Chapter 7 - Urinary System

Introduction

- Nitrogenous wastes
  - urea
  - creatinine
  - uric acid
Introduction

- Kidneys
  - Filter nitrogenous wastes to form **urine**
  - Maintain proper balance of
    - 1.
    - 2.
    - 3.

Kidneys also secrete hormones

___________________: enzymatic hormone important in adjusting blood pressure

___________________: hormone that stimulates the red blood cell production in bone marrow

- Kidneys also adjust amount of water and electrolytes for proper muscle and nerve function.

- Other functions
  - Produce urine
  - Secrete an active form of Vitamin D so intestines can absorb calcium
Each Kidney is composed of outer layer termed renal_________________
• And outer layer termed renal________________________

• Blood enters the kidney through the renal artery.

Renal Artery

- Branches into smaller and smaller arteries, eventually leading to microscopic filtering units called nephrons.

Nephron

- Microscopic functional unit of the kidney
- Forms urine in renal corpuscles and tubules by process of filtration, reabsorption, and secretion
Anatomy of the Major Organs

Organs of the Urinary System in a Male

Organs of the female urinary system

How Kidneys Produce Urine – p. 220

- Blood enters kidneys through right and left renal arteries
- Arterioles carry blood to capillaries
- Glomeruli filter blood
1. Name four organs of the urinary system.

2. What is the name of the structure that stores urine until it is voided?

3. What is the main function of the kidneys?
1. Name four organs of the urinary system. Kidneys, ureters, bladder, and urethra

2. What is the name of the structure that stores urine until it is voided? Urinary bladder

3. What is the main function of the kidneys? Remove toxic products from blood by forming urine

Combining Forms – p. 280

• Cyst/o
• Vesic/o
• Glomerul/o
• Meat/o

Combining Forms

• Nephr/o
• Ren/o
• Pyel/o
• Ur/o
• Urino/o
Combining Forms

• Ureter/o ureter
• Urethra/o urethra

Building Terms

• Cyst/o/scopy
• Cyst/o/cele

Building Terms

• Nephr/oma
• Ur/emia
Building Terms

• Ureter/o/stenosis

Suffixes – p. 281

• - emia
• - iasis
• - lysis
• - pathy

Suffixes

• - pexy
• - ptosis
• - tripsy
• - uris
Building Terms

- Azotemia
- Lithiasis
- Dialysis
Building Terms

• Nephr/o/pathy

• Nephr/o/ptosis

• Lith/o/tripsy

Lithotripsy

Building Terms

Poly/uria

An/uria

Hemat/uria

Noct/uria
ESRD
• End State Renal Disease
  *Signs and Symptoms*
  • Irreversible stage with gradual, progressive deterioration of kidney function.
  • Kidneys lose ability to excrete nitrogenous end products of metabolism.
  • Progressive weakness, anorexia, diarrhea, pruritus, and polyuria.

ESRD
• Usually result of *chronic renal failure (CRF)*, the gradual, progressive deterioration of kidney function to the point that the kidneys cannot sustain their necessary day-to-day activity.
  •
ESRD

Treatment
- Dietary restriction of protein, sodium, and potassium intake
- Antiemetics for nausea
- Control of hypertension

7 URINARY SYSTEM

Renal Calculi

Signs and Symptoms
- Concentration of mineral salts in the renal pelvis, in the calices of the kidney, or in the urinary tract.
- Renal calculi patients may remain asymptomatic for long periods.

Cystitis

Cystitis -

Bacterial infections often cause acute or chronic cystitis. In acute cystitis, the bladder contains blood as a result of mucosal hemorrhage (see figure, Acute cystitis).
Hydronephrosis

- Hydro
- Nephro
- osis

PKD

Kidney
- polycystic
- kidney
- disease (PKD)

**PKD**—The kidneys contain masses of cysts. Typically polycystic kidneys weight 20 times more than their usual weight.
Tests included in a Urinalysis

4. Protein
5. Glucose

6. Specific gravity – amount of wastes, minerals, and solids

Ketone bodies – occur when the body breaks down fats instead of sugar for fuel. High Ketones make the blood acidic and lead to Ketoacidosis which can lead to coma and death.
Urinalysis

6. **Sediment** – presence of abnormal particles, blood cells, bacteria etc.

7. **Phenylketonuria** – PKU – can accumulate in the urine of infants who lack an enzyme called phenylalanine hydroxylase and lead to retardation.

