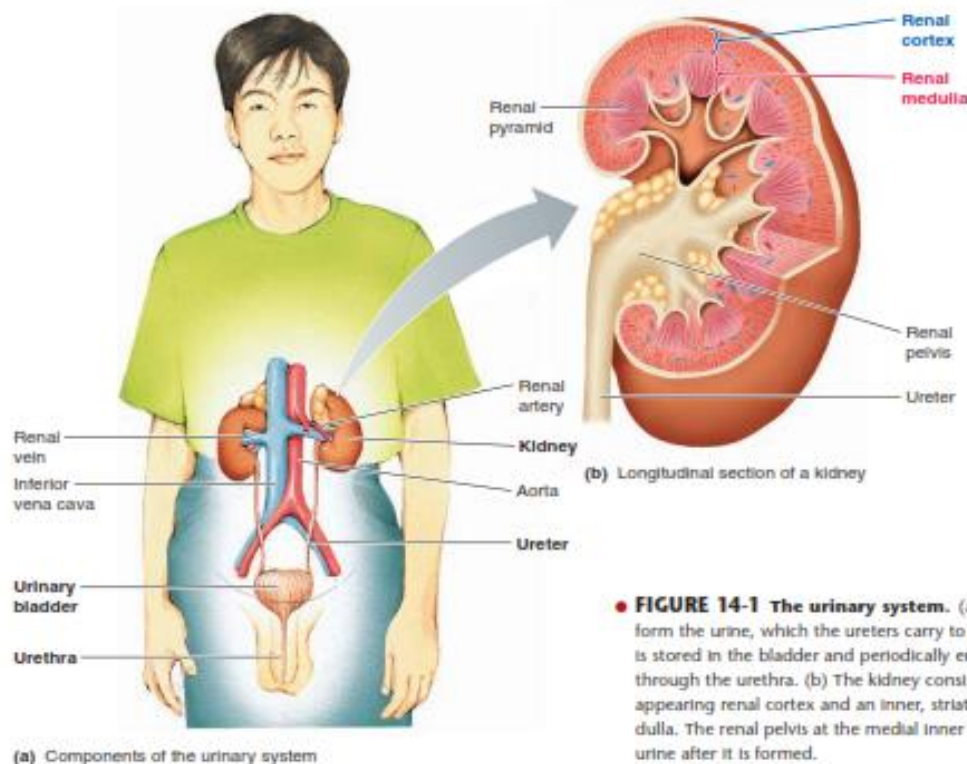


**SISTEM KEMIH OLEH
GINJAL
(FILTRASI
GLOMERULUS,
ALIRAN DARAH DAN
PENGATURANNYA)**

Dr. Hanna Cakrawati

GINJAL MELAKUKAN BERBAGAI FUNGSI YANG DITUJUKAN UNTUK MEMPERTAHANKAN HOMEOSTASIS

- ◉ Organ yang berperan dalam mempertahankan stabilitas volume, komposisi elektrolit, dan osmolaritasnya CES.



● **FIGURE 14-1 The urinary system.** (a) The pair of kidneys form the urine, which the ureters carry to the urinary bladder. Urine is stored in the bladder and periodically emptied to the exterior through the urethra. (b) The kidney consists of an outer, granular-appearing renal cortex and an inner, striated-appearing renal medulla. The renal pelvis at the medial inner core of the kidney collects urine after it is formed.

Fungsi ginjal

Mempertahankan keseimbangan H₂O di tubuh

Mempertahankan osmolaritas cairan tubuh yang sesuai, terutama melalui regulasi keseimbangan H₂O

Mengatur jumlah dan konsentrasi sebagian besar ion CES

Mempertahankan volume plasma yang tepat

Membantu mempertahankan keseimbangan asam-basa tubuh yg tepat dengan penyesuaian pengeluaran H dan HCO₃ di urin

Mengekskresikan produk akhir metabolisme tubuh

Mengeluarkan banyak senyawa asing

Menghasilkan eritropoietin

Menghasilkan renin

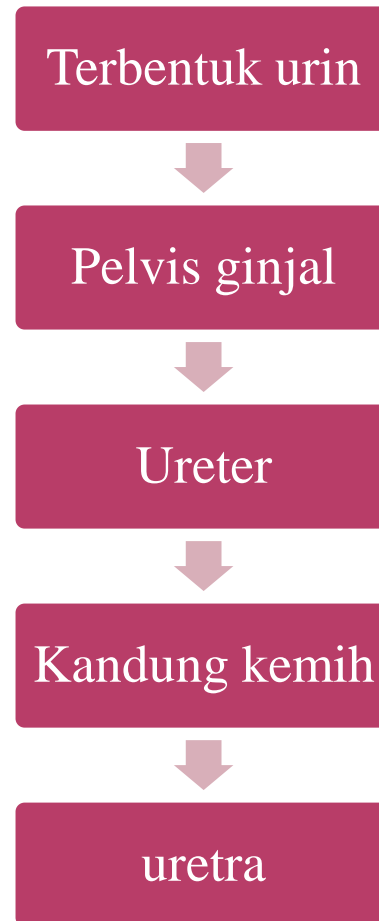
Mengubah vitamin D menjadi bentuk aktifnya

Although this chapter and the next few chapters focus mainly on the control of renal excretion, it is important to recognize that the kidneys serve multiple functions, including the following:

- Excretion of metabolic waste products and foreign chemicals
- Regulation of water and electrolyte balances
- Regulation of body fluid osmolality and electrolyte concentrations
- Regulation of arterial pressure
- Regulation of acid-base balance
- Secretion, metabolism, and excretion of hormones
- Gluconeogenesis

GINJAL MEMBENTUK URIN

- Ginjal → sepasang organ berbentuk kacang terletak di belakang rongga abdomen, di sisi columna vertebralis, sedikit di atas garis pinggang.
- Vaskularisasi → A.Renalis dan V.Renalis keluar dan masuk ginjal di indentasi medial ginjal.



