組織學實驗 ： 泌尿系統

Histology laboratory :

Urinary system

實驗講義 ： 陳世杰 老師 Shih-Chieh Chen, PhD.
劉俊馳 Chun-Chih Liu
李怡琛 Yi-Chen Lee
張昭元 Chao-Yuah Chang
張瀛双 Ying-Shuang Chang
☎:07-3121101 ext 2144-18
✉:littlebu@kmu.edu.tw

Please study these slides before coming to the class!

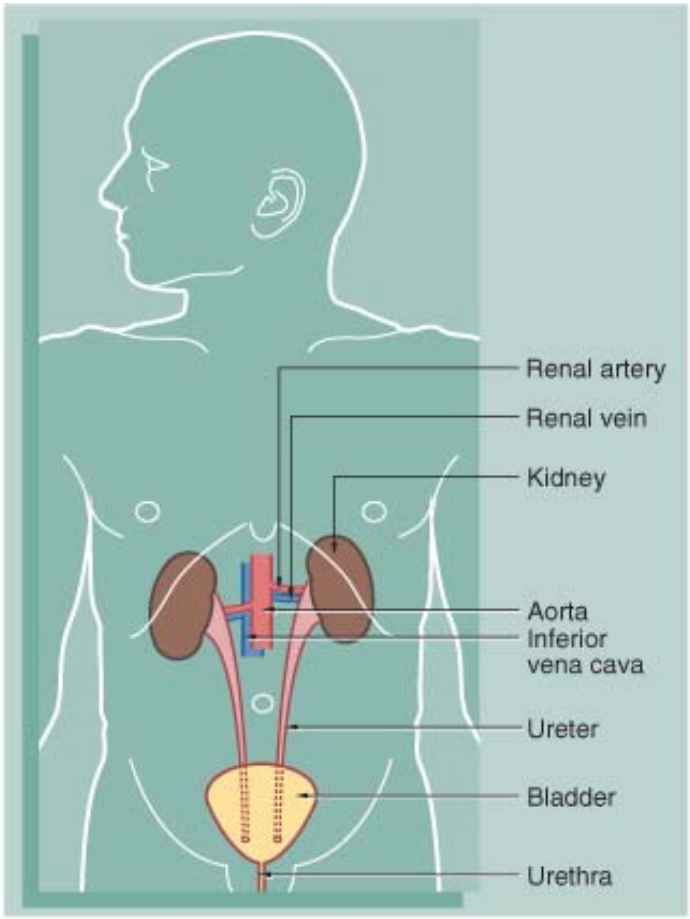
Sources of the Pictures & Text

- **Histology: A Text and Atlas** (4th ed) , M.H. Ross & W. Pawlina
- **Wheater's Functional Histology** (5th ed), B. Young & J.W.Heath

Photomicrograph of slides:

Department of anatomy,
Kaohsiung Medical University

Learning Objective
Microscopic structure of urinary system



1. Kidney :

NP-1-b, Kidney, human, PAS stain;
93W7120, Human ,Kidney,cortex , HE;

2. Ureter :

93W3039, Transitional epithelium (cs) , HE;
93W7125, Ureter (cs) , HE;

3. Bladder :

93W7130, Urinary bladder human (cs), HE;

