Ministry of Higher Education
& Scientific Research
Al-Muthanna University
Faculty of Pharmacy

وزارة التعليم العالي والبحث العلمي
جامعة المثنى
كلية الصيدلة

First stage

Faculty of Pharmacy

Al-Muthanna University

Second semester of 2020-2021 academic years

Theory Human Anatomy

(Urinary system)

Lec (6)

Lecturer Ahmed Adeeb Mohamed Al-Tamimi

The kidneys:

The two kidneys function to excrete most of the waste products of metabolism. They play a major role in controlling the water and electrolyte balance within the body and in maintaining the acid–base balance of the blood. The waste products leave the **kidneys** as **urine,** which passes down the **ureters** to the **urinary bladder,** located within the pelvis. The urine leaves the body in the **urethra.**

The kidneys are reddish brown and lie behind the peritoneum high up on the posterior abdominal wall on either side of the vertebral column; they are largely under cover of the costal margin (Fig. 5.63).

The right kidney lies slightly lower than the left kidney because of the large size of the right lobe of the liver. On the medial concave border of each kidney is a vertical slit that is bounded by thick lips of renal substance and is called the **hilum** (Fig. 5.64). The hilum extends into a large cavity called the **renal sinus.** The hilum transmits, from the front backward, the renal vein, two branches of the renal artery, the ureter, and the third branch of the renal artery. Lymph vessels and sympathetic fibers also pass through the hilum.

Coverings of kidney

The kidneys have the following coverings (Fig. 5.64):

■■ **Fibrous capsule:** This surrounds the kidney and is closely applied to its outer surface.

■■ **Perirenal fat:** This covers the fibrous capsule.

■■ **Renal fascia:** This is a condensation of connective tissue that lies outside the perirenal fat and encloses the kidneys and suprarenal glands.

■■ **Pararenal fat:** This lies external to the renal fascia and is often in large quantity. It forms part of the retroperitoneal fat. The perirenal fat, renal fascia, and pararenal fat support the kidneys and hold them in position on the posterior abdominal wall.

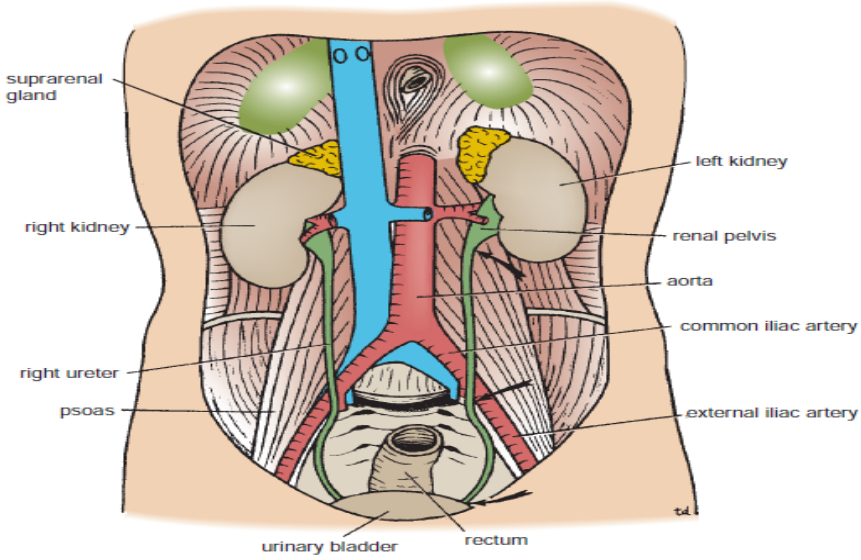


FIGURE 5.63 Posterior abdominal wall showing the kidneys and the ureters in situ. *Arrows* indicate three sites where the ureter is narrowed.