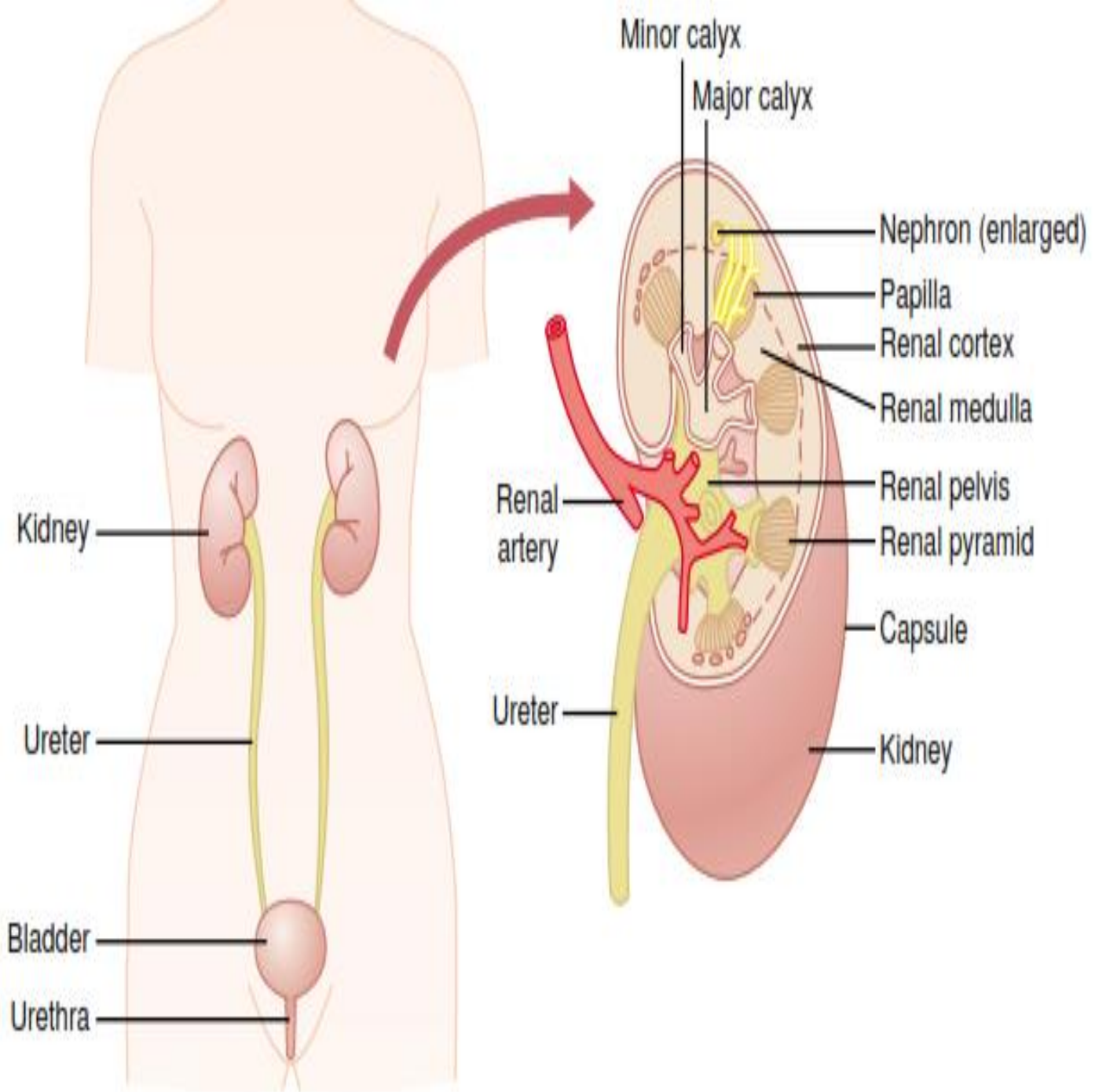
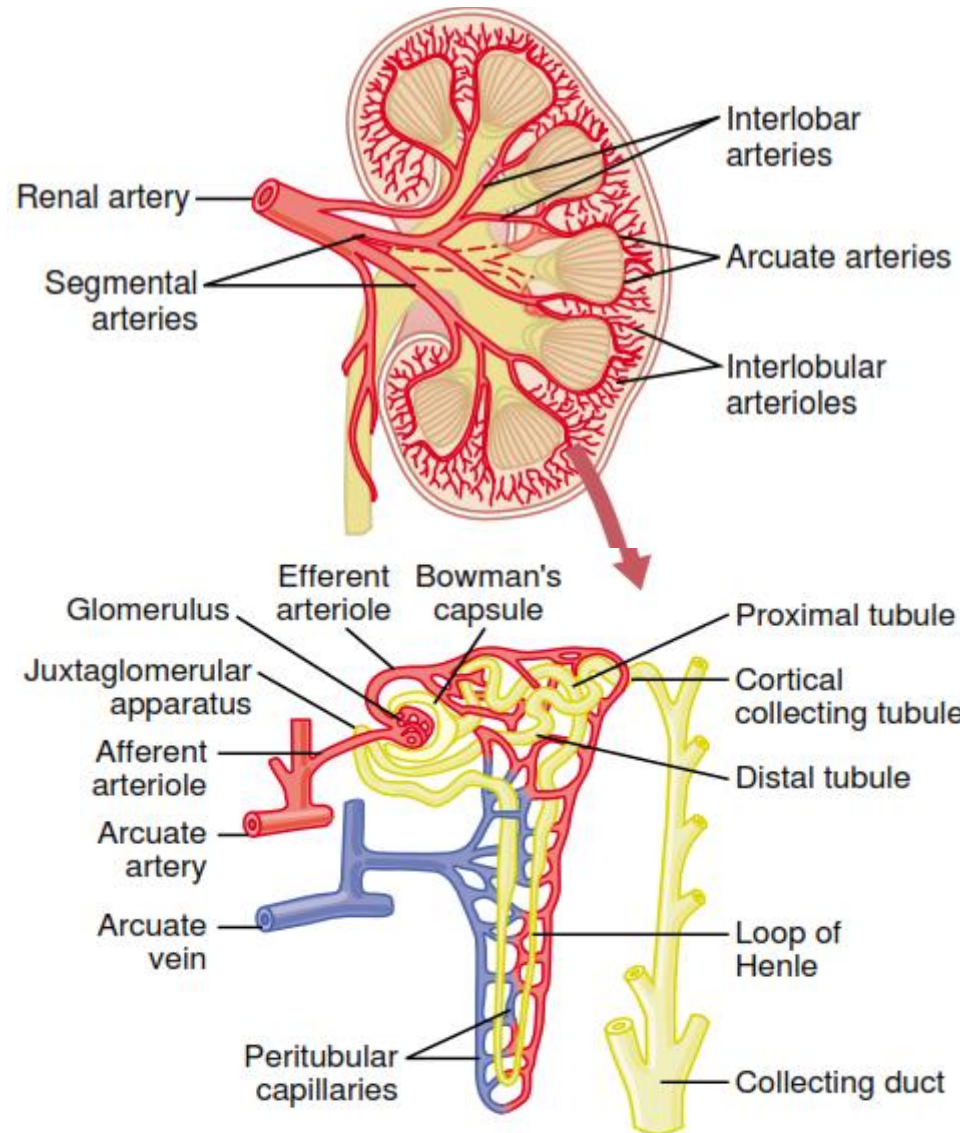


Figure 26-2

General organization of the kidneys and the urinary system.

