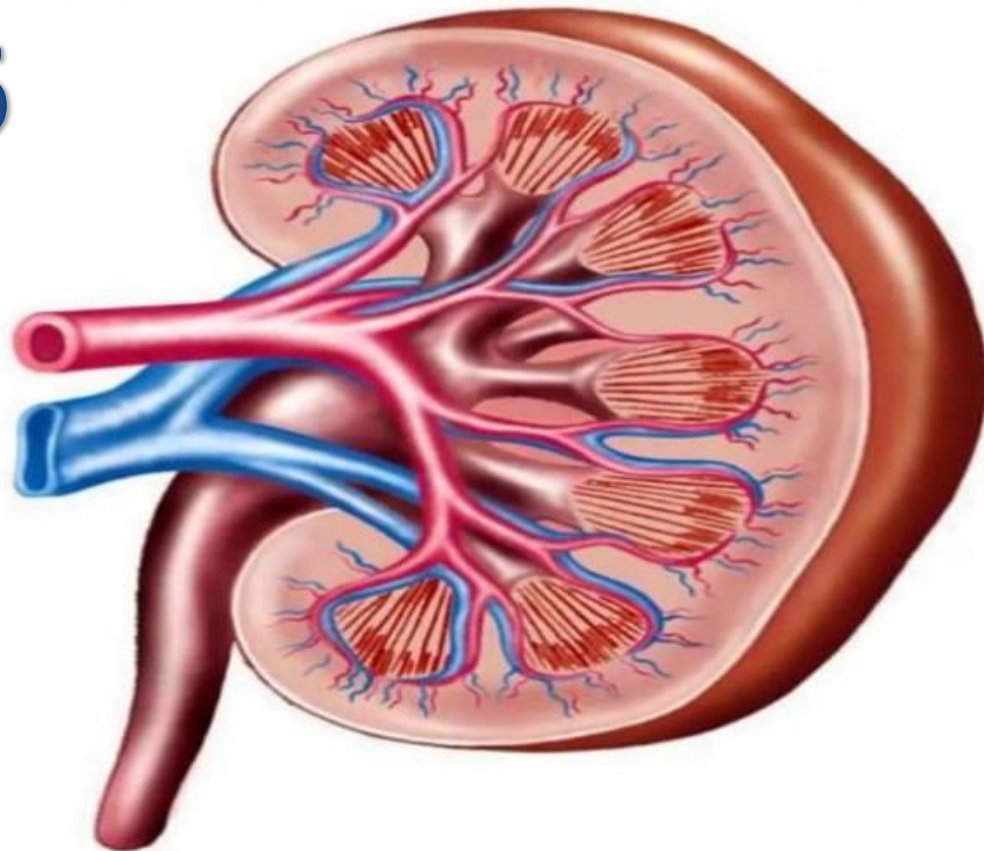


THE URINARY SYSTEM

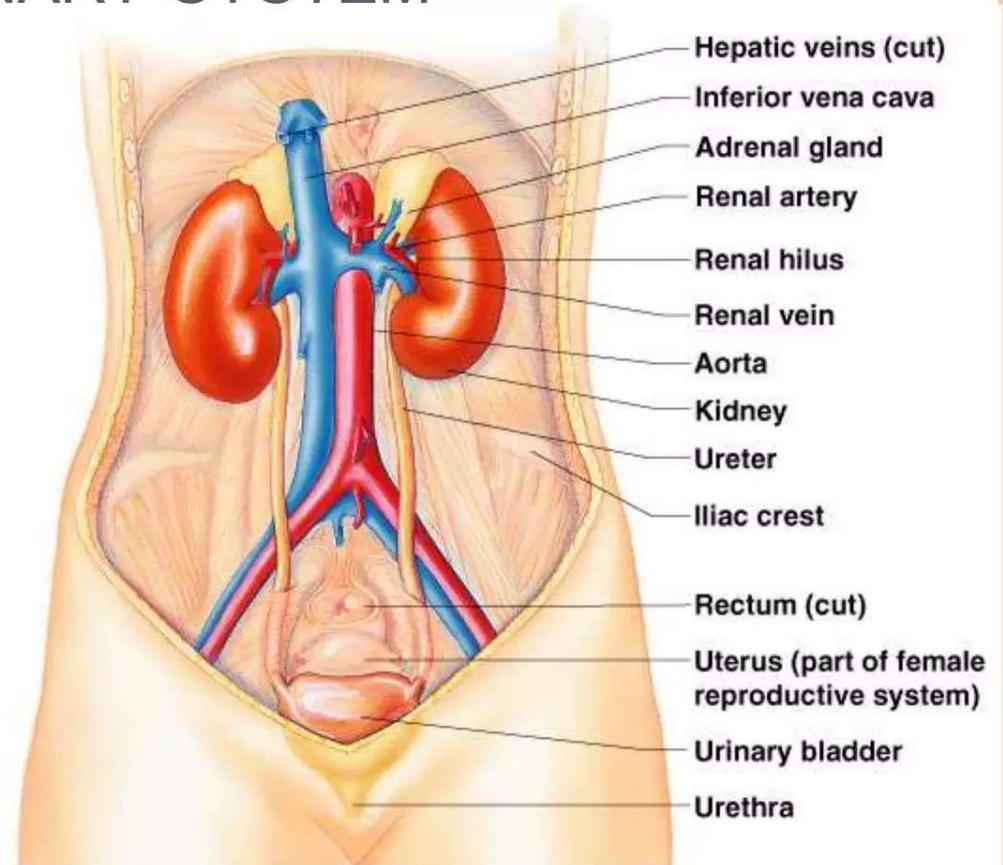
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ORGANS OF THE URINARY SYSTEM

