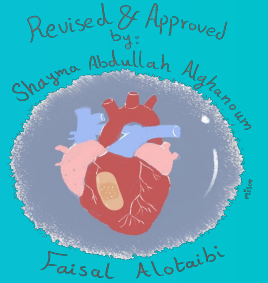
Anatomy Team
MED 439

MED439
KING SAUD UNIVERSITY



Summary for all anatomy lectures

Renal Block

Don't forget to check the Editing File

The lectures included in this file are :
Anatomy 1 : Anatomy of the kidney
Embryology 2 & 4: Development of the kidney, ureter, bladder & urethra
Anatomy 3 : Anatomy of the Ureter, Bladder & Urethra

@anatomy439

This file will help you to organize your thoughts once you have finished studying.
Good luck and we wish you all the best.

We highly recommend studying the actual lectures before.

اللهم إني أسألك فهم النبيين وحفظ المرسلين والملائكة المقربين اللهم اجعل ألسنتنا عامرة بذكرك وقلوبنا بخشيتك وأسرارنا بطاعتك إنك على كل شيء قدير

Kidney		
	Location of the kidney	- Lie behind the peritoneum on the posterior abdominal wall on either side of the vertebral column. (from T12 to L3) & its **Retroperitoneal**
	Characteristics	- Reddish brown. - Right kidney lies slightly lower than the left due to the large size of the right lobe of the liver. - The upper border of the right kidney is at the level of 11 intercostal space. - The upper border of the left kidney is at the level of 11 rib.
	Function	- Excretion of the wastes. - Synthesis of hormones (erythropoietin) and enzyme (renin) - Regulation of water and electrolytes balance - Convert Vitamin D to its active form.
	Covering from inner to outer	- Fibrous capsule - Perirenal (perinephric) fat - Renal fascia - Pararenal (paranephric) fat
	Blood supply	Aorta (at the level of L2) → renal artery → five segmental artery (4 in front and 1 behind the renal pelvis) → lobar artery (arises from each segmental artery , one for each renal pyramid) → 2 or 3 interlobar artery (run toward the cortex on each side of the renal pyramid) →arcuate arteries (at the junction of the cortex and medulla) → interlobular arteries. → afferent glomerular arterioles.
	Veins	- Vein drains into IVC. - The left renal vein receives the left gonadal and the left suprarenal veins.
	Nerve supply	Renal sympathetic plexus
	Two capillary beds	- The glomerulus - The peritubular capillary
	Hilum transmits Anterior to posterior	- Renal vein - 2 branches of Renal artery - Ureter - Third branch of renal artery

Relations of the kidney

Anterior	Posterior
Right: · Right suprarenal gland · Liver · Second part of the duodenum · Right colic flexure · Colic of small intestine	**Muscles(4):** - diaphragm - psoas major - quadratus lumborum - Transversus abdominis
Left: · Left suprarenal gland · Stomach · Spleen · Pancreas · Left colic flexure · Descending colon · Colic of jejunum	**Nerves(3):** · Subcostal nerve (T12) · Iliohypogastric nerve (L1) · Ilioinguinal nerve (L1)
-	**Others:** - 12th ribs - Costodiaphragmatic pleural recess.

Ureter

Definition	It is a muscular tube transporting urine from kidney to urinary bladder.
Length	25 - 30 cm
Beginning	It begins as a continuation of renal pelvis (pelvis of ureter).
Course of ureter	
In abdomen	- It descends anterior to psoas major muscle (opposite the tips of lumbar transverse processes). - It crosses anterior to the end (bifurcation) of common iliac artery to enter the pelvis.
In pelvis	- It runs downward & backward to the level of ischial spine. - It runs obliquely for 3/4 inch in wall of bladder before opening (valve-like part).
Termination	Opens at upper lateral angle of base of urinary Bladder.
Site of constriction	- At ureteropelvic junction - At pelvis inlet - At site of entrance of bladder
Arterial supply	- Renal artery - Gonadal artery - Common iliac artery - Internal iliac artery

Urinary bladder

It has the shape of three-sided pyramid placed on one of its angle (NECK)

<table>
<tr><th>Apex</th><th colspan="2">Base</th><th colspan="2">Superior surface</th><th>2 inferio-lateral surface</th><th>Neck</th></tr>
<tr><td rowspan="3">- Directed Anteriorly and forward.

- lies behind the upper border of symphysis pubis.

- Is connected to the median umbilical ligament (remnant of urachus).

- It is the same for both males & females.</td><td colspan="2">- Directed posteriorly & backward.</td><td>Males</td><td>Females</td><td rowspan="3">- Are related to Retropubic fat separating them from pubic bones.

- Accommodates distention of bladder.

- Continuous with anterior abdominal wall.

- Rupture of bladder escape of urine to anterior abdominal wall.</td><td rowspan="3">- Is the lowest & most fixed part of urinary bladder.

- Is continuous with urethra.

- Is related to (lies behind) lower border of symphysis pubis.

In males:
- Is related to upper surface of prostate gland (inferiorly, it rests on the base of prostate)</td></tr>
<tr><td>Males</td><td>Females</td><td rowspan="2">- Coils of ileum
- Sigmoid colon</td><td rowspan="2">Is related to the uterus</td></tr>
<tr><td>- Vas deferens
- Seminal vesicle of both sides.</td><td>Is related to vagina</td></tr>
</table>

Interior of the urinary bladder

Trigone	Uvula vesicae
- A triangular area in base of bladder bounded by : 2 ureteric orifices & internal urethral orifice - Its mucous membrane is elastic (not folded)	Elevation behind internal urethral orifice, produced by median lobe of prostate gland

Capacity of urinary bladder

- Accommodates from 300 – 500 ml of urine	- Is circular in shape & bulges into the abdominal cavity

Urinary bladder supply			
Arteries	**Veins**	**Lymph**	**Nerves**
Internal iliac artery	Internal iliac vein	Internal iliac lymph nodes	- Parasympathetic: Pelvic splanchnic nerves from: [S2, 3, 4]. - Sympathetic: From L1,2 - Sensory: Transmitting pain due to overdistention of bladder. (via general visceral afferent fibers from bladder to CNS).