Pathologic Terminology

Pathologic Conditions

**Kidney**

- Glomerulonephritis
- interstitial nephritis
- nephrolithiasis
- nephrotic syndrome
- polycystic kidneys (PKD)
Pathologic Conditions

Kidney
• polycystic kidney disease (PKD)

PKD—The kidneys contain masses of cysts. Typically polycystic kidneys weight 20 times more than their usual weight.

Hypernephroma

Kidney
■ Renal cell carcinoma

(hypernephroma)
Cancerous tumor of the kidney in adulthood.

Pathologic Conditions (cont’d.)

Kidney
• pyelonephritis
• renal cell carcinoma
• renal failure
• renal hypertension
• Wilms tumor – malignant tumor of the kidney occurring in childhood
Wilm’s Tumor

• Malignant tumor of the kidney that occurs in young children, usually before the age of 5

Renal Hypertension

• Renal –

• Hyper/tension

• High blood pressure the results from kidney disease

Pathologic Conditions (cont’d.)

Urinary bladder

• Bladder cancer
Associated Conditions:

- **Diabetes insipidus** – lack of ADH prevents H2O from being reabsorbed

- **Diabetes mellitus** - inadequate secretion or use of insulin. Sugar cannot leave the bloodstream and be available to cells for energy.

QUICK QUIZ:

4. A term that means frequent (voluntary) urination at night is:
   A. Anuria
   B. Nocturia
   C. Diuresis
   D. Hematuria

Diagnostic Procedures

- **blood urea nitrogen (BUN)** – normally low, accumulates in blood when kidney is diseased. Can lead to death.

- creatinine clearance test
X-Ray Studies

X-Ray Studies
– CT scan
– kidneys, ureters, & bladder (KUB)
– renal angiography
– retrograde pyelogram (RP) – KUB after contrast
– voiding cystourethrogram (VCUG)

CT Scan

• **CT-Computed Tomography**
The scan with contrast shows a benign cyst on the kidney.

VOIDING CYSTOURETHROGRAM

• *(VCUG)* showing a normal female urethra. The bladder is filled with contrast material, followed by x-ray imaging.
Clinical Procedures

- **Ultrasonography**: imaging urinary tract structures using high frequency sound waves

- **Radioisotope scan**: image of kidney after injecting a radioisotope (that concentrates in the kidney) into the bloodstream

CLINICAL PROCEDURES

Magnetic imaging

- **Magnetic resonance imaging (MRI)**: using magnetic field and radio waves to produce images in all three planes of the body
Other Clinical Procedures

- **Cystoscopy** – visual exam with endoscope
- **Dialysis** – separating wastes from blood
- **Lithotripsy** – removal of stones

**Lithotripsy**

Extracorporeal shock-wave lithotripsy (ESWL)

- Powerful sound-wave vibrations break up calculi in urinary tract or gallbladder.
Clinical Procedures

- renal angioplasty – dilation of narrow arteries
- renal biopsy
- renal transplantation
- urinary catheterization

Cytoscopy—direct visual examination of urinary bladder with an endoscope.
Clinical Procedures (cont'd.)

Continuous ambulatory peritoneal dialysis (CAPD)

Abbreviations – p. 305

- ADH
- ARF
- CRF
- BUN

Abbreviations

- UA
- UTI urinary tract infection
- VCUG voiding cystourethrogram
Which combining form means pus?
A. pyel/o
B. lith/o
C. ogli/o
D. py/o

A term that means frequent (voluntary) urination at night is:
A. Anuria
B. Nocturia
C. Diuresis
D. Hematuria

Pharmacology
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Treat bacterial infection of urinary tract. Act on the bacterial membrane or one of its metabolic processes.

Type of antibiotic prescribed depends on the infecting organism and the type and extent of infection.
Pharmacology

• Suppress spasms in ureter, bladder, and urethra by relaxing smooth muscles lining their walls.

• Allow normal emptying of the bladder.

Pharmacology

• Promote and increase excretion of urine. (Lasix)

A chest x-ray reveals an accumulation of fluid in the lungs. The doctor prescribes a drug to stimulate production and flow of urine. The drug is a/an (antispasmodic, antidiuretic, diuretic).

Mr. Q was catheterized for surgery and now experiences spasms in the urethra and bladder. To decrease the spasms and allow normal emptying of the bladder, the doctor prescribes a/an (antispasmodic, antidiuretic, diuretic).
Mrs. T is diagnosed with a urinary tract infection. To treat the bacterial infection, the physician prescribes an (analgesic, antibiotic, antispasmodic).

To relieve the patient’s nephralgia, the physician prescribes an (analgesic, antibiotic, antispasmodic).