4. Urethra :

93W5246, Urethra Female (cs) , HE

B. Young & J.W.Heath

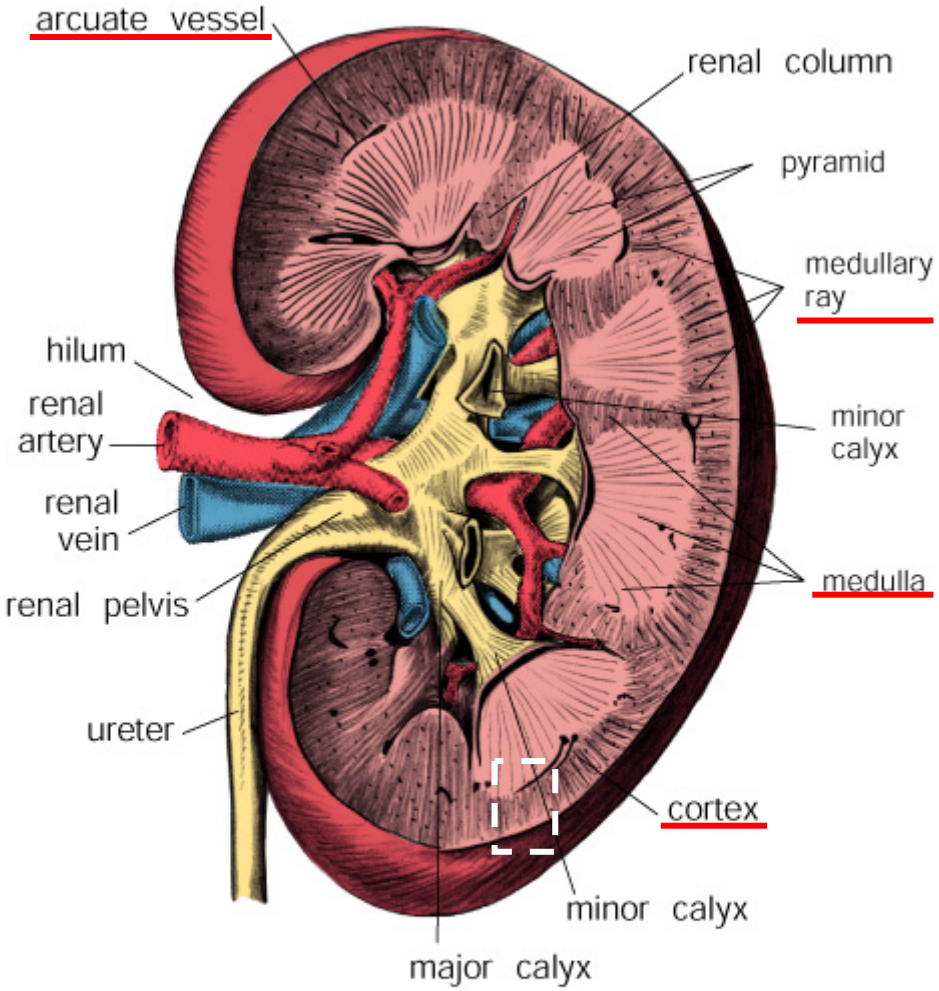


Fig.1 **Diagram of kidney structure.**

M.H. Ross & W. Pawlina

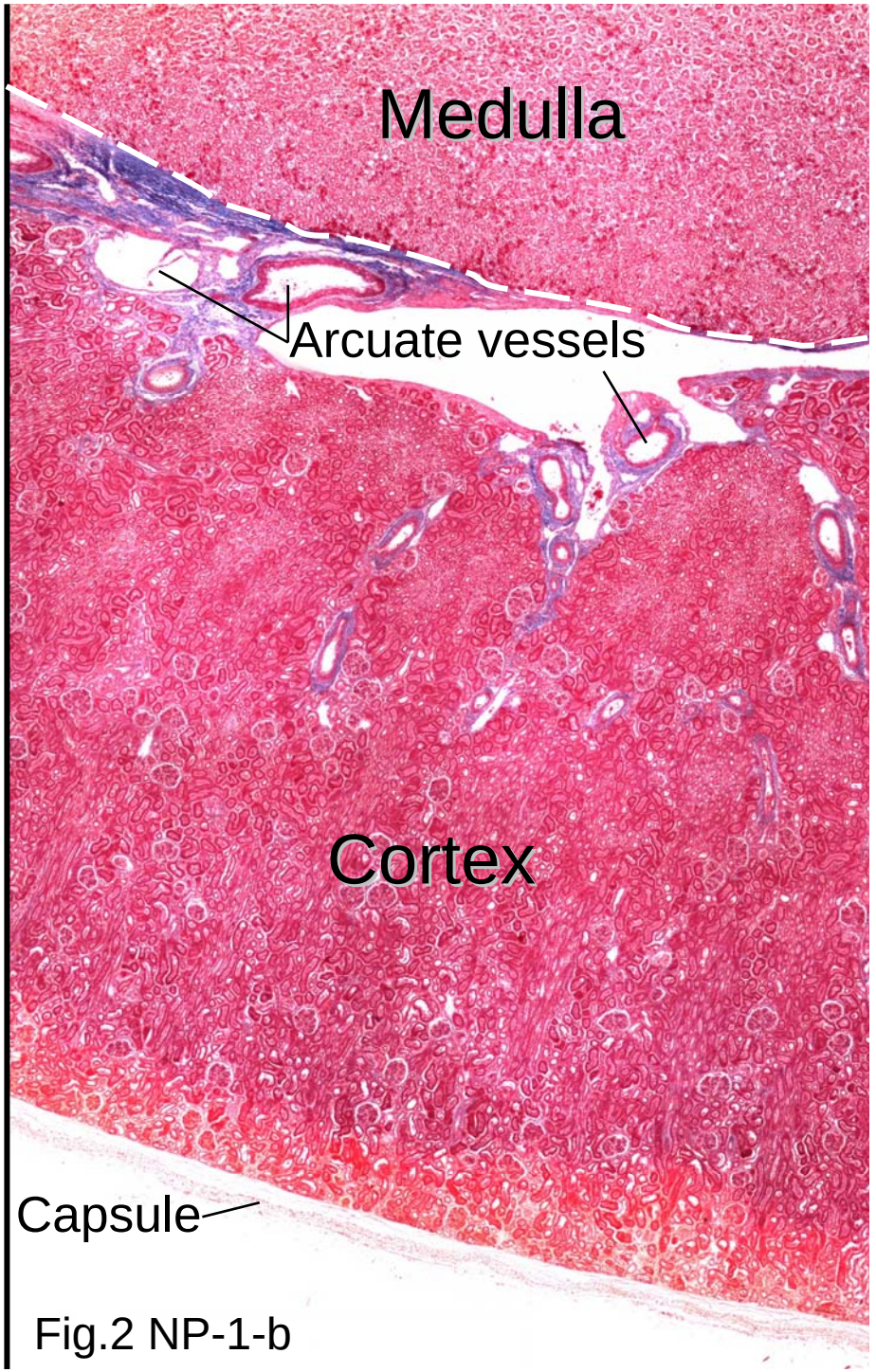


Fig.2 NP-1-b

Fig.1 Diagram of kidney structure. The diagram represents a hemisection of a kidney, revealing its structural organization. The white dashed line rectangle shows the orientation of figure2.

Fig.2 NP-1-b Kidney, human, PAS stain. PAS staining is mainly used for staining structures containing high proportion of carbohydrate macromolecules, typically found in connective tissues, mucus, and basal laminae to create a purple-magenta color. The lower part of the section is the cortex. It is easily distinguished from the upper portion above the white dashed line, the medulla. The arcuate vessels are located at the boundary between the cortex and the medulla.