Renal Blood Supply



Blood flow to the two kidneys is normally about 22 percent of the cardiac output, or 1100 ml/min.

The renal

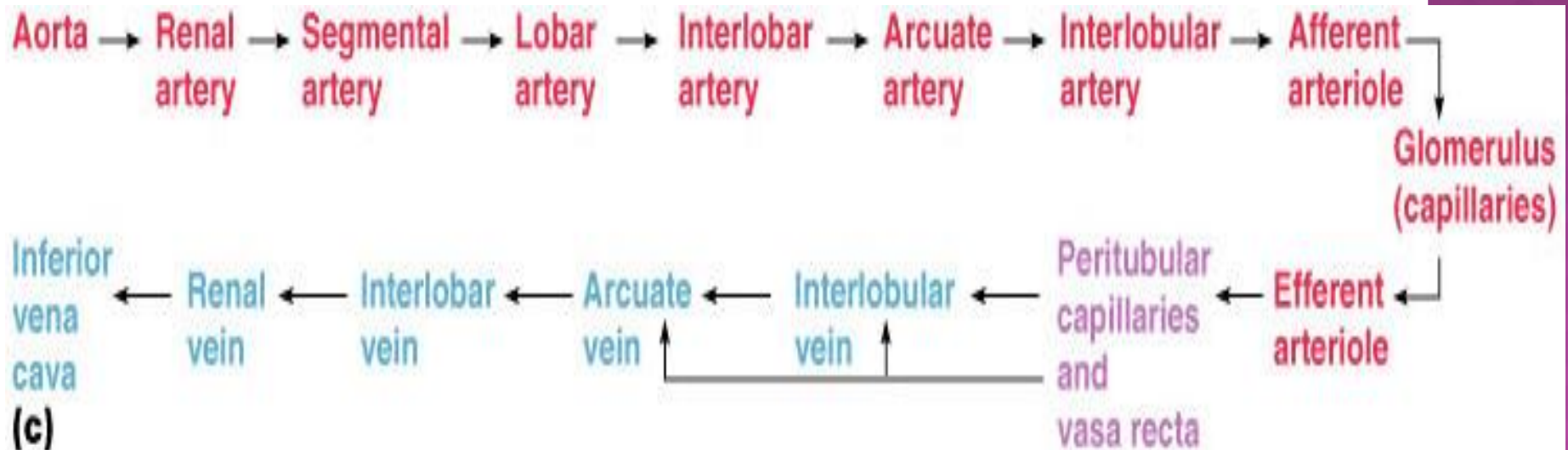
artery enters the kidney through the **hilum** and then branches progressively to form the interlobar arteries, arcuate arteries, interlobular arteries and **afferent arterioles**, which lead to the glomerular capillaries. The distal ends of the capillaries of each glomerulus coalesce to form the **efferent arteriole**, which leads to a second capillary network, **the peritubular capillaries**, that surrounds the renal tubules.

The peritubular capillaries empty into the vessels of the venous system, which run parallel to the arteriolar vessels and progressively form the *interlobular vein*, *arcuate vein*, *interlobar vein*, and *renal vein*, which leaves the kidney beside the renal artery and ureter.

- ⦿ High hydrostatic pressure in the glomerular capillaries (about 60 mm Hg) causes rapid fluid filtration, much lower hydrostatic pressure in the peritubular capillaries (about 13 mm Hg) permits rapid fluid reabsorption.

