

Organs not suspended by mesentery = "retroperitoneal"

URINARY SYSTEM OVERVIEW

1. Paired organs (kidneys)
 - a. located posterior wall of abdominal cavity
 - b. kidneys surrounded by renal capsule
 - c. kidneys surrounded layer of adipose tissue
 - d. located 'outside' of abdominal cavity = retroperitoneal

2. Homeostatic functions of kidneys:
 - a. correct balance of Na, K, Cl, Ca ions
 - b. assists in pH balance
 - c. regulates blood pressure by adjusting blood volume

3. Complicated filter mechanism:
 - a. kidneys retain valuable nutrients
 - b. kidneys excrete nitrogenous wastes
e.g., (urea, uric acid), toxins & drugs

4. Filtrate (urine) from kidneys passes to:
 - a. ureters for transfer down into urinary bladder
 - b. bladder retains urine until it is convenient to urinate
 - c. urine passes through body wall via the urethra

Structure of kidney:

1. oddly enough, kidneys look just like kidney-beans!
2. renal cortex: outer-most layer
3. renal medulla: inner-most layer
4. renal pelvis (cavity):
 - a. minor calyces > major calyces > renal pelvis
 - b. renal pelvis tapers to form the ureter
 - c. ureters drain urine to urinary bladder
5. renal hilus:
 - a. entrance for renal a. and ANS nerves
 - b. exit for renal v., lymphatic vessels, ureter
 - c. renal sinus: fat-filled depression around hilus
6. kidneys are 'segmented' = each 'lobe' contains:
renal pyramid + renal papilla + minor calyx
7. 'segments' separated by renal columns
 - a. composed of cortical tissue
 - b. path for renal a/v.'s from hilus to cortex

Renal blood vessels

1. renal artery (abdominal aorta)
 - segmental arteries > afferent arteriole
 - glomerular capillaries = glomerulus
2. glomerulus drained by
 - efferent arterioles
 - filtered blood carried to peritubular capillaries
[a.k.a., 'renal portal system']
 - renal portal system reclaims water from loop of Henle
3. peritubular cap.s drain *eventually* to renal v.
4. renal v. > inferior vena cava > heart

Nephron

1. the functional unit of the kidney: nephron
 - a. incredibly complex bit of plumbing
 - b. majority of each nephron is located in the cortex
2. **renal corpuscle** (Malpighian corpuscle) consists of:
 - a. glomerulus (mass of capillaries)
 - afferent arteriole (incoming blood from renal a.)
 - glomerular capillary bed
 - efferent arteriole (outgoing blood)
 - b. glomerular capsule (Bowman's capsule)
3. **glomerulus** is covered by specialized cells (podocytes)
 - a. podocytes are critical to nephron function
 - b. podocytes bear processes called pedicles
 - c. pedicles from adjacent cells interdigitate
 - d. gaps/slits between interdigitations = coarse filter
4. **proximal convoluted tubule - PCT**
 - collects filtrate from capsular space
 - reclamation of some water, all organic nutrients
5. **loop of Henle**
 - loop travels into medulla and back to the cortex
 - reclamation of sodium, chloride, water
6. **distal convoluted tubule - DCT**
 - secretion of drugs, toxins
7. **collecting duct**
 - gathers the filtrate from many DCT's
 - further reclamation of water
8. collecting ducts combo to form renal papillae
9. urine passes into calyces and renal pelvis

Ureters

1. transfer urine from renal pelvis to urinary bladder
2. retroperitoneal
3. histology:
 - a. mucosa with transitional epithelium
 - b. muscularis - 2 layers/peristalsis
 - c. adventitia - CT
4. **nephrolithiasis** = renal calculi (kidney stones)
 - a. Ca/Mg salts, uric acid crystals
 - b. blockage of ureters - quite painful

Urinary bladder

1. hollow muscular organ: storage reservoir for urine
2. shape/location varies with volume of urine
 - a. pear shaped (pyramidal) when empty
 - b. spherical when full
3. located
 - a. posterior to pubic symphysis, retroperitoneal
 - b. anterior to rectum in males
 - c. anterior to vagina/uterus in females
4. ureters enter postero-lateral corners (ureteral openings)
5. urethra drains from floor (neck) of bladder
6. trigone: triangular region on bladder floor
formed by: 2 ureteral openings & int. urethral sphincter

Muscles of note

1. detrusor muscle:
 - a. muscle of the bladder wall
 - b. two layers of muscle (rugae)
2. internal urethral sphincter
 - a. muscle at entrance to urethra
 - b. involuntary (ANS) control over urination (micturition)
3. external urethral sphincter
 - a. located in urogenital diaphragm
 - b. voluntary control over micturition (pudendal nerve)

Urethra - covered in male/female repro. system lectures

Urine: 93-97% water, clear-yellow, sterile, pH 4.5-8

Urinalysis: physical and chemical assessment of urine

Pyelogram: X-ray image of kidneys

Diuretics: drugs that promote fluid loss in the urine

Hematuria: blood loss in urine

Proteinuria: protein loss in urine

Dysuria: painful urination

UTI: urinary tract infection

- bacteria colonize bladder, ureters, & kidneys