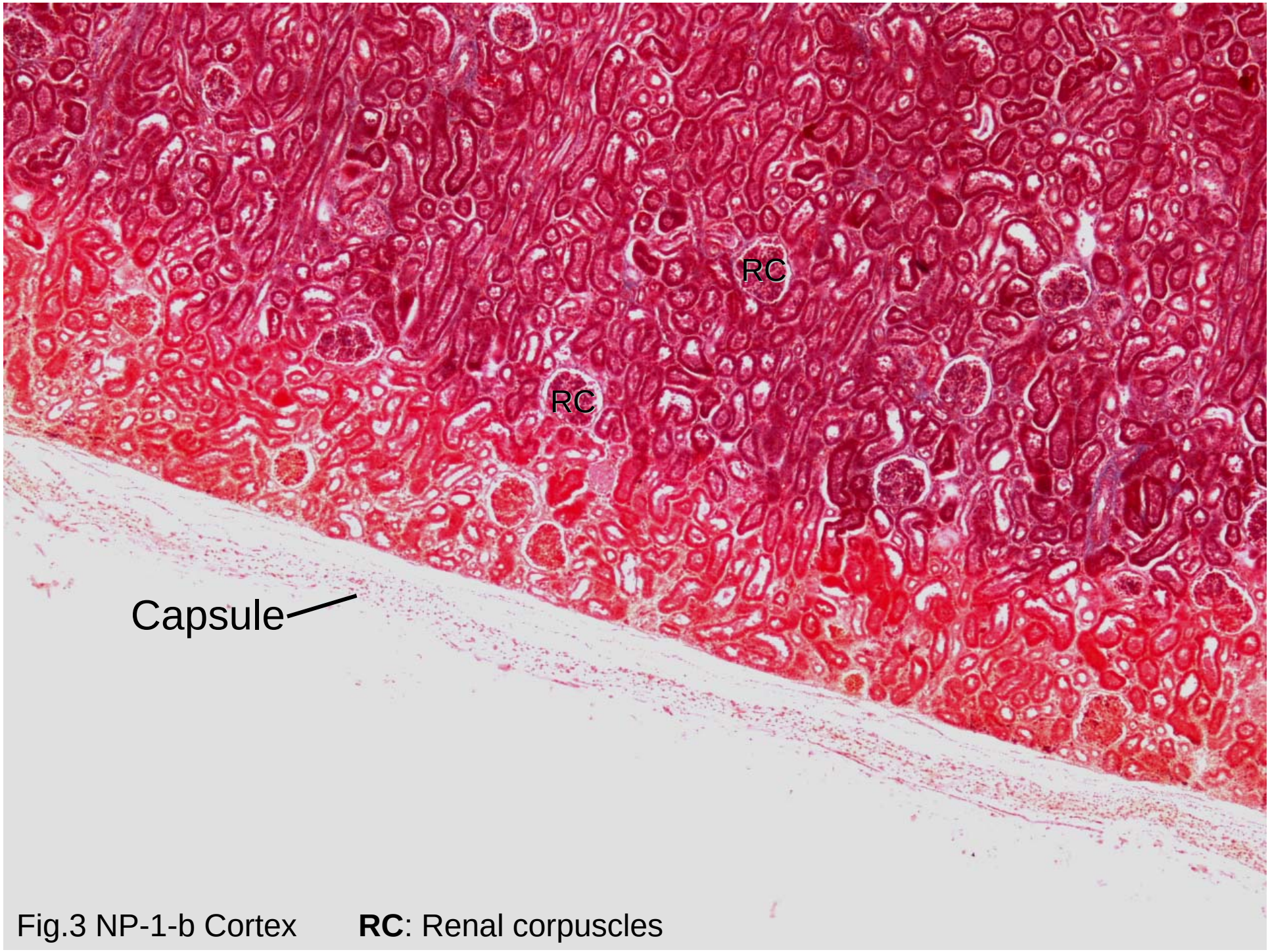


Fig.3 NP-1-b Cortex **RC**: Renal corpuscles

Fig.3 Photomicrograph of kidney capsule. This photo-micrograph shows the capsule and part of the underlying cortex. The capsule is composed of dense connective tissue, but its color faded away. The most distinctive feature of the renal cortex is the presence of the renal corpuscles (RC).