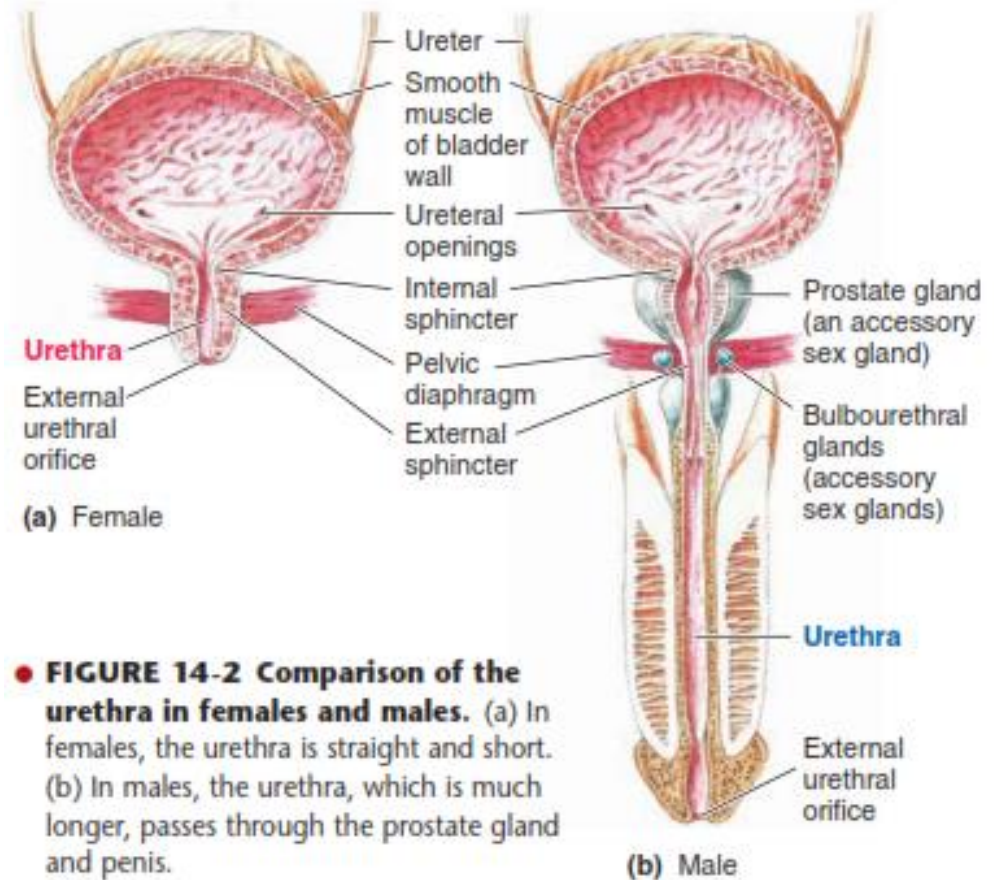
BLOOD AND NERVE SUPPLY

- Approximately one-fourth (1200 ml) of systemic cardiac output flows through the kidneys each minute
- Arterial flow into and venous flow out of the kidneys follow similar paths
- The nerve supply is via the renal plexus



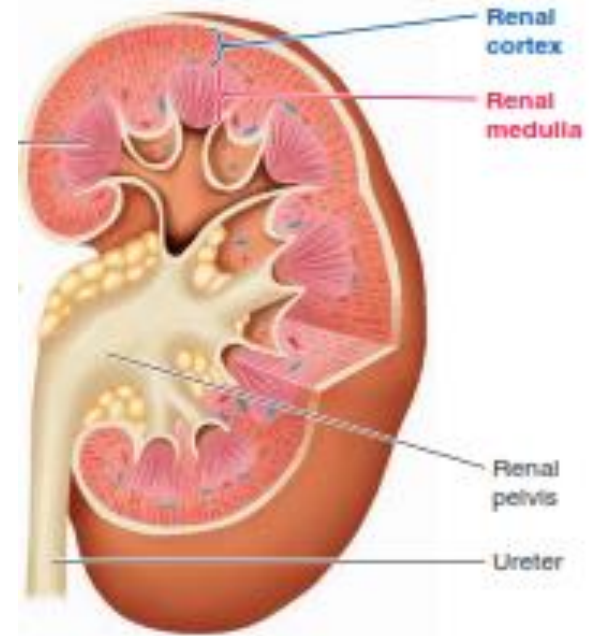
PERBANDINGAN URETRA PADA WANITA DAN PRIA

- ⦿ Pada wanita → uretra lurus dan pendek
- ⦿ Pada pria → uretra jauh lebih panjang, berjalan melalui kelenjar prostat dan penis



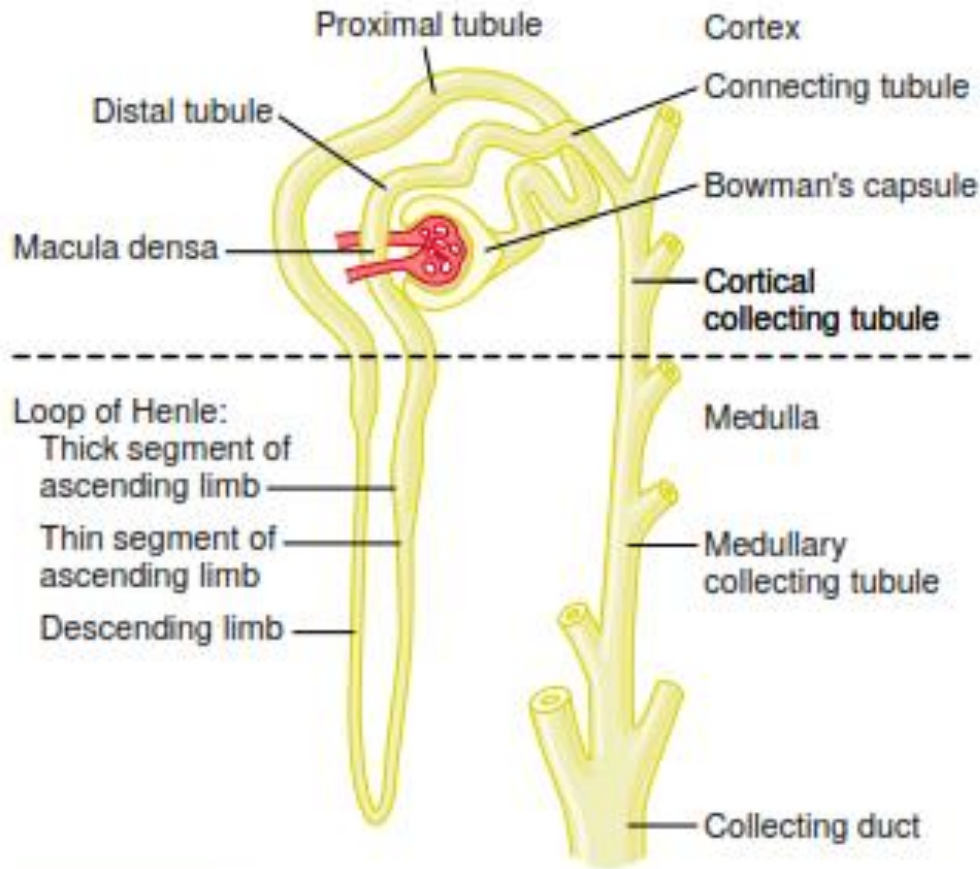
THE NEPHRON IS THE FUNCTIONAL UNIT OF THE KIDNEY

- ⦿ Each kidney in the human contains about 1 million *nephrons*, each capable of forming urine.
- ⦿ *The kidney* cannot regenerate new nephrons. Therefore, with renal injury, disease, or normal aging.
- ⦿ there is a gradual decrease in nephron number. After age 40, the number of functioning nephrons usually decreases about 10 per cent every 10 years



