4 cm long
  - Diameter about 8 mm
  - Slightly curved
  - Ant. To vagina
  - Squamous epithelium
- **Male urethra**
  - Diameter about 8 mm
  - Squamous epithelium
  - Diff. parts (see the fig.)

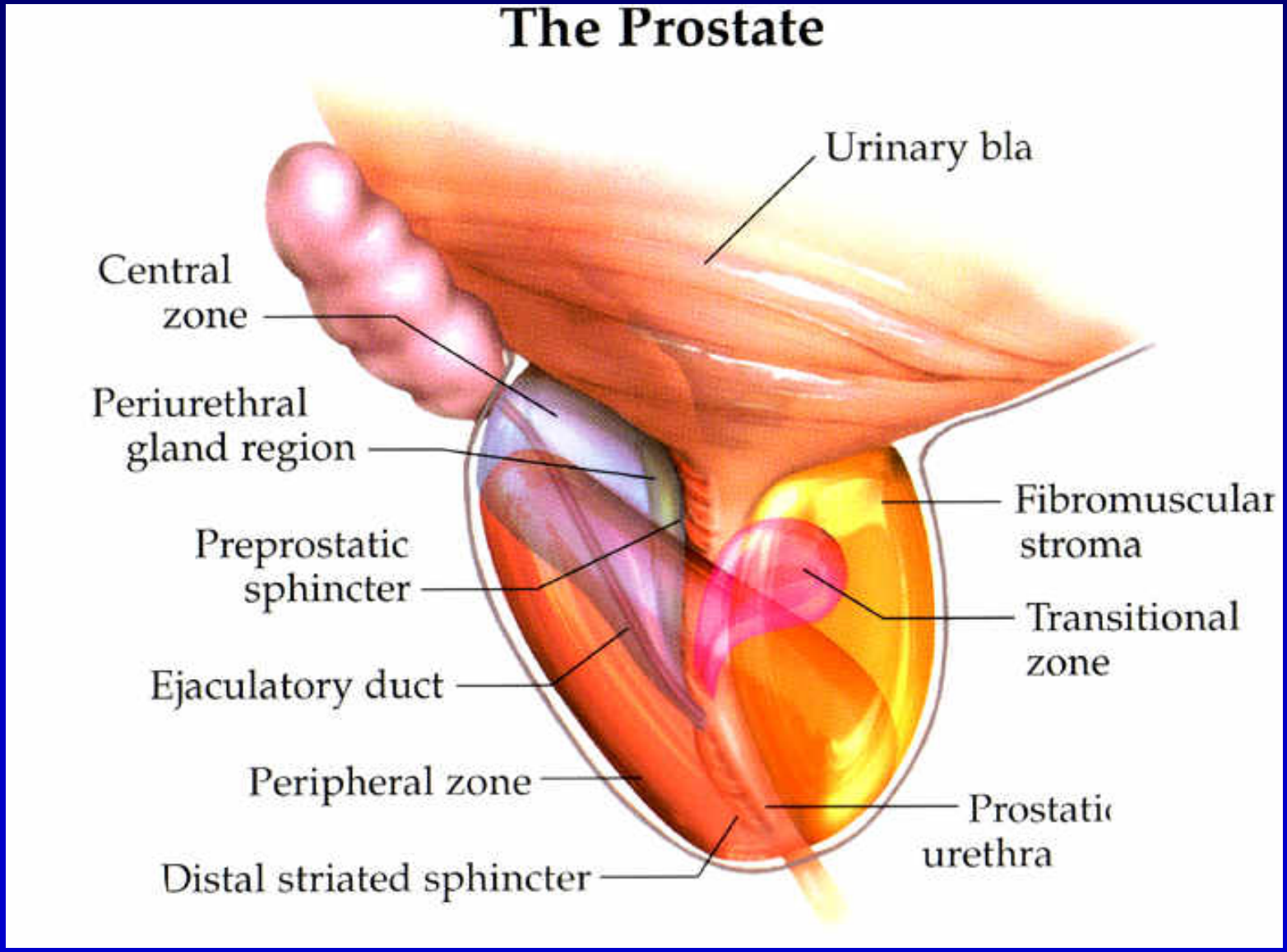


Prostate

- **Anatomy**
  - A fibromuscular & glandular organ
  - Lying just inferior to the bladder
  - Ovoid shape, with a narrowed **apex** inferiorly and a broad **base** superiorly
  - Normally about 20 grams
  - Size: 4 x 3 x 2 cm
  - Traversed by post. urethra (2.5 cm)
  - Supported anteriorly by: Puboprostatic ligament
  - Perforated posteriorly by ejaculatory ducts