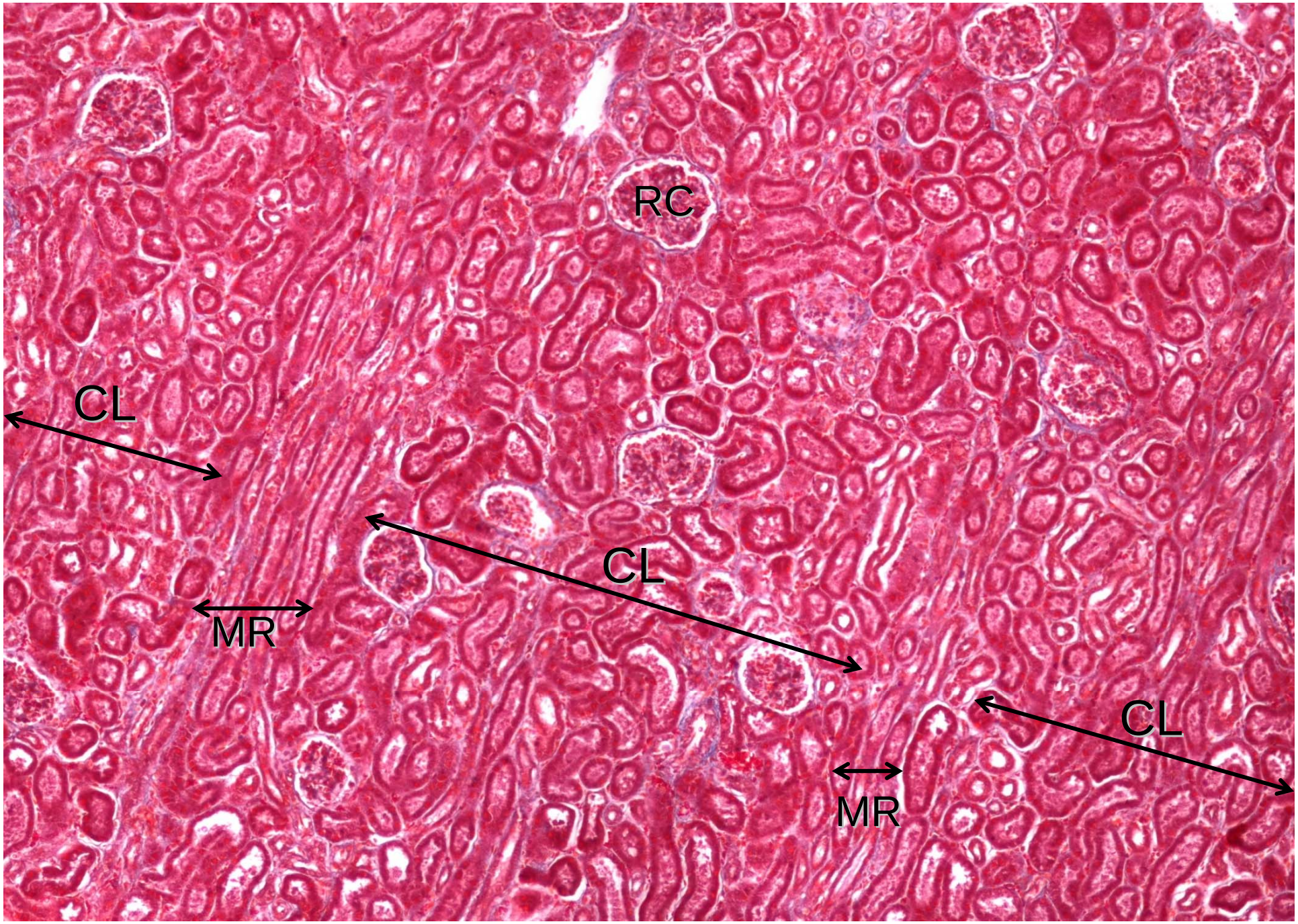


Fig.4 NP-1-b Cortex **RC**: Renal corpuscles; **CL**: Cortical labyrinth; **MR**: Medullary rays

Fig 4. **The microscopic structure of renal cortex.** The renal cortex can be divided into regions referred to the cortical labyrinth (CL) and the medullary rays (MR). The cortical labyrinth contains the renal corpuscles (RC). Surrounding each renal corpuscle are the proximal and distal convoluted tubules, which are also part of the cortical labyrinth. The medullary rays are composed of groups of straight tubules oriented in the same direction and appear to radiate from the medulla. When the medullary rays are cut longitudinally, as they are in this figure, the tubules present elongated profiles. The medullary rays contain proximal thick segments (descending limb of Henle's loop), distal thick segments (ascending limbs of Henle's loop), and collecting tubules. But they can’t be identified well in this slide.