Renal Structure

Each kidney has a dark brown outer **cortex** and a light brown inner **medulla.** The medulla is composed of **renal pyramids,** each having its base oriented toward the cortex and its apex, the **renal papilla,** projecting medially (Fig. 5.64). The cortex extends into the medulla between adjacent pyramids as the **renal columns.** Extending from the bases of the renal pyramids into the cortex are striations known as **medullary rays.** The renal sinus, which is the space within the hilum, contains the upper expanded end of the ureter, the **renal pelvis.** This divides into two or three **major calyces,** each of which divides into two or three **minor calyces** (Fig. 5.64). Each minor calyx is indented by the apex of the renal pyramid, the **renal papilla.**

BLOOD SUPPLY

Arteries

The renal artery arises from the aorta at the level of the 2nd lumbar vertebra. Each renal artery usually divides into five **segmental arteries** that enter the hilum of the kidney. They are distributed to different segments or areas of the kidney. **Lobar arteries** arise from each segmental artery, one for each renal pyramid. Before entering the renal substance, each lobar artery gives off two or three **interlobar arteries** (Fig. 5.64). The interlobar arteries run toward the cortex on each side of the renal pyramid. At the junction of the cortex and the medulla, the interlobar arteries give off the **arcuate arteries,** which arch over the bases of the pyramids (Fig. 5.65). The arcuate arteries give off several **interlobular arteries** that ascend in the cortex. The **afferent glomerular arterioles** arise as branches of the interlobular arteries.

Veins

The renal vein emerges from the hilum in front of the renal artery and drains into the inferior vena cava.