- Kidneys
- Ureters
- Urinary bladder
- Urethra



(a)


Figure 15.1a

FUNCTIONS OF THE URINARY SYSTEM

- Elimination of waste products
 - Nitrogenous wastes
 - Toxins
 - Drugs
- Regulate aspects of homeostasis
 - Water balance
 - Electrolytes
 - Acid-base balance
 - Blood pressure
 - RBC production
 - Activation of vit.D



LOCATION OF THE KIDNEYS

- Against the dorsal body wall
- At the level of T₁₂ to L₃
- The right kidney is slightly lower than the left
- Attached to ureters, renal blood vessels, and nerves at renal hilus
- Atop each kidney is an adrenal gland



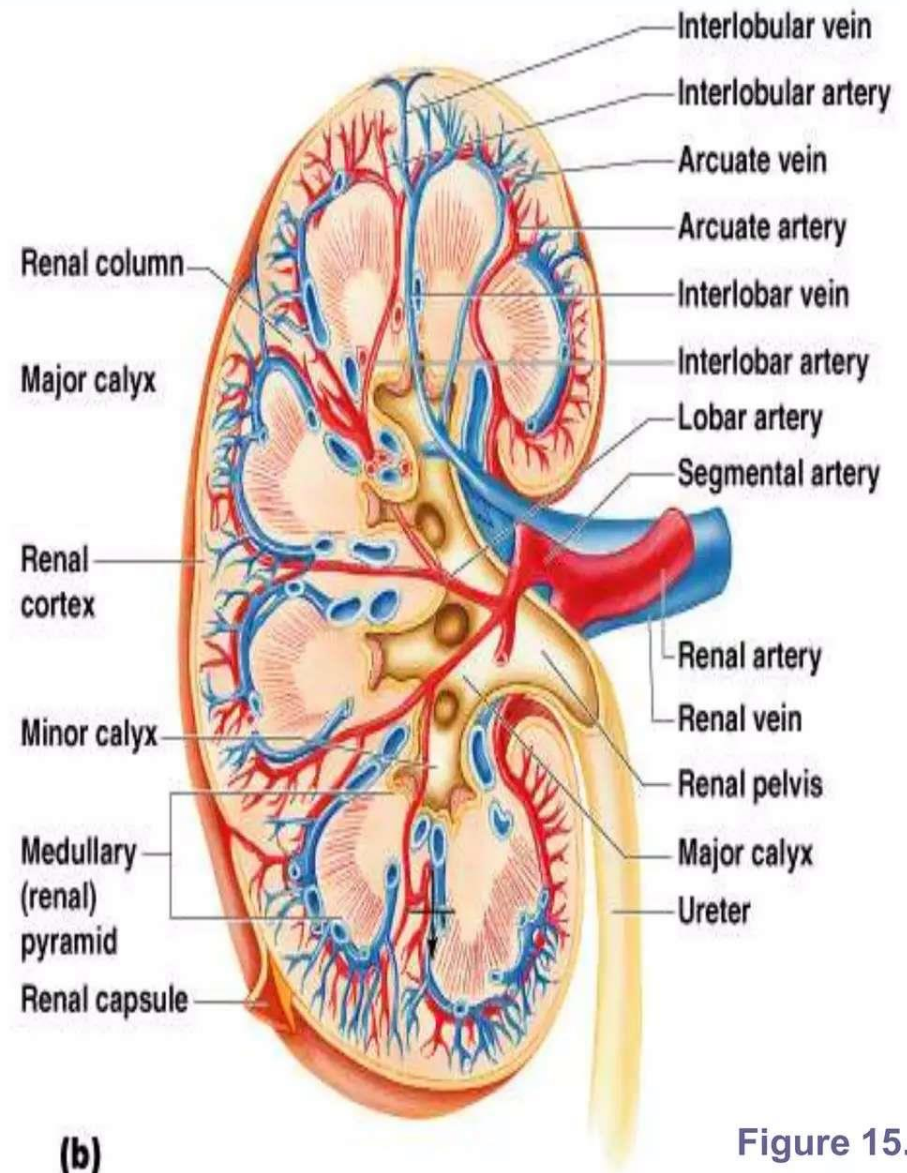
COVERINGS OF THE KIDNEYS

- Renal capsule
 - Surrounds each kidney
- Adipose capsule
 - Surrounds the kidney
 - Provides protection to the kidney
 - Helps keep the kidney in its correct location



REGIONS OF THE KIDNEY

- Renal cortex – outer region
- Renal medulla – inside the cortex
- Renal pelvis – inner collecting tube



(b)

Figure 15.2b

KIDNEY STRUCTURES

- Medullary pyramids – triangular regions of tissue in the medulla
- Renal columns – extensions of cortex-like material inward
- Calyces – cup-shaped structures that funnel urine towards the renal pelvis