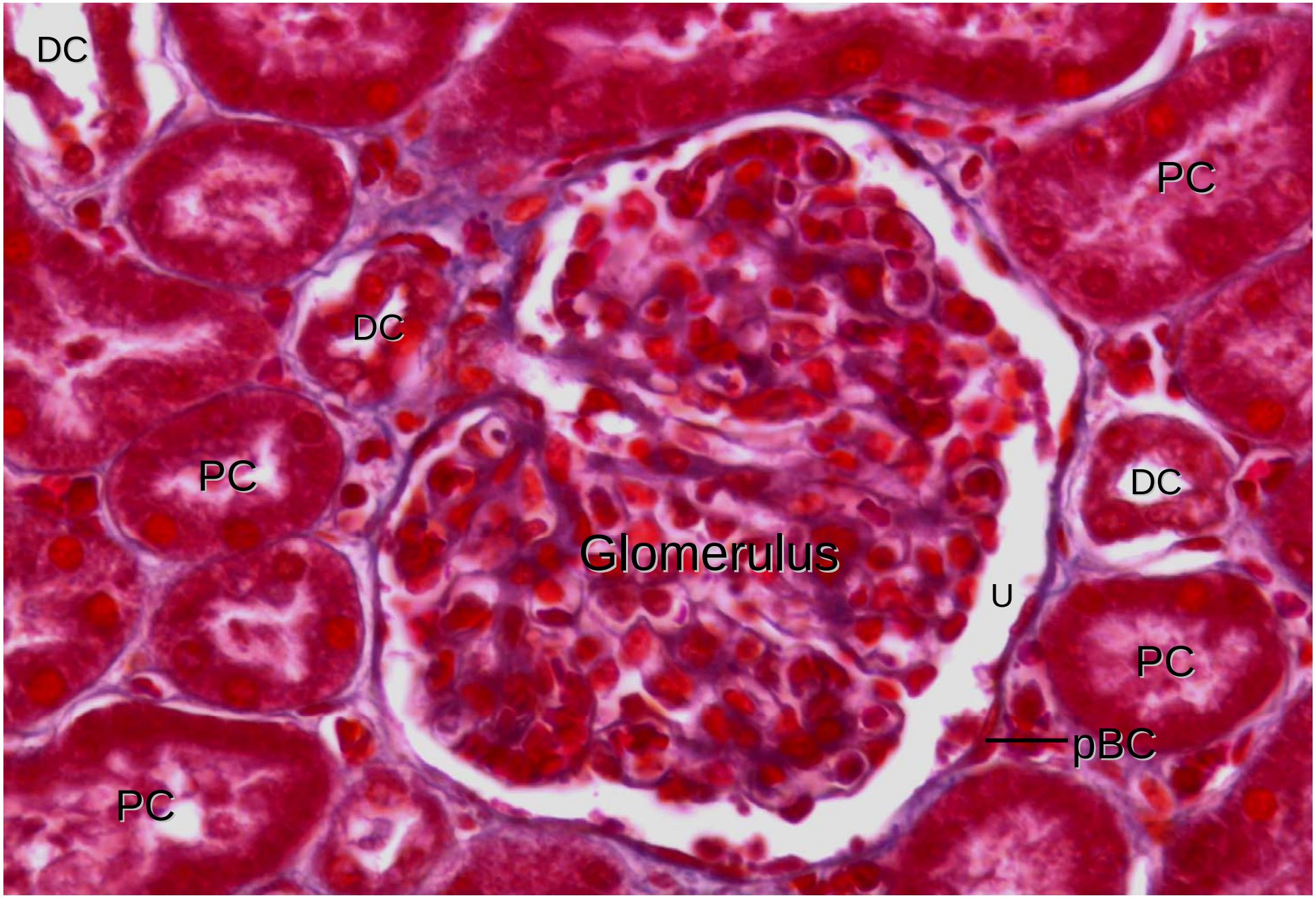


Fig.5 NP-1-b Cortex

DC: Distal convoluted tubule; **PC**; Proximal convoluted tubule; **pBC**: parietal layer of Bowman's capsule; **U**: Urinary space

Fig 5. **The microscopic structure of renal corpuscle.** The renal corpuscle appears as a spherical structure which periphery is composed of a thin capsule that encloses a narrow clear-appearing space, the urinary space (U), and a capillary tuft or glomerulus that appears as a large cellular mass. The capsule of the renal corpuscle, known as the renal or Bowman's capsule, actually has two parts; a parietal layer, which is marked (BC), and a visceral layer. The parietal layer consists of simple squamous epithelial cells. The proximal convoluted tubules (PC) have a slightly larger outside diameter than the distal convoluted tubules (DC) have. The proximal tubules have a brush border, whereas the distal tubules have a cleaner, sharper luminal surface. Typically, fewer nuclei appear in a cross section of a proximal convoluted tubule than in an equivalent segment of a distal convoluted tubule.