(b) Longitudinal section of a kidney

PERCABANGAN TUBULUS DASAR NEFRON

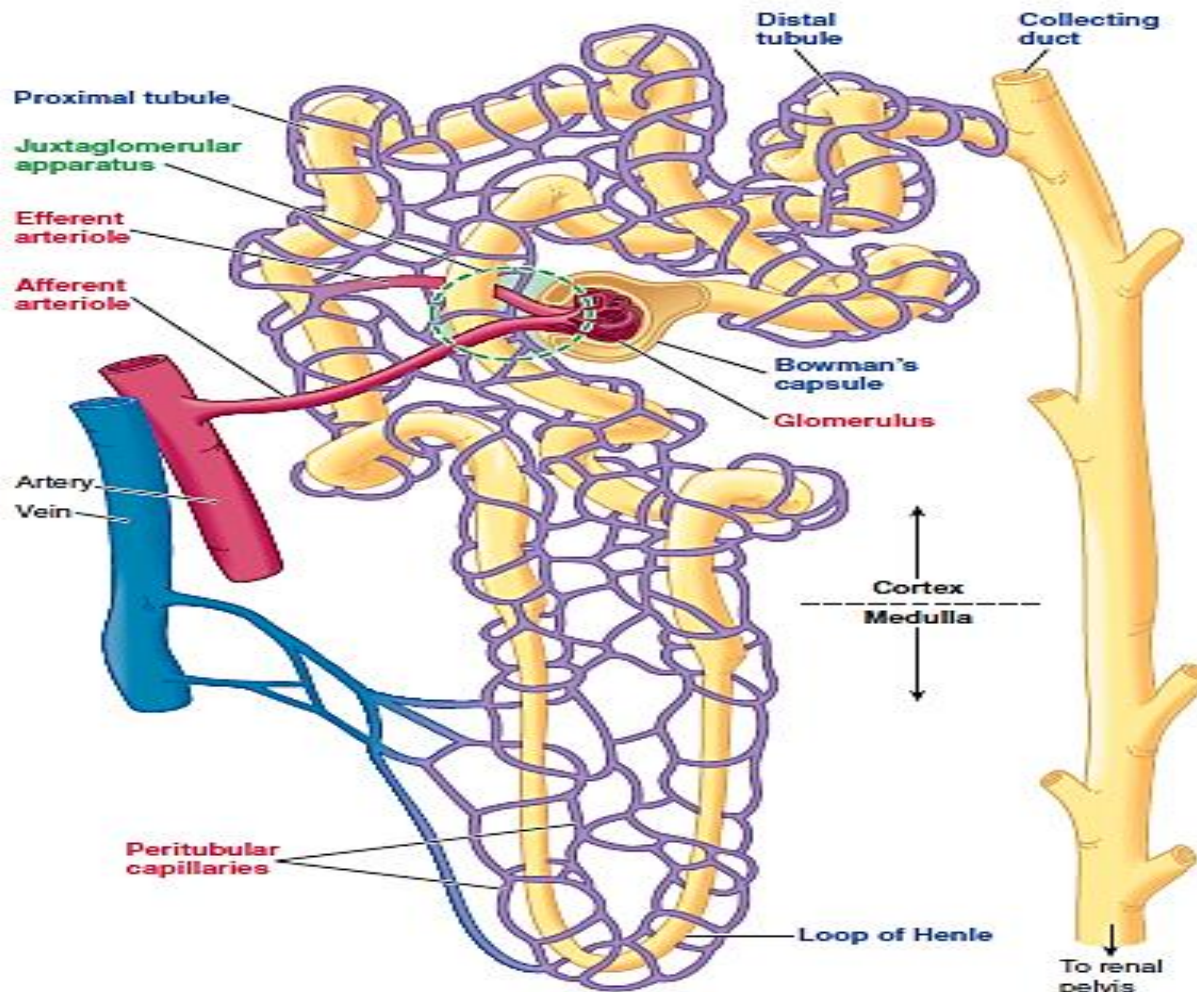


Each nephron contains (1) a tuft of glomerular capillaries called the **glomerulus**, through which large amounts of fluid are filtered from the blood, and (2) a long **tubule** in which the filtered fluid is converted into urine on its way to the pelvis of the kidney

Figure 26-4

Basic tubular segments of the nephron. The relative lengths of the different tubular segments are not drawn to scale.

NEFRON & TUBULAR



● **FIGURE 14-3 A nephron.** Components of a cortical nephron, the most abundant type nephron in humans.

Vascular component

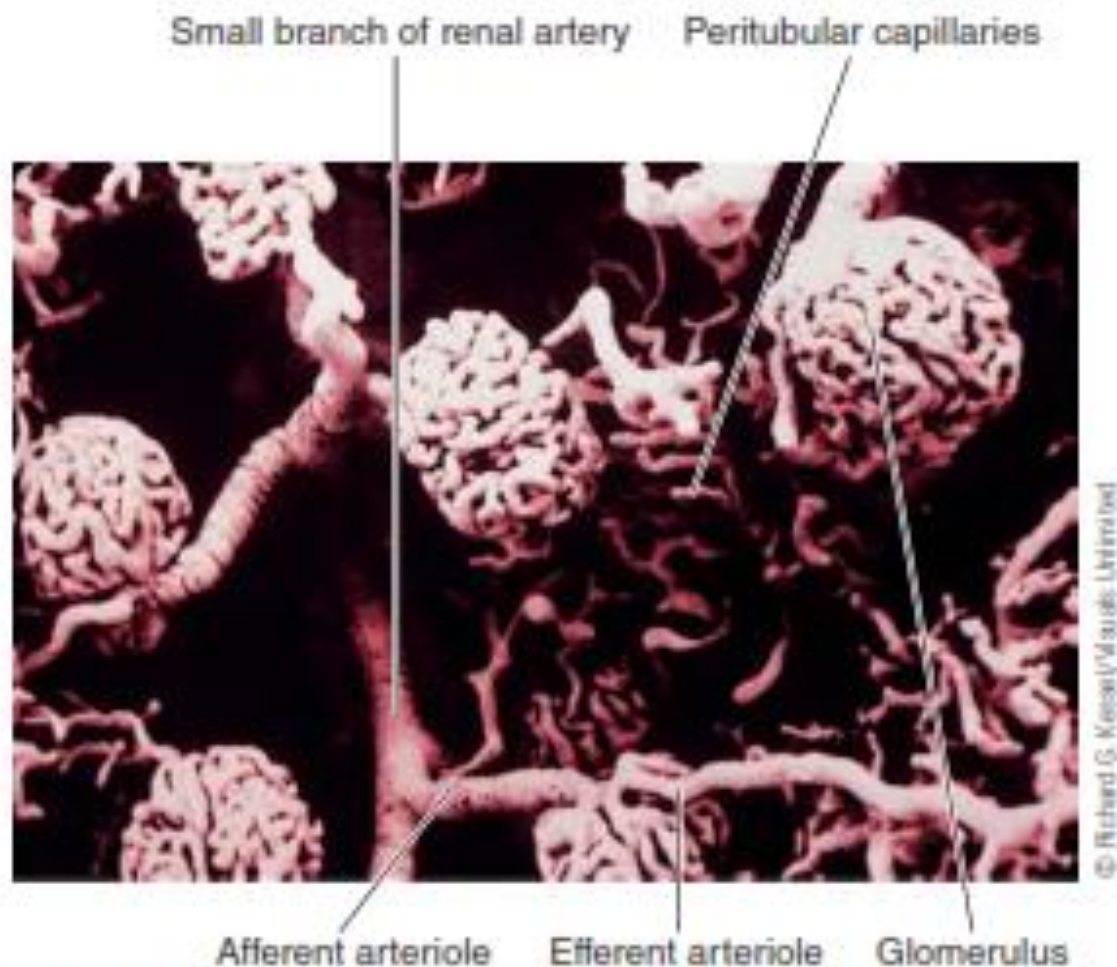
- **Afferent arteriole**—carries blood to the glomerulus
- **Glomerulus**—a tuft of capillaries that filters a protein-free plasma into the tubular component
- **Efferent arteriole**—carries blood from the glomerulus
- **Peritubular capillaries**—supply the renal tissue; involved in exchanges with the fluid in the tubular lumen