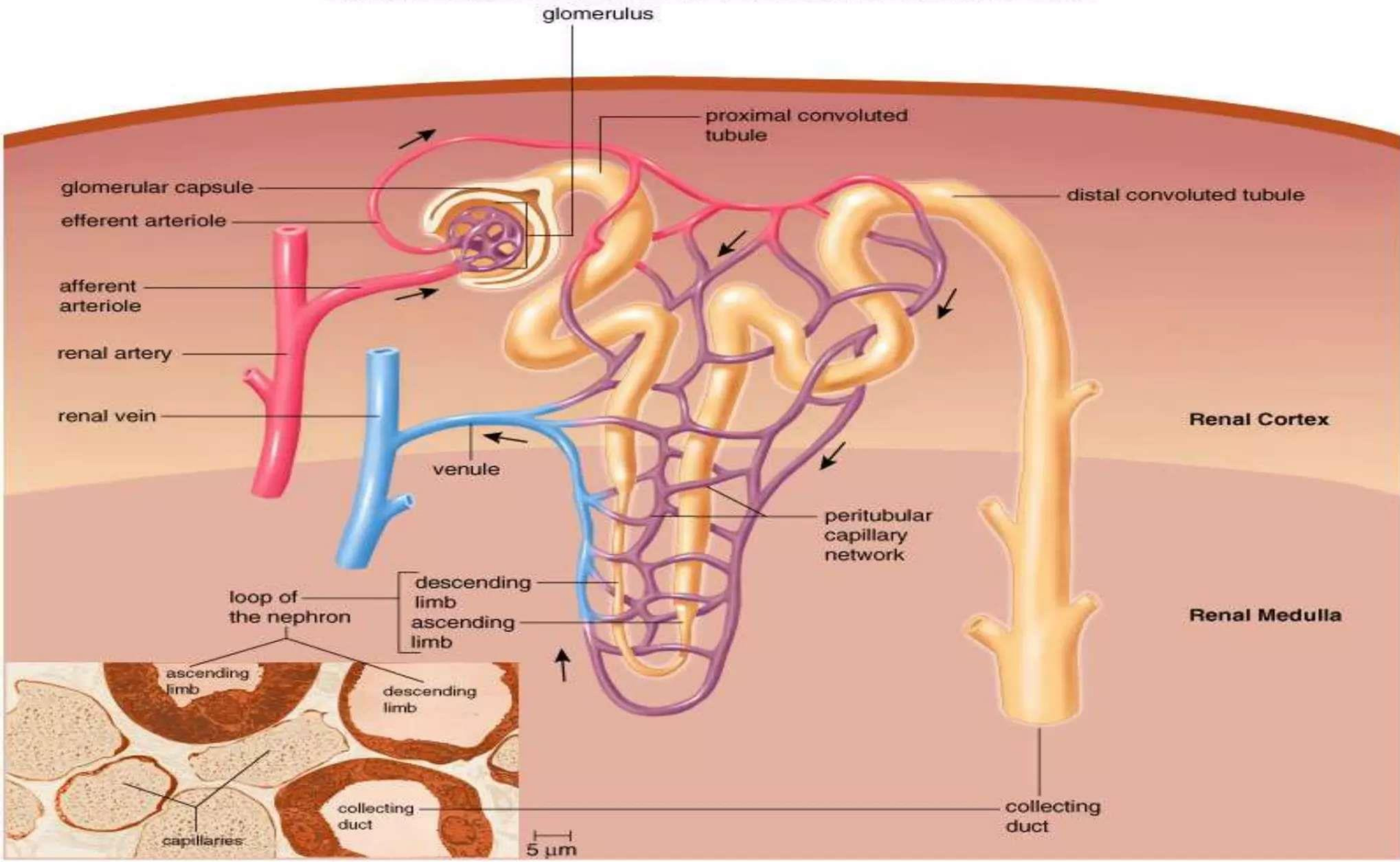
NEPHRONS

- The structural & functional units of the kidneys
- Responsible for forming urine
- Main structures of the nephrons
 - Glomerulus
 - Renal tubule



NEPHRON ANATOMY

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GLOMERULUS