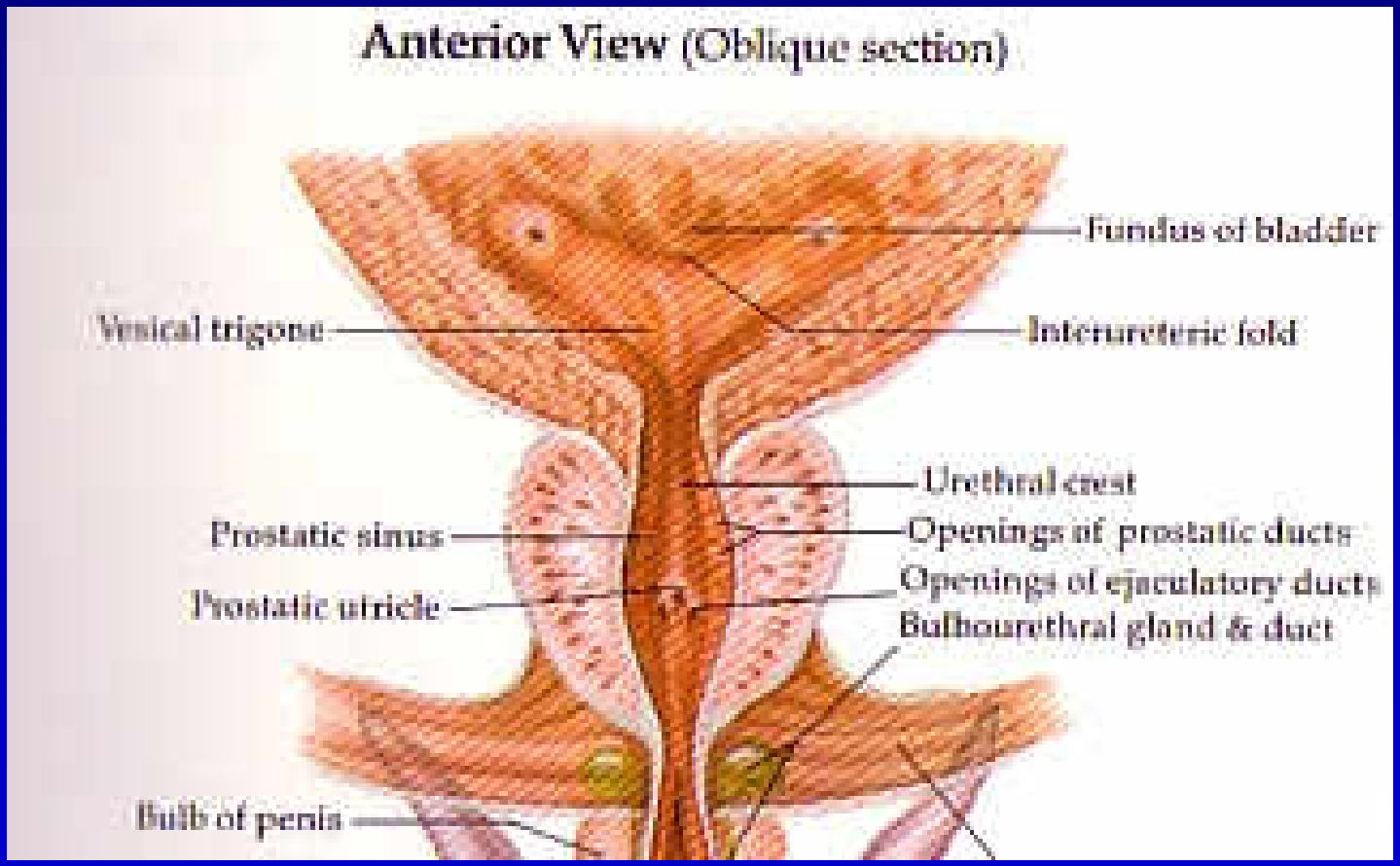


Prostate


The Prostate
Urinary bla
Central zone
Periurethral gland region
Preprostatic sphincter
Ejaculatory duct
Peripheral zone
Distal striated sphincter
Fibromuscular stroma
Transitional zone
Prostatic urethra

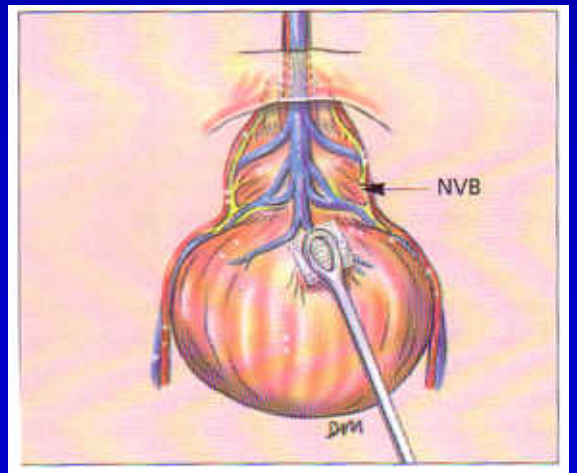
Prostate

- **Prostatic urethra**

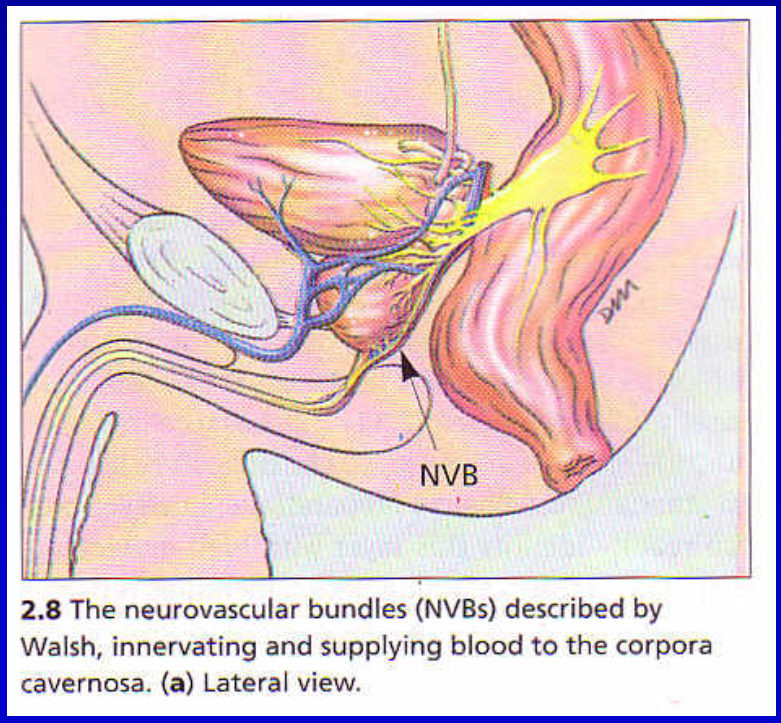


Prostate

- **Venous and lymphatic drainage**
  - Venous:
    - Periprostatic plexus
      - Deep dorsal vein of penis
        - » Internal iliac vein
  - Lymphatics:
    - Obturator and iliac nodes