Tubular component

- **Bowman's capsule**—collects the glomerular filtrate
- **Proximal tubule**—uncontrolled reabsorption and secretion of selected substances occur here
- **Loop of Henle**—establishes an osmotic gradient in the renal medulla that is important in the kidney's ability to produce urine of varying concentration
- **Distal tubule and collecting duct**—variable, controlled reabsorption of Na^+ and H_2O and secretion of K^+ and H^+ occur here; fluid leaving the collecting duct is urine, which enters the renal pelvis

Combined vascular/tubular component

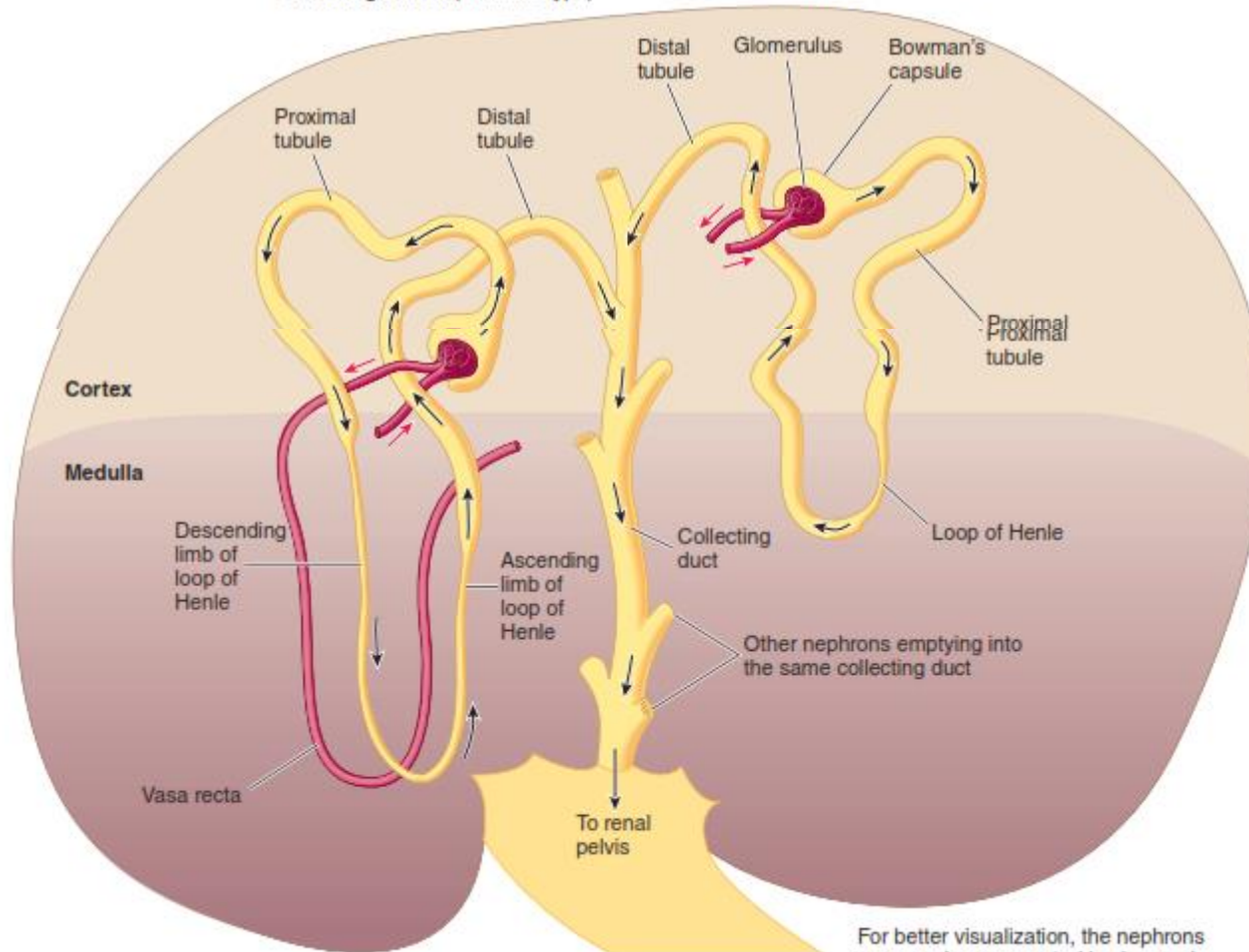
- **Juxtaglomerular apparatus**—produces substances involved in the control of kidney function



- **FIGURE 14-4** Scanning electron micrograph of a glomerulus and associated arterioles.