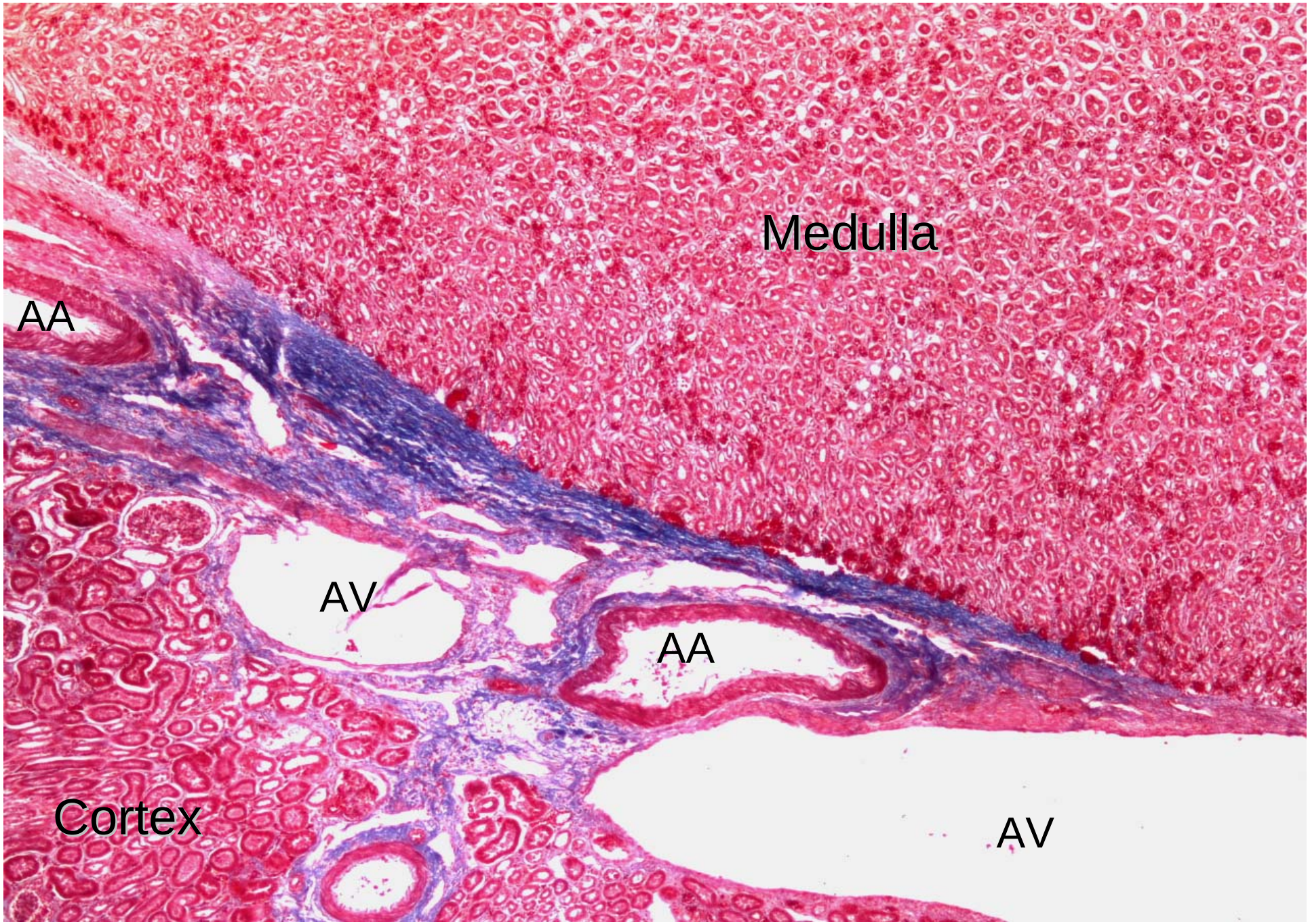


Fig.6 NP-1-b **AA**: Arcuate artery; **AV**: Arcuate vein

Fig.6 The photomicrograph of renal cortex and medulla. A photomicrograph including the cortex and part of the medulla is shown