Urethra

Males	Females
Length = 20 cm. Prostatic Urethra (Length=3 cm): - Widest & most dilatable - Extends from neck of bladder inside prostate gland [Structures openings into prostatic urethra] : Ejaculatory ducts: containing sperms & secretion of seminal vesicles Ducts of prostate gland Membranous Urethra (Length=1 cm): - Surrounded by external urethral sphincter Penile (spongy) Urethra (Length=16 cm): - Extends inside penis & opens externally through external urethral orifice (narrowest part of whole urethra) - **Has both urinary and genital functions**	Length=4cm. - Has only urinary function. - Extends from neck of urinary bladder to open externally through the external urethral orifice (anterior to the vaginal opening)

Time	Event	Region	Notes
Beginning of 4th week	Pronephric system	Cervical region	- Not functioning - Disappear completely
End of 4th week	Mesonephric system	Thoracic & abdominal regions	- Temporarily function. - Not disappear completely, *both sexes: forms ureteric bud. *male: forms genital duct.
5th week	Metanephric system Permanent kidney	Pelvic region	Formed of 2 origins: 1- Ureteric Budàgive Collecting part of kidney 2- Metanephric Blastema (Mass): (derived from nephrogenic cord)àgive Excretory part of kidney
9th week	**Events**		
	- Metanephric system starts to function > Beginning of glomerular filtration. - kidney attains its adult position. - The hilum is rotated medially		
At birth	Nephron formation is completed		
After birth	1- ↑ in kidney size (C.T not nephrons) 2- Disappearance of kidney lobulation.		

Congenital abnormalities

Abnormalities	Description
Pelvic kidney	Failure of ascent of one kidney (ureter is short)
Horseshoe renal	- The poles of both kidneys fuse. - The kidneys have a lower position than normal but have normal function
Unilateral renal agenesis	Due to absence of one ureteric bud. ما عندهم الا كلية واحدة
Supernumerary kidney	Due to development of 2 ureteric buds. يصير عندهم ٣ كلى ، و الكلية الثالثة لها يوريتر مستقل
Complete division of ureteric bud	- Right side > Malrotation of kidney. - Left side > bifid ureter & supernumerary kidney

Structure	Comments
Cloaca	- Dilated terminal part of the hind gut. - Receive: Allantois & mesonephric duct. <u>A mesodermal urorectal septum divides it to:</u> 1- Ventral part: Primitive urogenital sinus 2- Dorsal part: Anorectal canal.
Primitive urogenital sinus	- Communicates with the allantois and the mesonephric ducts. <u>Divided into 3 parts:</u> 1- Cranial; Vesical part > Form most of the urinary bladder. 2- Middle; Pelvic part > Form the main part of male urethra & entire part of female urethra. 3- Caudal; Phallic part > genital tubercle.
Urinary bladder	- Develop mainly by Vesical part from urogenital sinus. - Trigone > derived from the absorbed caudal ends of the mesonephric ducts. - Epithelium > endodermal origin. - Other layers > splanchnic mesoderm. - Apex > Allantois (which form median umbilical ligament at birth) - After absorption of the mesonephric ducts to form the trigone, the ureters open separately in the bladder. - Infants and children > in abdominal origin. - Starts to enter the greater pelvis at 6 yrs. - Become pelvic origin after puberty.
Urethra	- Genital tubercle > Mesenchymal elevation, develops at the cranial end of the cloacal membrane. - Two urethral folds > develop on either side of the urogenital membrane. - Male > fuse with each other to close the penile urethra. - Female > remain separate to form labia minora. - Laterally two labioscrotal folds > develop on either side of the urethral folds.
Female urethra	- The entire female urethra is derived from endoderm of the pelvic part of the urogenital sinus. - The external urethral orifice opens dorsal to the glans clitoris.
Male urethra	- The genital tubercle elongates forming the phallus (which is the precursor of the penis). - Most of the male urethra : prostatic, membranous and spongy parts is derived from endoderm of the pelvic part of urogenital sinus. - The distal part of penile urethra in glans penis starts as ectodermal solid cord that grows towards the root of penis to meet the spongy urethra, later it canalizes.

Anomalies

Anomalies	Description
Urachal Anomalies	
Urachal cyst	Remnant of epithelial lining of urachus
Urachal sinus	Discharge serous fluid from the umbilicus
Urachal fistula	The entire urachus remains patent and allows urine to escape from the umbilicus.
Bladder Anomalies	
Exstrophy of the bladder (Ectopia vesicae)	Exposure of the posterior wall of the bladder > due to a defect in the anterior abdominal wall and anterior wall of the bladder.
Urethral Anomalies	
Hypospadius	- Most common. - Incomplete fusion of the urethral folds. - Abnormal opening of the urethra occur along the ventral (inferior) aspect of the penis.
Epispadius	- Rare. - Urethral meatus (opening) is found on the dorsum (superior) of penis. - Most often associated with .

Team leaders
Abdullah Alsubaihi
Abeer Awwad

Contact us:
Anatomy439@gmail.com