Juxtamedullary nephron:
long-looped nephron important in
establishing the medullary vertical
osmotic gradient (20% this type)

Cortical nephron:
most abundant type
of nephron (80% this type)



PERBANDINGAN NEFRON KORTEKS DAN JUKSTAMEDULA

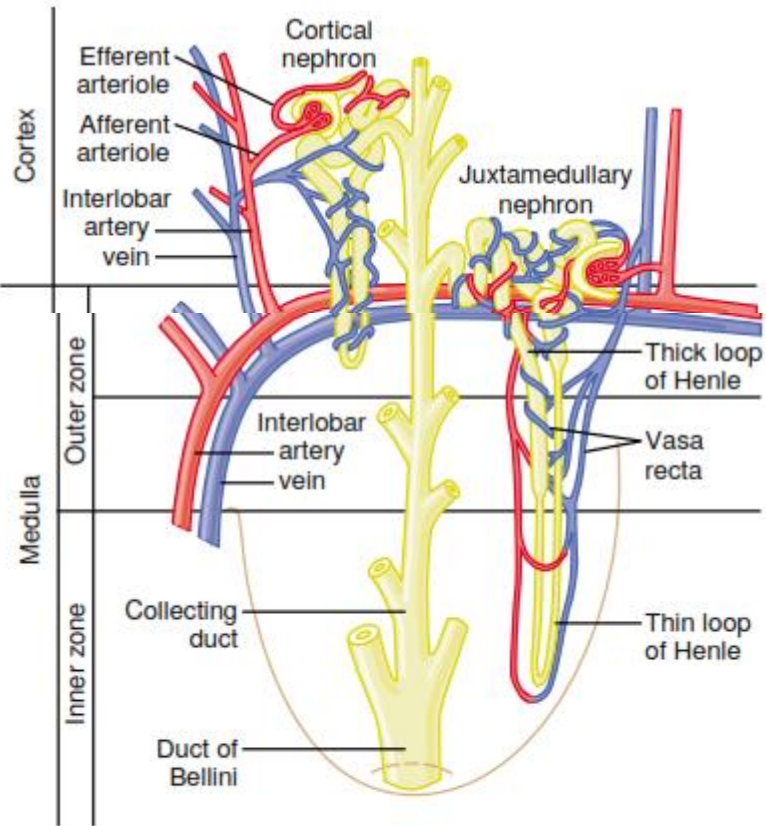


Figure 26-5

Schematic of relations between blood vessels and tubular structures and differences between cortical and juxtamedullary nephrons.

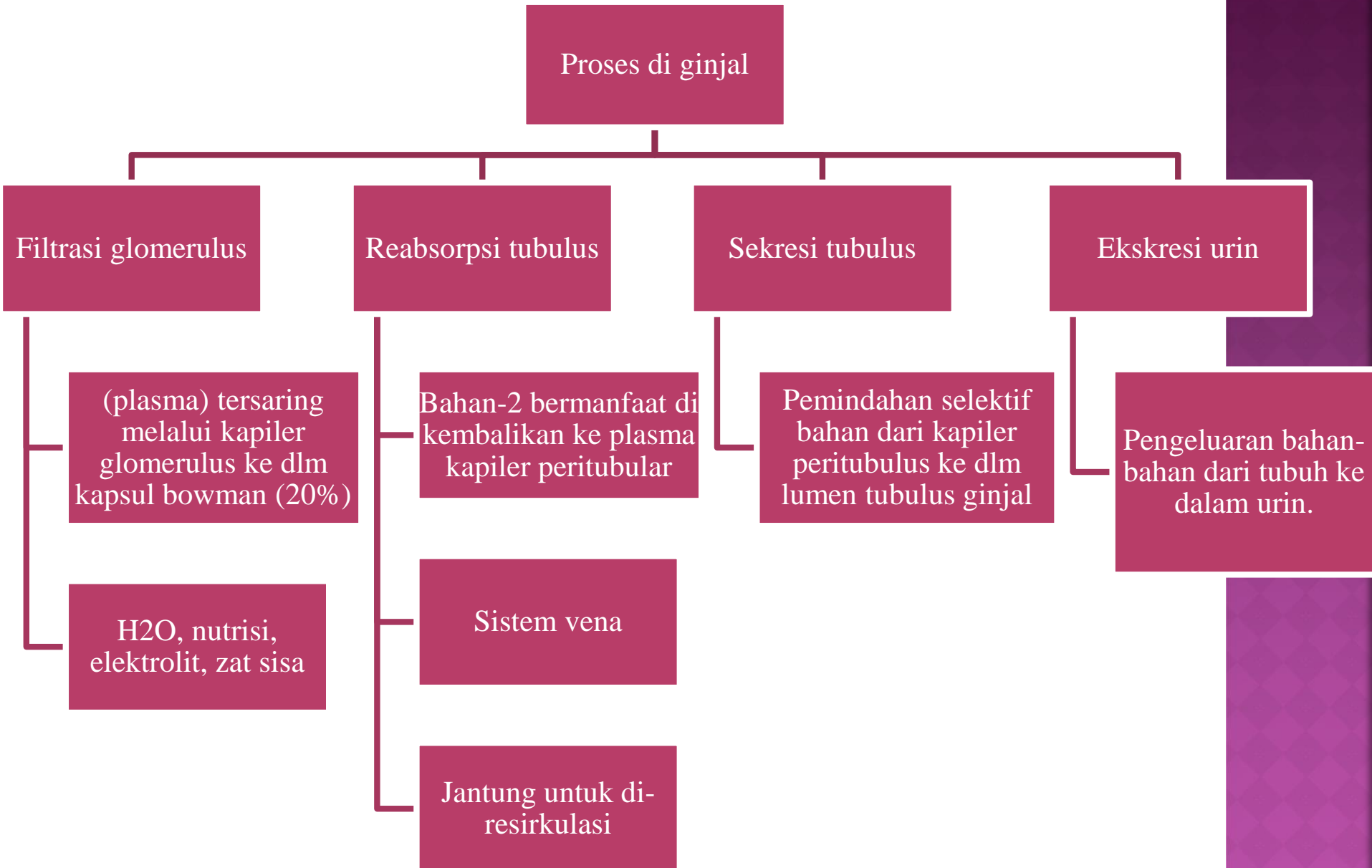
PERBEDAAN NEFRON KORTEKS DAN JUKSTAMEDULA

- ◉ Glomerulus terletak di korteks bagian luar
- ◉ Lengkung henle sedikit masuk medula
- ◉ 80% nefron pada manusia tipe nefron korteks
- ◉ Glomerulus terletak di bagian dalam di samping medula
- ◉ Lengkung henle masuk ke dalam medula
- ◉ Kapiler peritubulus membentuk lengkung vaskular (vasa rekta)
- ◉ Ex: tikus gurun

