Position of the Kidneys within the Posterior Abdominal Wall

Figure 23.2a

Body wall
Pararenal fat
Renal capsule
Adipose capsule (perirenal fat)
Renal artery
Renal vein
Peritoneum
Inferior vena cava
Peritoneal cavity
Anterior renal fascia
Posterior renal fascia
Aorta
Kidney
Anterior
Body of vertebra L₂
Posterior
The external urethral sphincter surrounds the urethra and is voluntarily controlled. The levator ani muscle of the pelvic floor also serves as a voluntary constrictor of the urethra.

The length and functions of the urethra differ in the two sexes. In females the urethra is only 3–4 cm. In males the urethra is approximately 20 cm long.
classes of nephrons

• Cortical nephrons: represent 85% of the nephrons in the kidneys. Except for small parts of their loops of Henle that dip into the outer medulla, they are located entirely in the cortex.

• Juxtamedullary nephrons: originate close to the cortex-medulla junction, and they play an important role in the kidneys’ ability to produce concentrated urine. Their loops of Henle deeply invade the medulla.
Glomerular Filtration

- This is the movement of water and proteins free solutes from plasma in the glomerulus into the capsular space of the bowmans capsule. The glomerulus is a much more efficient filter than are other capillary beds because:

- (1) its filtration membrane has a large surface area and is thousands of times more permeable to water and solutes

- (2) glomerular blood pressure is much higher than that in other capillary beds (approximately 55 mm Hg as opposed to 18 mm Hg or less), resulting in a much higher net filtration pressure
Importance of Tubular secretion

1. Disposing of substances, such as certain drugs and metabolites, which are tightly bound to plasma proteins. Such substances are not readily filtered and so must be secreted.

2. Eliminating undesirable substances or end products that have been reabsorbed by passive processes (urea and uric acid).

3. Controlling blood pH. When blood pH drops toward the acidic end of its homeostatic range, the renal tubule cells actively secrete more H\(^+\) into the filtrate and retain more HCO\(_3\)\(^-\) (a base). As a result, the blood pH rises and the urine drains off the excess H\(^+\). Conversely, when blood pH approaches the alkaline end of its range, Cl\(^-\) is reabsorbed instead of HCO\(_3\)\(^-\), which is allowed to leave the body in urine.

4. Ridding the body of excess K\(^+\). Because virtually all K\(^+\) present in the filtrate is reabsorbed in the PCT and ascending loop of Henle, nearly all K\(^+\) in urine is from aldosterone-driven active tubular secretion into the late DCT and collecting ducts.