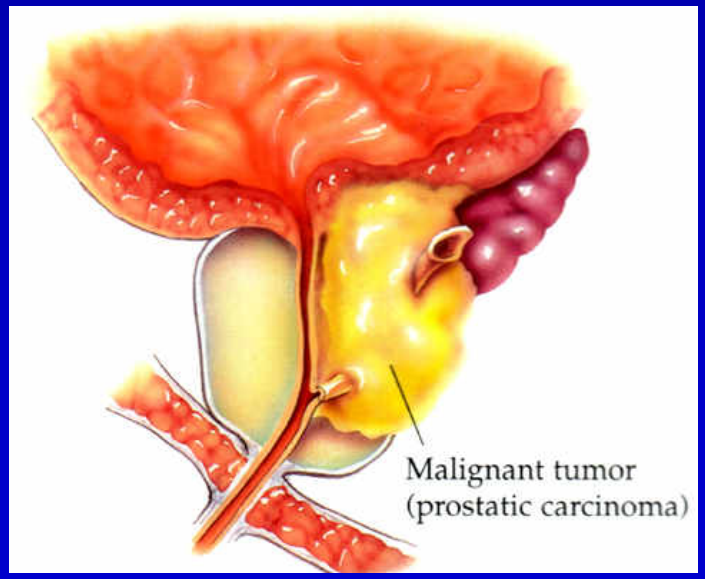
(b) AP view at surgery.

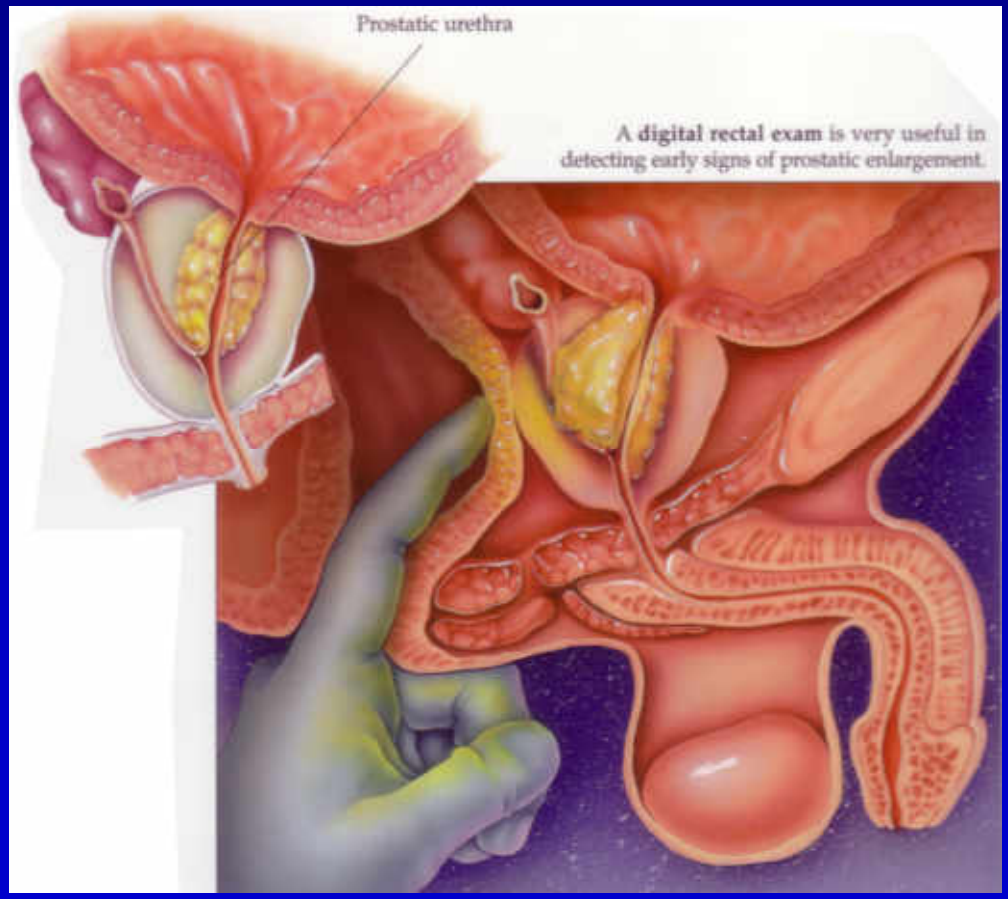


2.8 The neurovascular bundles (NVBs) described by Walsh, innervating and supplying blood to the corpora cavernosa. (**a**) Lateral view.

Prostate

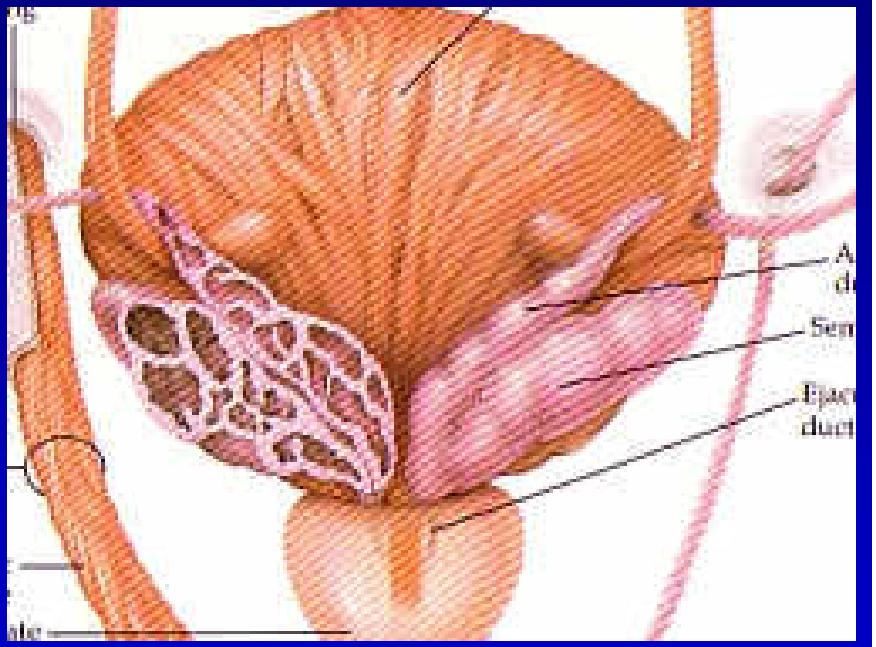
- **Pysical examination**
  - Normal prostate
    - Peanut size
    - Symmetric
    - Smooth surface
    - Gl. consistency
    - No pain





