I. Gross Anatomy of the Kidney

A. Location and gross external anatomy (See Text Fig. 26.1-2-3)
   1. Location is retroperitoneal
      a. What does this mean?
      b. Position is uneven—why?
   2. Shape and size
   3. 3 layers surrounding the kidney
      a. Renal capsule
      b. Adipose capsule
      c. Renal fascia
   4. Renal Hilus (Hilum)
      a. Blood supply—renal artery and renal vein
      b. Ureter

B. Gross internal anatomy of the kidney (See Text Fig. 26.3)
   1. Cortex
   2. Medulla
      a. Renal pyramid
      b. Renal papilla
      c. Renal column
   3. Nephron—Functional unit of kidney
      a. How many?
      b. Why is it considered the functional unit of the kidney?
   4. Papillary duct
   5. Renal column
   6. Minor calyces
   7. Major calyces
   8. Renal pelvis
   9. Ureter
II. Blood supply to the kidney—Trace the path of blood through the kidney (Text Fig. 26.4)
1. Renal artery
2. Interlobar arteries
3. Arcuate arteries
4. Interlobular arteries
5. Afferent arterioles (microscopic)
6. Glomerular capillaries (glomerulus) (microscopic)
7. Efferent arterioles (microscopic)
8. Peritubular capillaries and/or vasa recta
9. Interlobular veins
10. Arcuate veins
11. Interlobar veins
12. Renal veins

III. Nerve Supply
A. The major blood vessels of the kidneys are supplied with nerves from the autonomic nervous system.
B. Nerves help regulate the size of the small blood vessels and thus the flow of blood through the kidneys.

IV. Anatomy of the Nephron
A. Structure and histology (overview Fig. 26.5a & b)
1. Renal corpuscle (Malpighian corpuscle) (Text Fig. 26.6 and 26.8)
   a. Glomerulus
      1) capillary
      2) fenestrated epithelium
      3) basal lamina
   b. Bowman's capsule (renal capsule)
      1) Parietal (outer) layer
         a) squamous epithelial cells
         b) forms outer wall
      2) Visceral (inner) layer—what’s its specialty?
         a) modified simple squamous epithelial cells
         b) podocytes
         c) pedicels and filtration slits
   c. Capsular space --what’s in here? (generally speaking—later on you’ll be much more specific.)
Urinary System: Anatomy of Kidney and Nephron
Review Urinary Lab and Text Chapter 26

2. Renal tubules
   a. Proximal convoluted tubules
      1) Simple cuboidal epithelium
      2) Well-developed microvilli on apical surface—why?
      3) Mitochondria
   b. Descending limb of the loop of Henle
      1) Simple squamous epithelium
      2) Also thin part of ascending limb
      3) Lots of reabsorption
   c. Ascending limb of loop of Henle (thick part—only in juxtamedullary nephrons)
      1) Simple cuboidal to low columnar epithelium
      2) Apical membranes impermeable to water
   d. Distal convoluted tubule
      1) Simple cuboidal epithelium
      2) Only sparsely populated with microvilli—why?

   • Compare/contrast juxtamedullary nephron and cortical nephron

3. Collecting duct
   a. Begins in cortex and passes into medulla
   b. Formed from merging of 2 or more distal convoluted tubules
   c. Merge to become papillary duct that empties into a minor calyx through an opening in the renal papilla
   d. Principal cells here have (and also in the last portion of the DCT) have receptors for ADH and aldosterone—know this—more in lecture. This is important because the permeability of this tubule can be altered depending on the needs of the body.

B. Blood supply directly associated with the nephron and urine formation
   1. Afferent arteriole
      a. Takes blood into the glomerulus
      b. Wider than efferent arteriole
      c. Can regulate diameter
   2. Glomerulus
   3. Efferent arteriole
      a. Not a venule (why do I point this out?)
      b. Diameter smaller than afferent arteriole (why is this important?)
      c. Can regulate diameter (why do I point this out?)
   4. Peritubular capillaries
   5. Vasa recti

   • Nephritis—what is it?
• Glomerulonephritis—relate it to your knowledge inflammation, increased permeability, and the importance of protein in the blood. Now what?

C. Juxtaglomerular apparatus
   1. Associated with the afferent arteriole (maybe efferent arteriole) and the tubule cells of the ascending limb of the loop of Henle (called the macula densa here because they are packed closely together) just before it enters the distal convoluted tubule.

   2. Cells of the juxtaglomerular apparatus are sensitive to decrease in ABP (due to decrease in blood volume, dehydration, or Na\(^+\) deficiency.

   3. When renal blood pressure (increases, decreases?), these cells release renin.

This begins the renin-angiotensin-aldosterone pathway—refer to cardiovascular notes and the text—chapter 18. Notice how the systems are starting to pull together into one BIG picture?