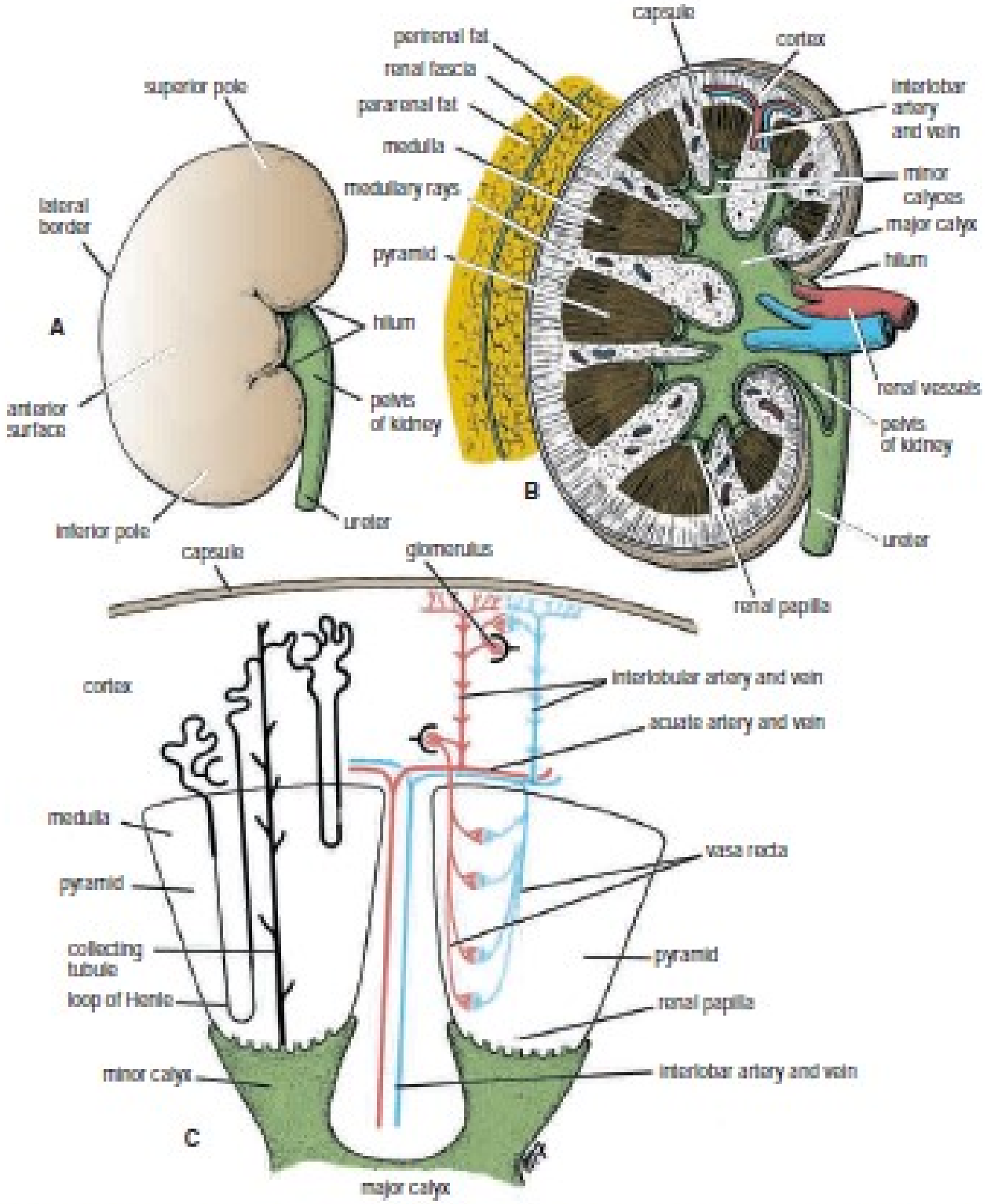
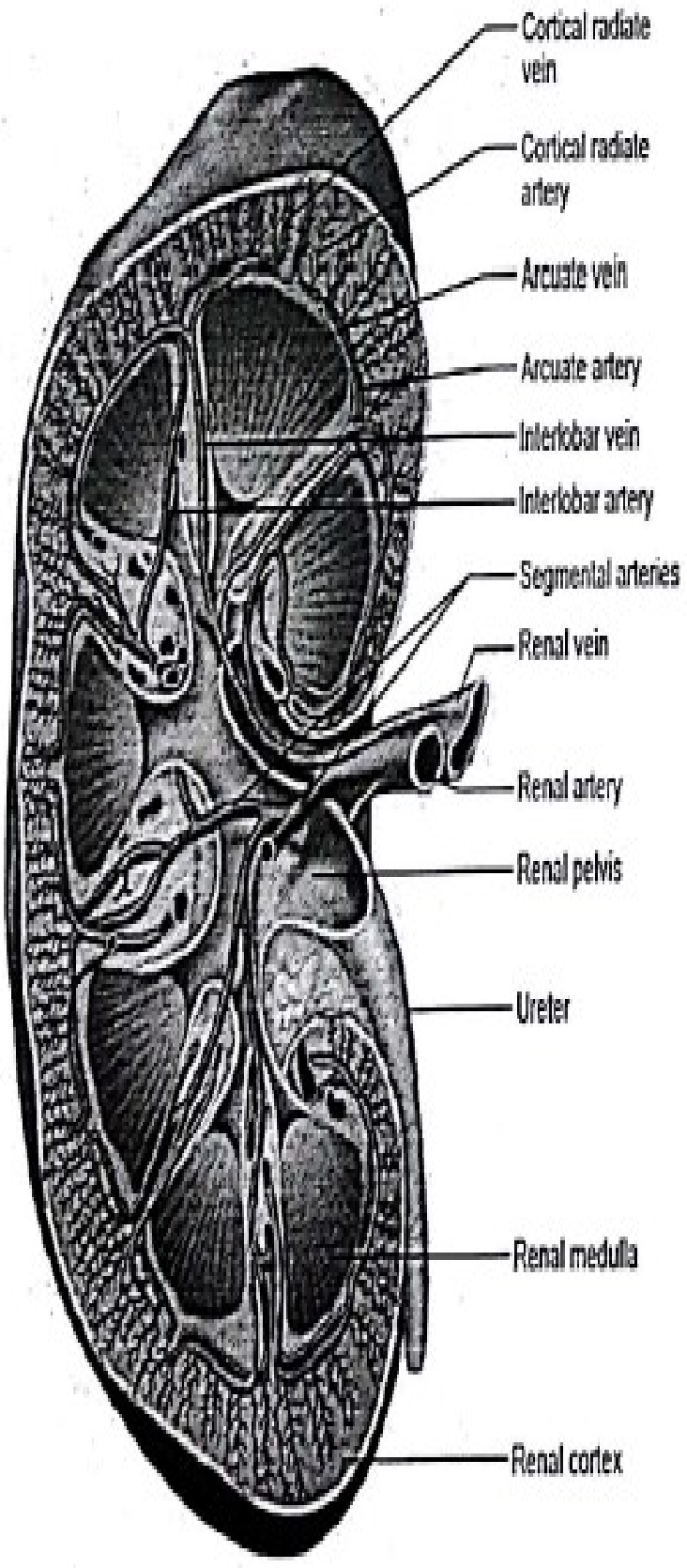
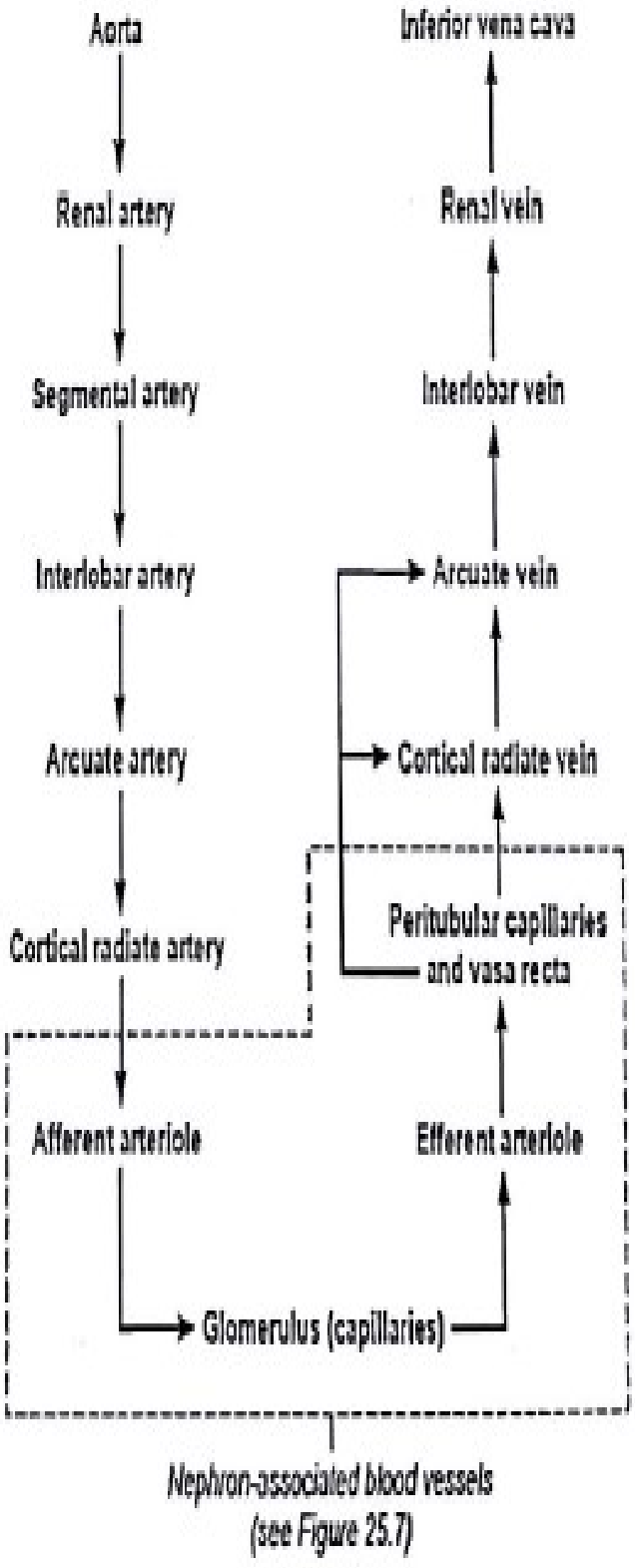


FIGURE 5.64 **A.** Right kidney, anterior surface. **B.** Right kidney, coronal section showing the cortex, medulla, pyramids, renal papillae, and calyces. **C.** Section of the kidney showing the position of the nephrons and the arrangement of the blood vessels within the kidney.



(a) Frontal section illustrating major blood vessels



(b) Path of blood flow through renal blood vessels

Figure 25.4 Blood vessels of the kidney.

Urinary Bladder

The urinary bladder is situated immediately behind the pubic bones within the pelvis. The bladder has a strong muscular wall. Its shape and relations vary according to the amount of urine that it contains. The empty bladder in the adult lies entirely within the pelvis; as the bladder fills, its superior wall rises up into the hypogastric region). The empty bladder is pyramidal, having an apex, a base, and a superior and two inferolateral surfaces; it also has a neck.

Male Urethra

The male urethra is about 8 in. (20 cm) long and divided into three parts

The prostatic urethra

The membranous urethra

The penile urethra

Female Urethra

The female urethra is about 1.5 in. (3.8 cm) long and serves only transport urine to the body exterior