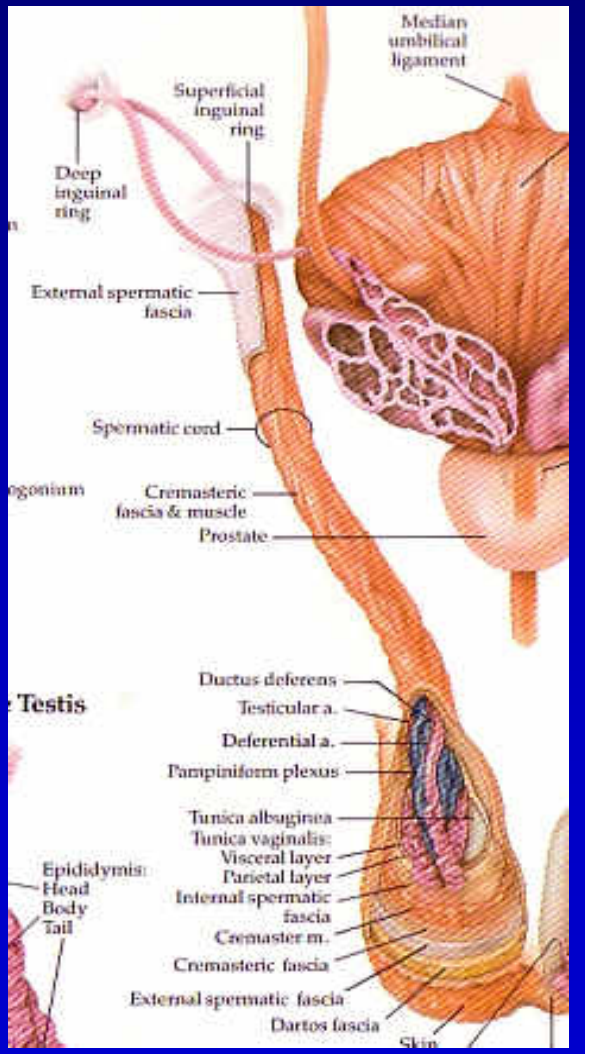
Seminal vesicles

- **Anatomy**
  - Cephalic to the prostate
  - Under base of the bladder
  - About 6 cm long
  - Quite soft
  - Joins its corresponding vas deferens to form the ejaculatory duct
  - Blood supply similar to prostate



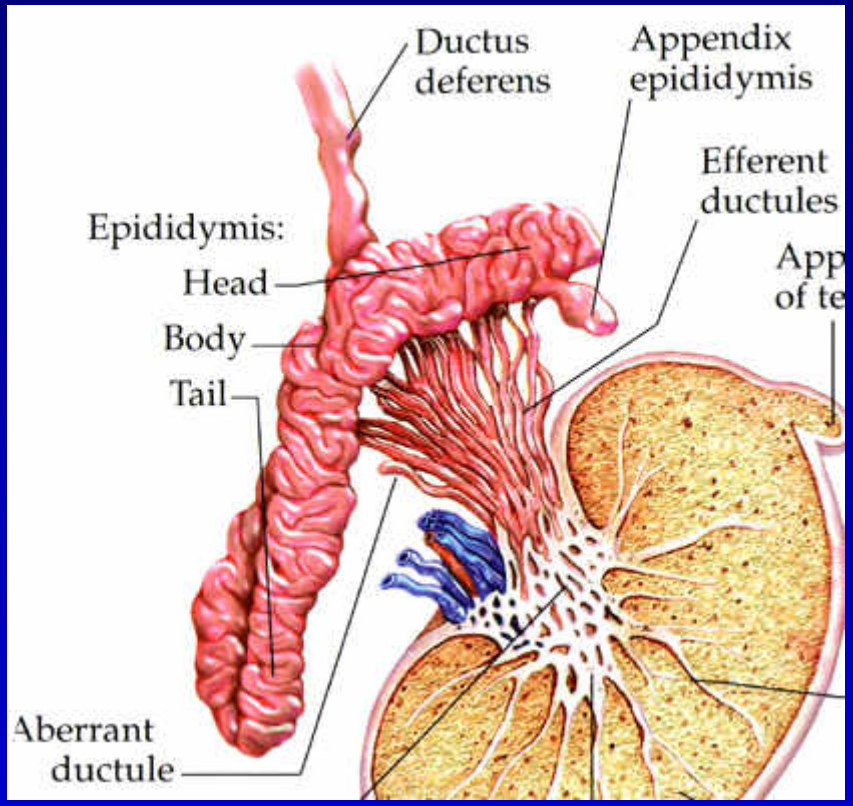
Spermatic cord

- **Anatomy**
  - Two spermatic cords extend from testicle to external inguinal ring. Through inguinal canal it reaches to internal inguinal ring and its contents enter the retroperitoneum
  - Each cord contains:
    - Ductus deferens
    - Cremaster muscle
    - Internal spermatic a.
    - External spermatic a.
    - Vas deferens a.
    - Pampiniform plexus
    - Lymphatics
    - Nerves