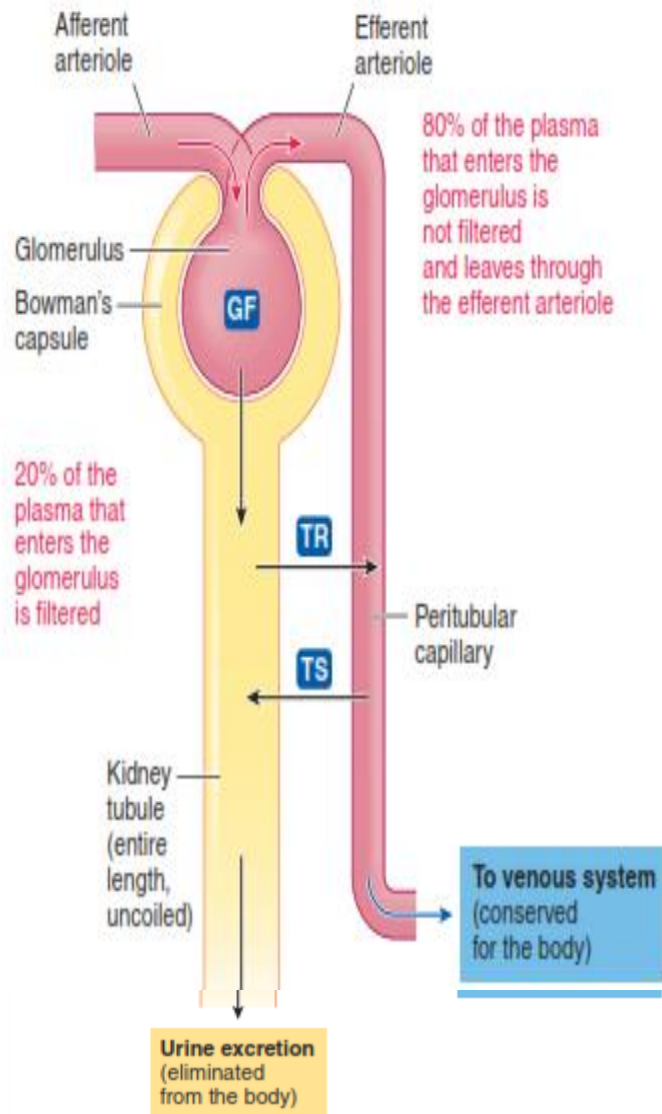
Nefron korteks

jukstamedula

PROSES DASAR DI GINJAL

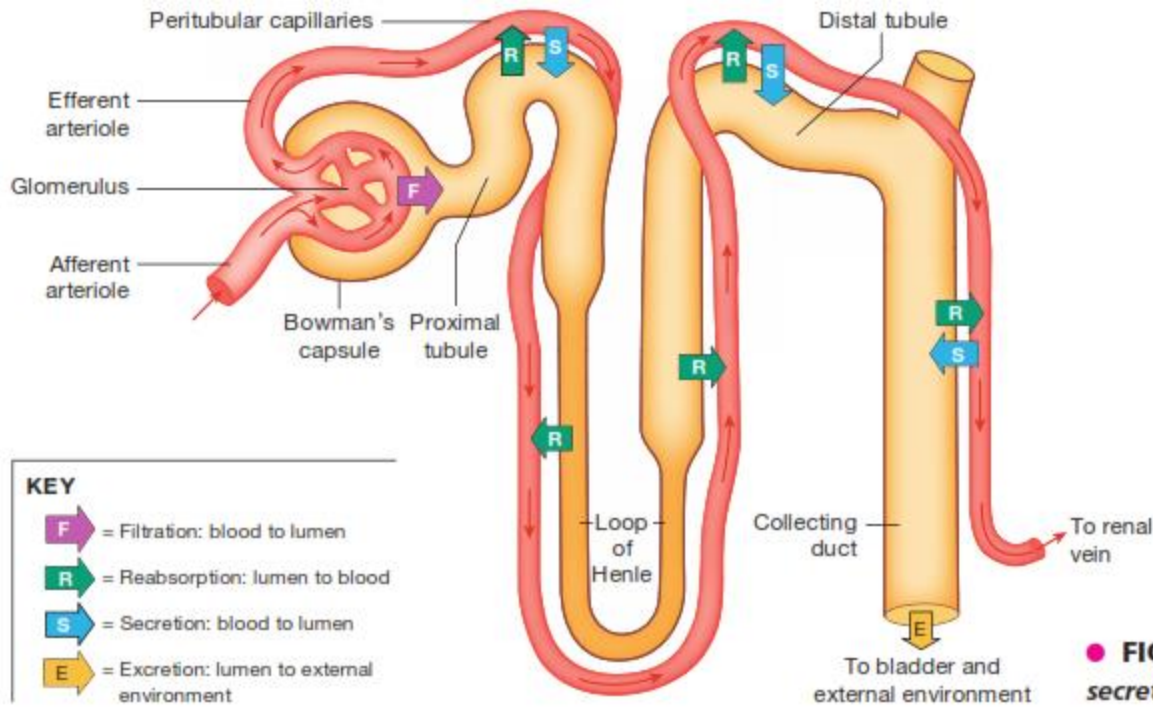


PROSES-PROSES DASAR DI GINJAL



- GF** = **Glomerular filtration**—nondiscriminant filtration of a protein-free plasma from the glomerulus into Bowman's capsule
- TR** = **Tubular reabsorption**—selective movement of filtered substances from the tubular lumen into the peritubular capillaries
- TS** = **Tubular secretion**—selective movement of nonfiltered substances from the peritubular capillaries into the tubular lumen

● **FIGURE 14-6 Basic renal processes.** Anything filtered or secreted but not reabsorbed is excreted in the urine and lost from the body. Anything filtered and subsequently reabsorbed, or not filtered at all, enters the venous blood and is saved for the body.



● **FIGURE 19-2** *Filtration, reabsorption, secretion, and excretion*