here. Located at the boundary between the lower cortex and the upper medulla are numerous profiles of arcuate arteries (AA) and arcuate veins (AV).

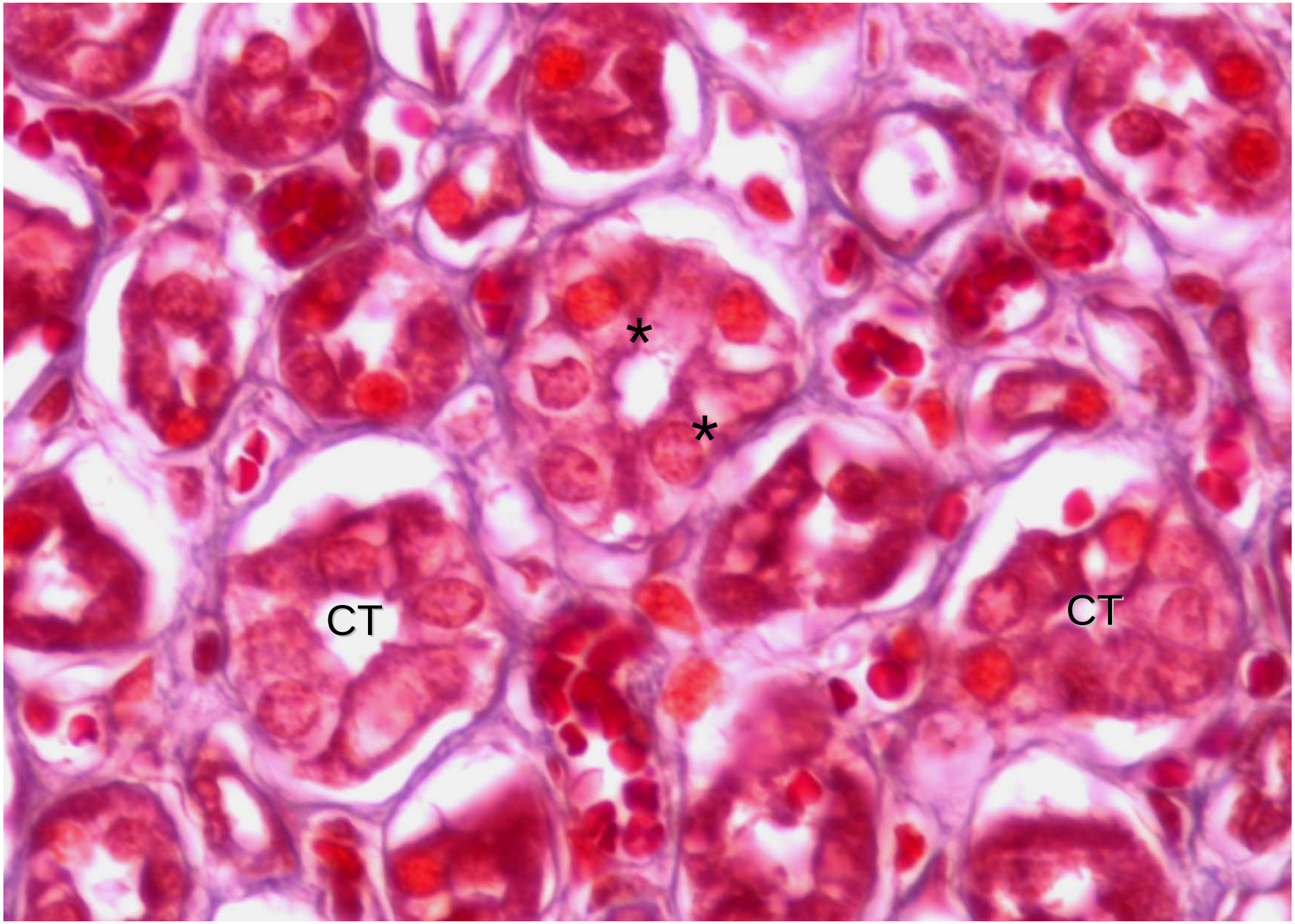
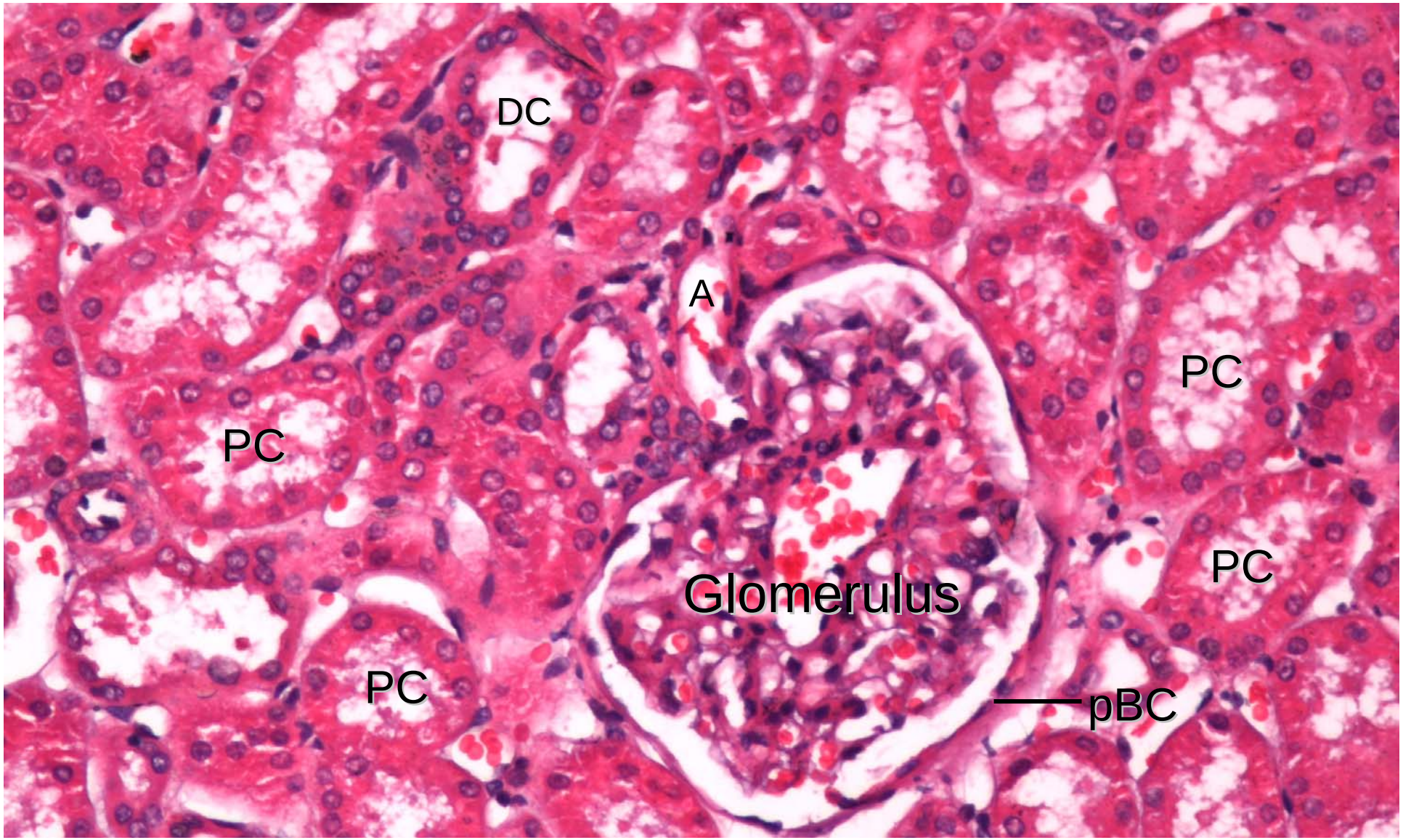