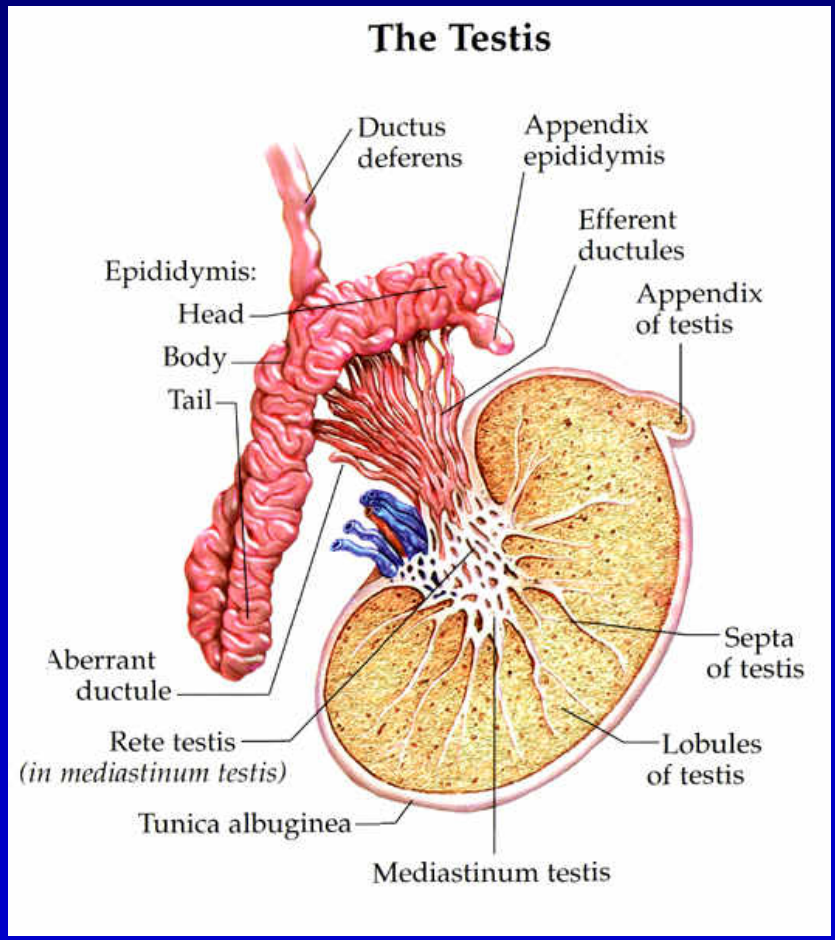
Epididymis

- **Anatomy**
  - The upper portion of epididymis is connected to the testis by efferent ducts from the testis
  - It consists of coiled ducts
  - Its lower pole connected to ductus deferens
  - It lies posterolateral to the testis



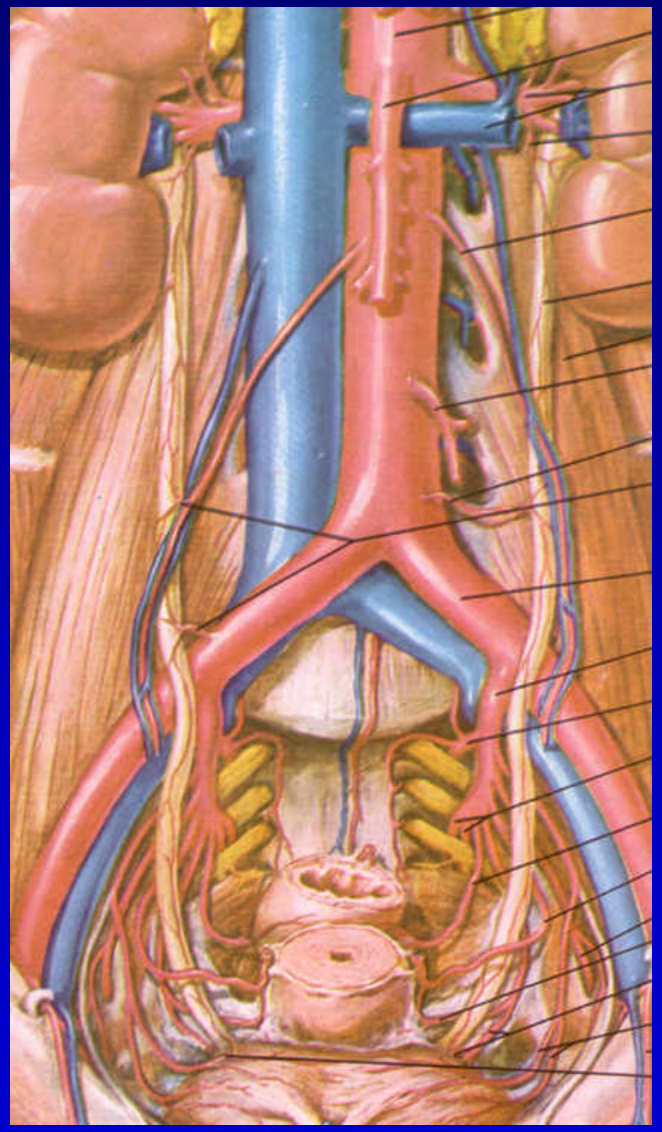
Testis

- **Anatomy**
  - Size: 4 x 3 x 2.5 cm
  - About 30 ml
  - They are enclosed in a strong capsule called tunica albuginea
  - At the upper pole is the appendix testis
  - Closely attached to the epididymis
  - It has 2 important functions:
    - Spermatogenesis
    - Testosterone production by Leydig cells



Testis

- **Blood supply**
  - Closely associated with that of the kidney because of common embryologic origin
  - Arterial supply
    - Internal spermatic a.
      - From the aorta
    - External spermatic a.
      - Internal iliac a.
  - Venous drainage
    - Pampiniform plexus, into the spermatic cord
      - Internal spermatic vein
        - » Lt. to renal, Rt. to v. cava
      - External spermatic vein
        - » Into iliac veins