- A specialized capillary bed
- Attached to arterioles on both sides (maintains high pressure)
 - Large afferent arteriole
 - Narrow efferent arteriole

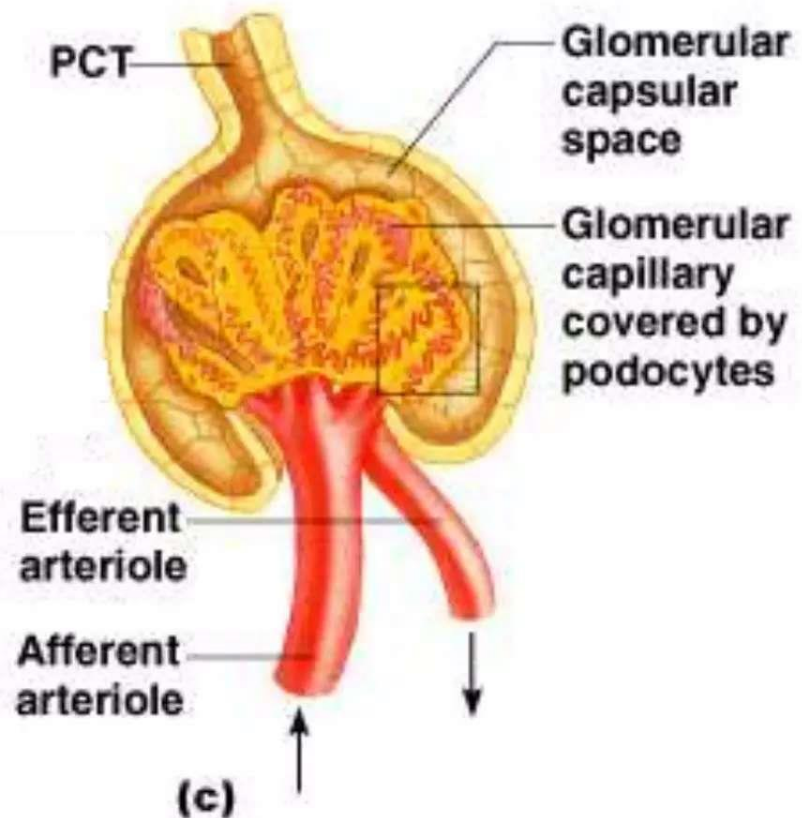
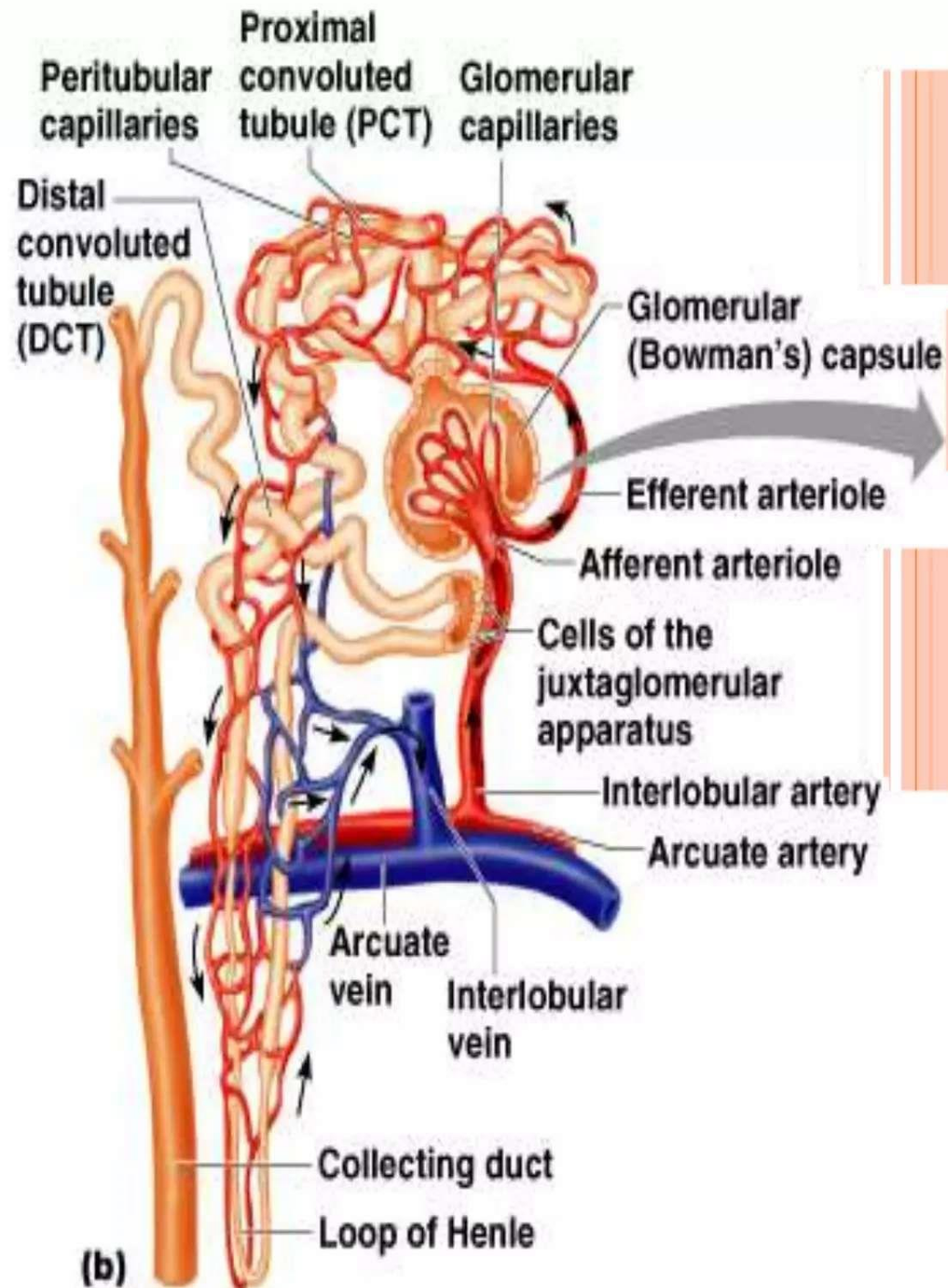