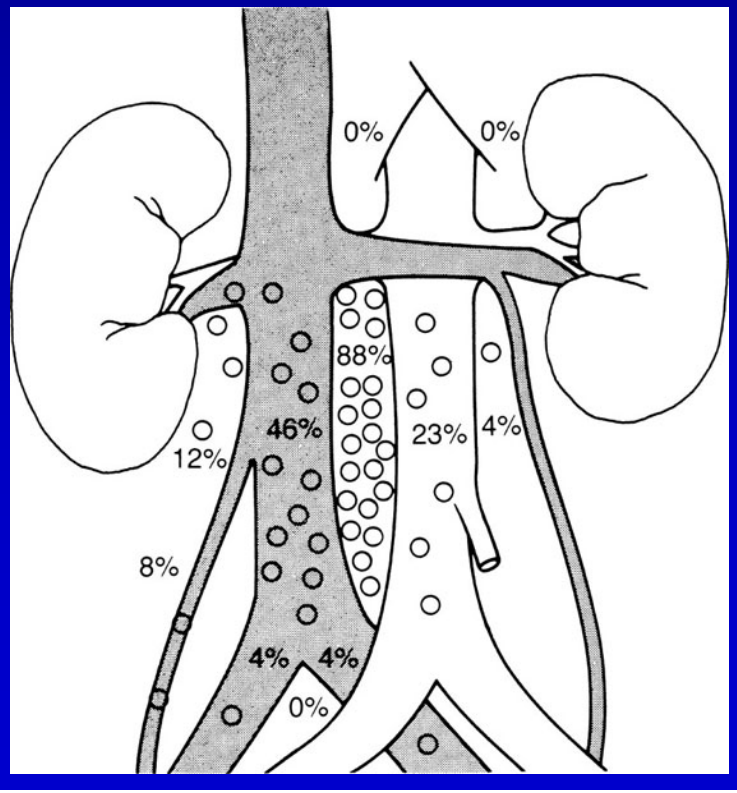


Testis

- ## Lymphatic drainage

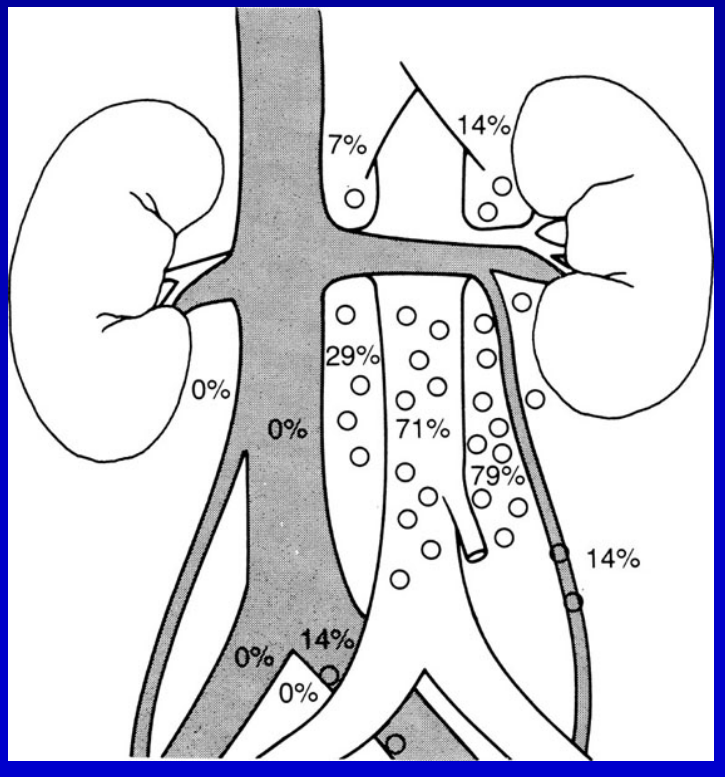
Right side:

- Inter-aortocaval nodes
- Para-caval nodes



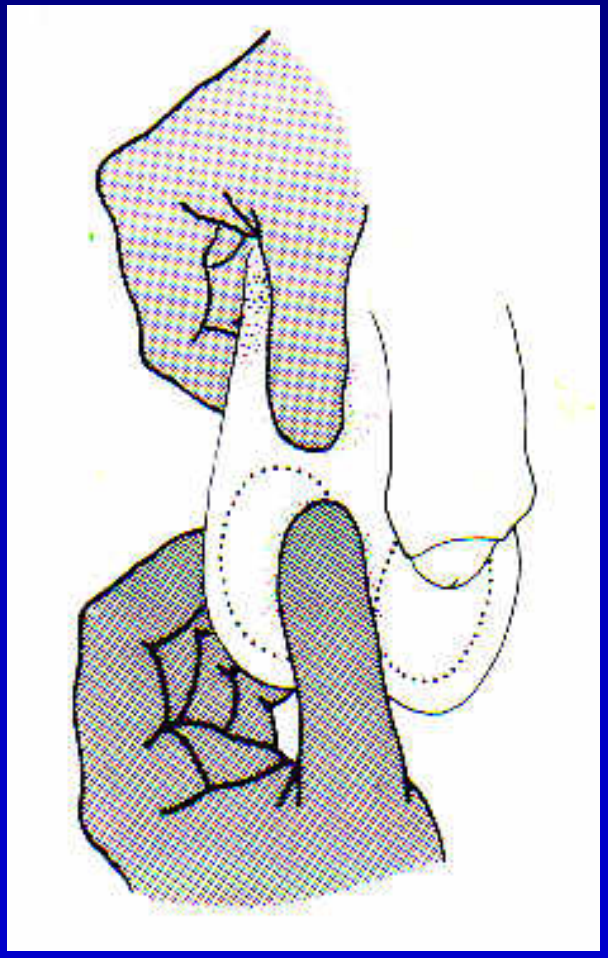
Left side:

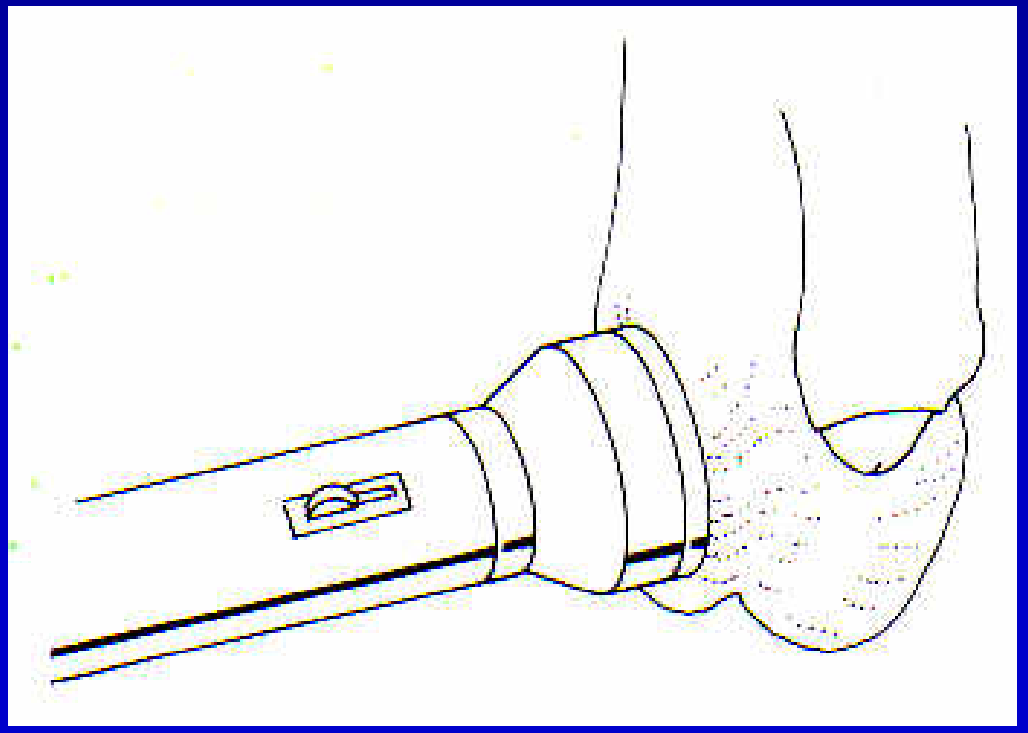
- Para-aortic nodes



Testis

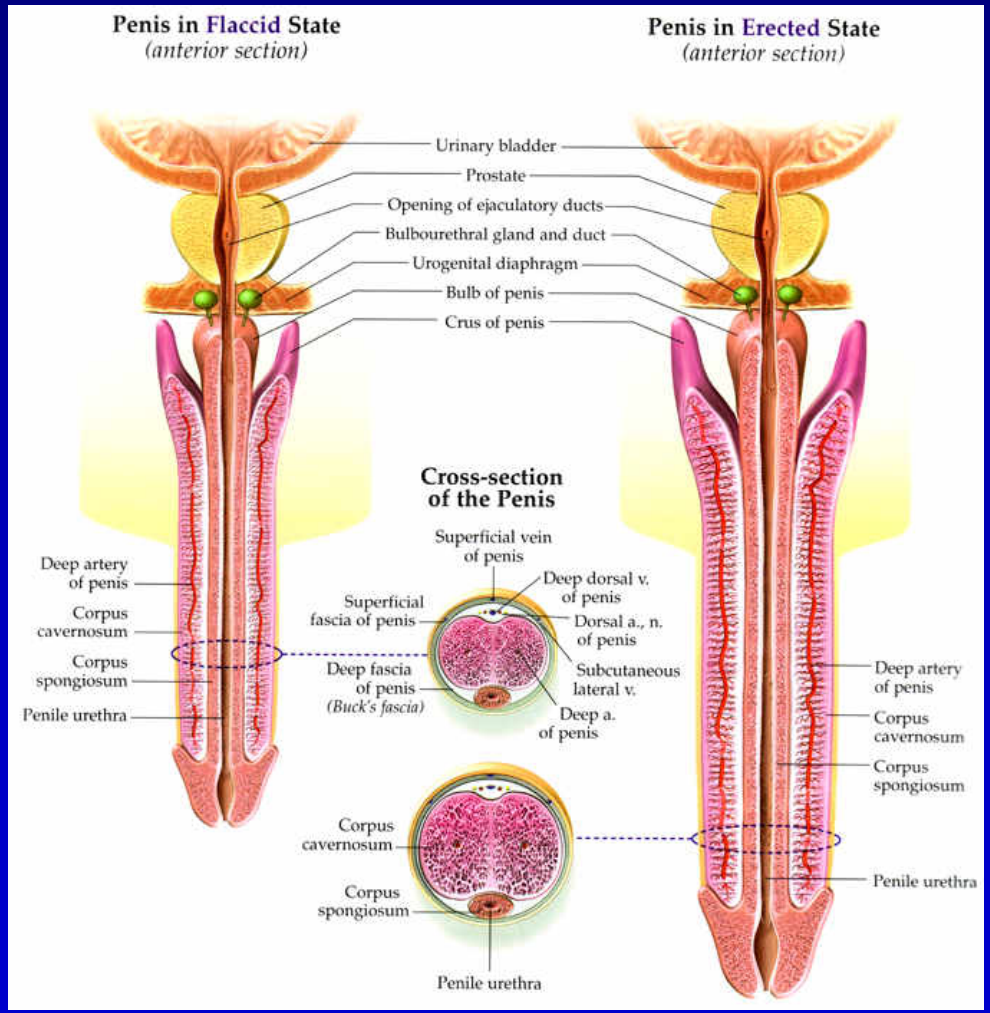
- **Physical examination**

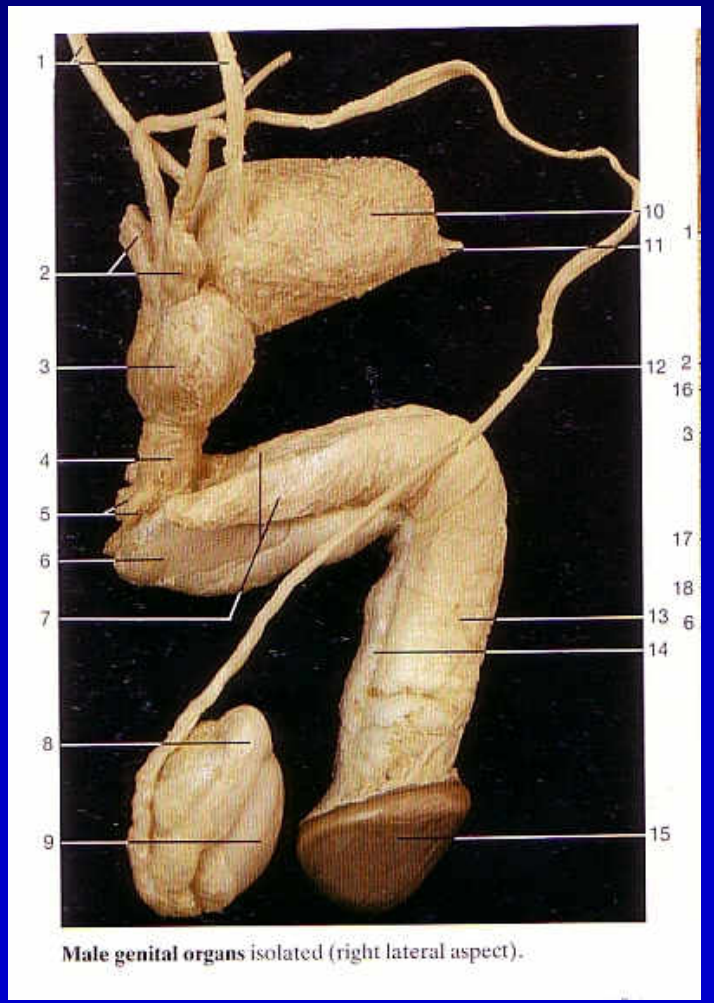




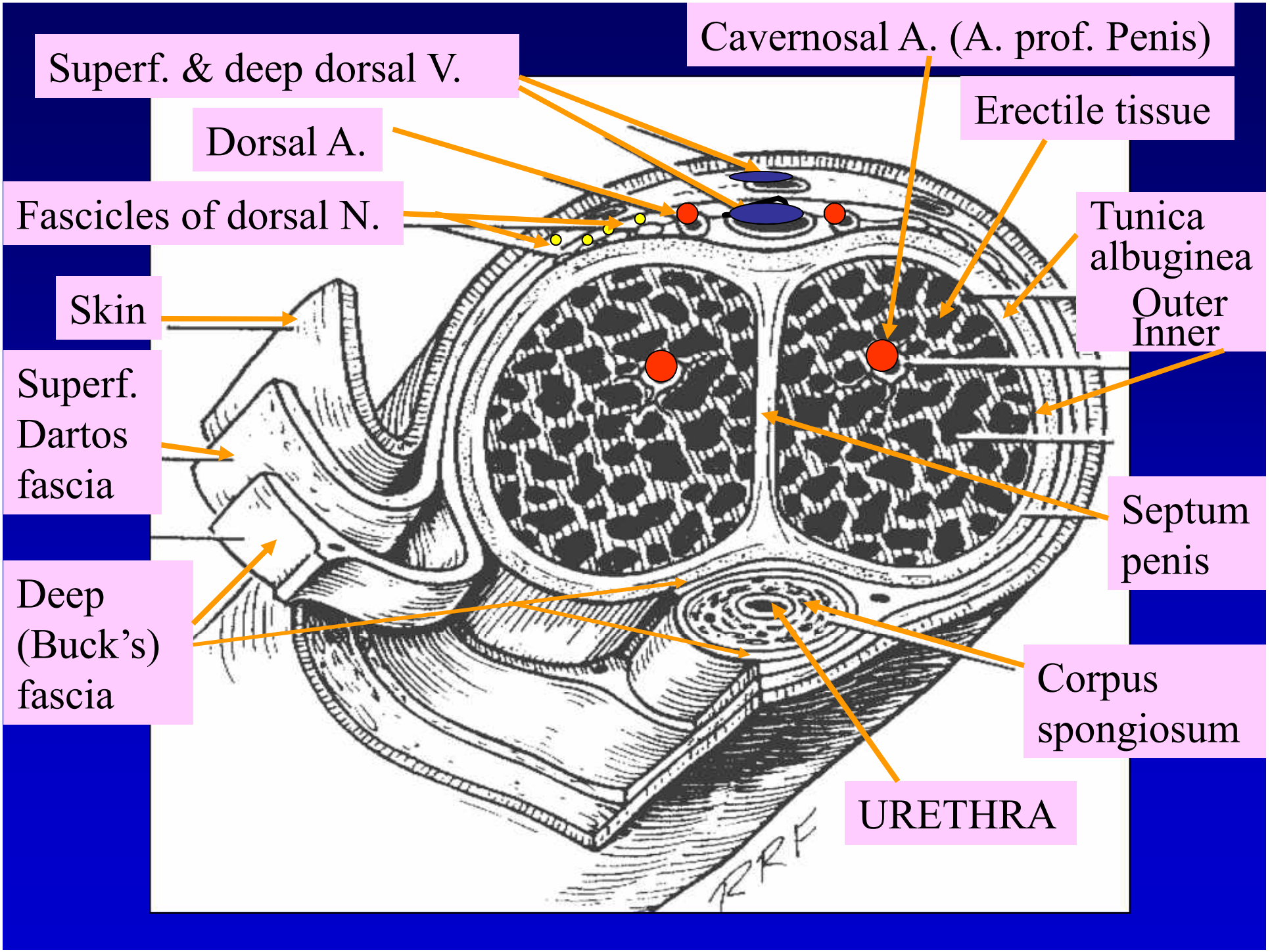
Penis

- **Anatomy**





Male genital organs isolated (right lateral aspect).


Superf. & deep dorsal V.
Cavernosal A. (A. prof. Penis)
Dorsal A.
Erectile tissue
Fascicles of dorsal N.
Tunica albuginea
Outer
Inner
Skin
Superf. Dartos fascia
Septum penis
Deep (Buck's) fascia
Corpus spongiosum
URETHRA
RRF

Have a Nice Semester in Urology!!

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