Figure 15.3c

RENAL TUBULE

- Glomerular (Bowman's) capsule
- Proximal convoluted tubule
- Loop of Henle
- Distal convoluted tubule



URETERS

- Slender tubes attaching the kidney to the bladder
 - Continuous with the renal pelvis
 - Enter the posterior aspect of the bladder
- Runs behind the peritoneum
- Peristalsis aids gravity in urine transport



URINARY BLADDER

- Smooth, collapsible, muscular sac
- Temporarily stores urine

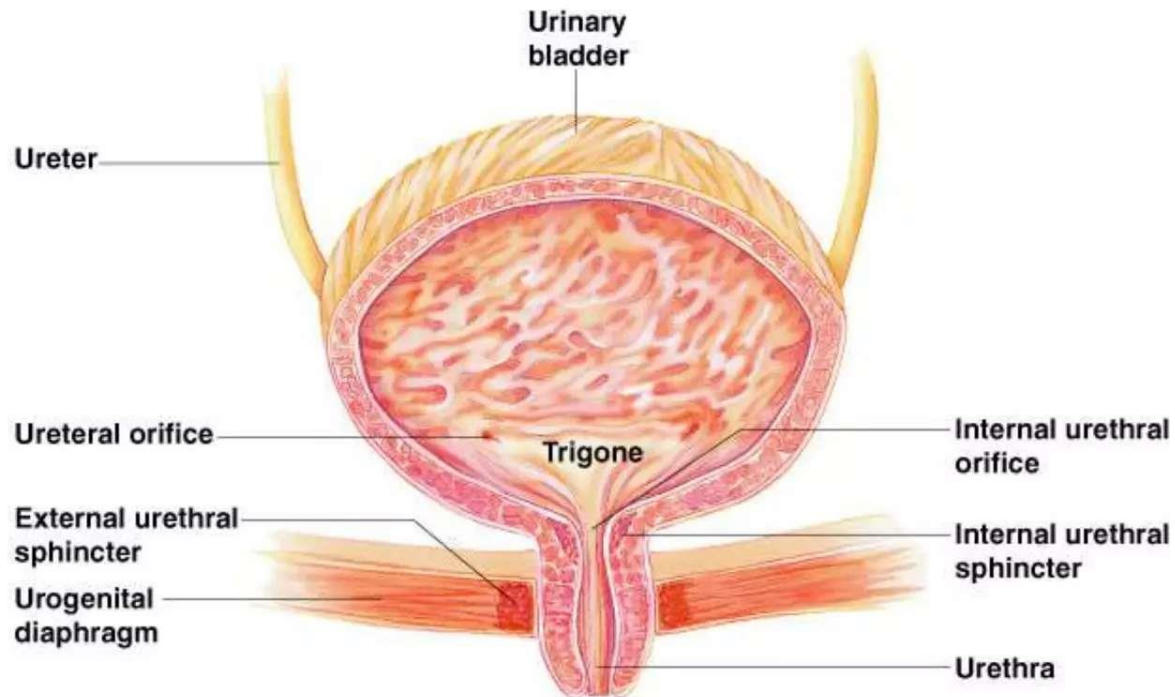



Figure 15.6

URINARY BLADDER

- Trigone – three openings
 - Two from the ureters
 - One to the urethra

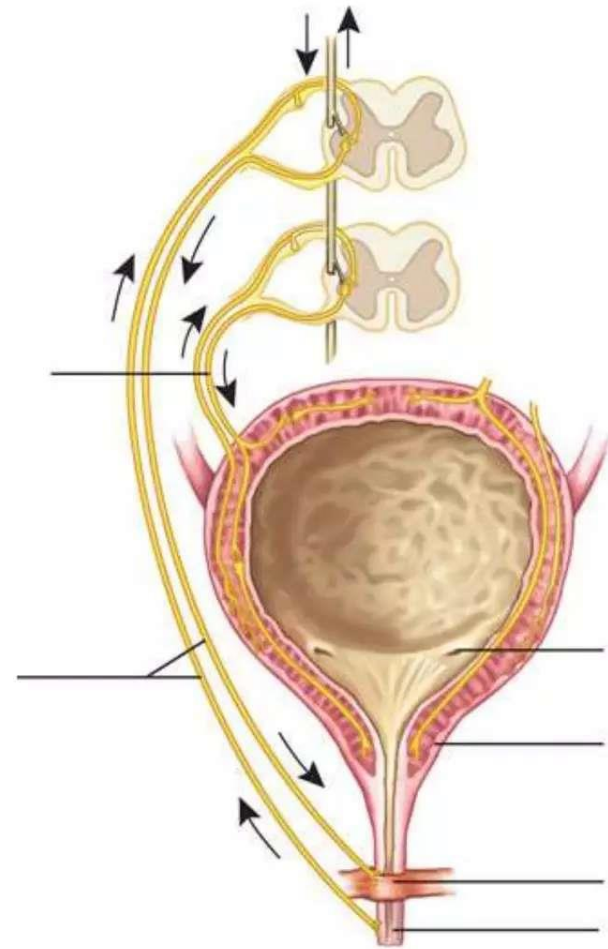


Figure 15.6

URINARY BLADDER WALL

- Three layers of smooth muscle (detrusor muscle)
- Mucosa made of transitional epithelium
- Walls are thick and folded in an empty bladder
- Bladder can expand significantly without increasing internal pressure



URETHRA

- Thin-walled tube that carries urine from the bladder to the outside of the body by peristalsis
- Release of urine is controlled by two sphincters
 - Internal urethral sphincter (involuntary)
 - External urethral sphincter (voluntary)



DEVELOPMENTAL ASPECTS OF THE URINARY SYSTEM

- Functional kidneys are developed by the third month
- Urinary system of a newborn
 - Bladder is small; urine cannot be concentrated
- Control of the voluntary urethral sphincter starts until age 18 months
- Urinary infections are the only common problems before old age



AGING AND THE URINARY SYSTEM

- There is a progressive decline in urinary function
- The bladder shrinks with aging
- Urinary retention is common in males



THE END