Fig.7 NP-1-b Medulla **CT**: Collecting tubules ; *: the boundaries between the cells

Fig.7 The microscopic structure of renal medulla. This region contains proximal and distal thick segments, thin segments, and collecting tubules. All of the tubules are parallel, and all are cut in cross section; thus, they present circular profiles. Unfortunately, the tissue is shrunk seriously to be difficultly identified the different parts of tubule except the collecting tubules (CT). The cells forming the collecting tubules are cuboidal and the boundaries between the cells are usually evident (*); this serves as one of the most dependable features for the identification of collecting tubules.



DC: Distal convoluted tubule; **PC**; Proximal convoluted tubule;
pBC: parietal layer of Bowman's capsule; **A**: Arteriole

Fig.8 93W7120, Human ,Kidney,cortex , HE.
The description of the structures please refer to figure 5.

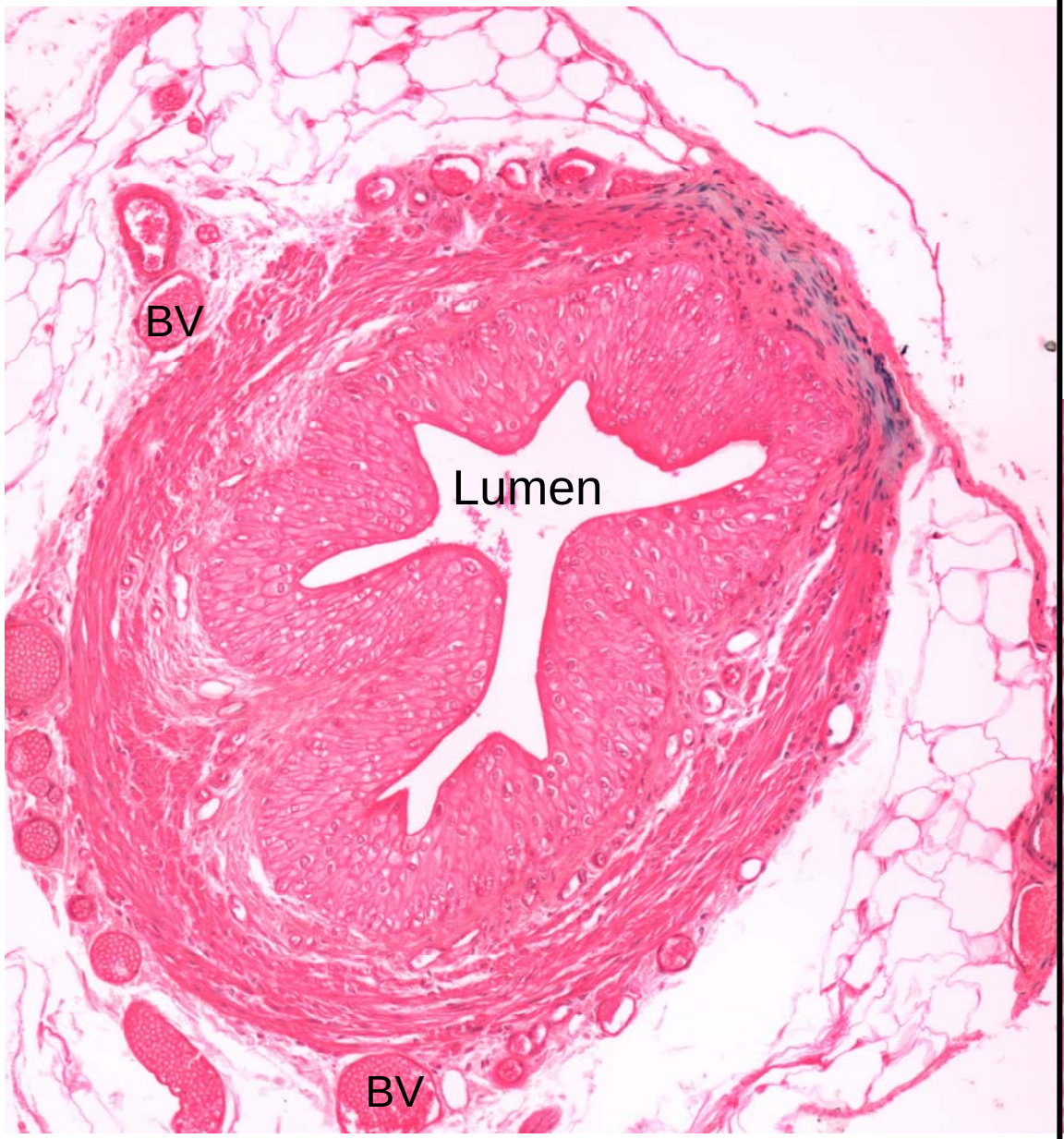
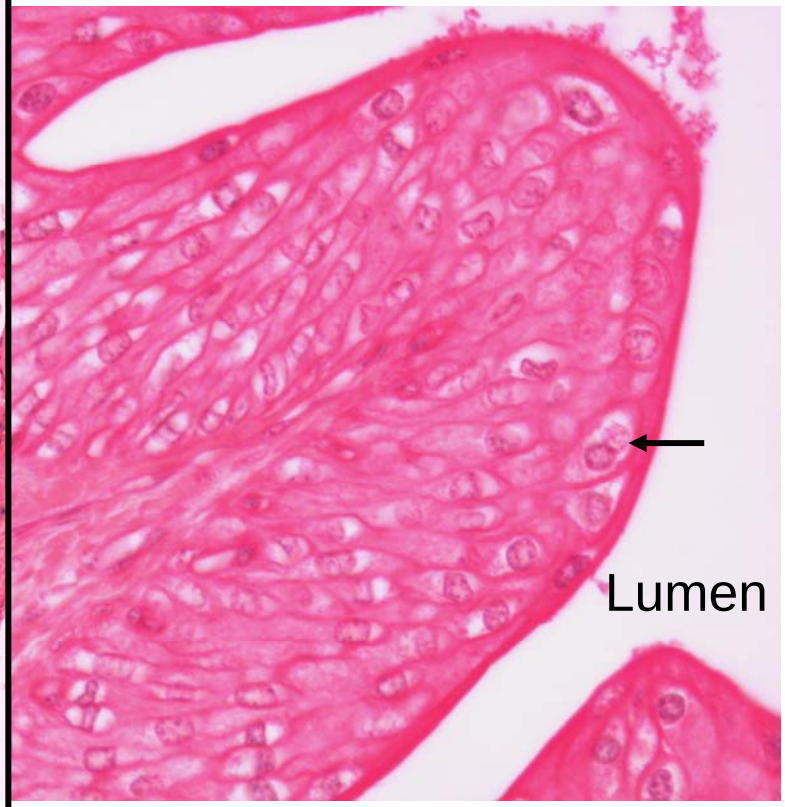


Fig.9a 93W3039 **BV**: Blood vessels



arrow: binucleate surface cell

Fig.9b

Fig.9 93W3039, Transitional epithelium (cs) , HE. This H&E-stained specimen shows the 5- to 6-cell-layer thickness of the epithelium in the relaxed ureter. The surface cells are characteristically the largest, and some surface cells are binucleate (arrow). The ability of this epithelium to become thinner and flatter allows all of these passages to accommodate to distension by the urine.

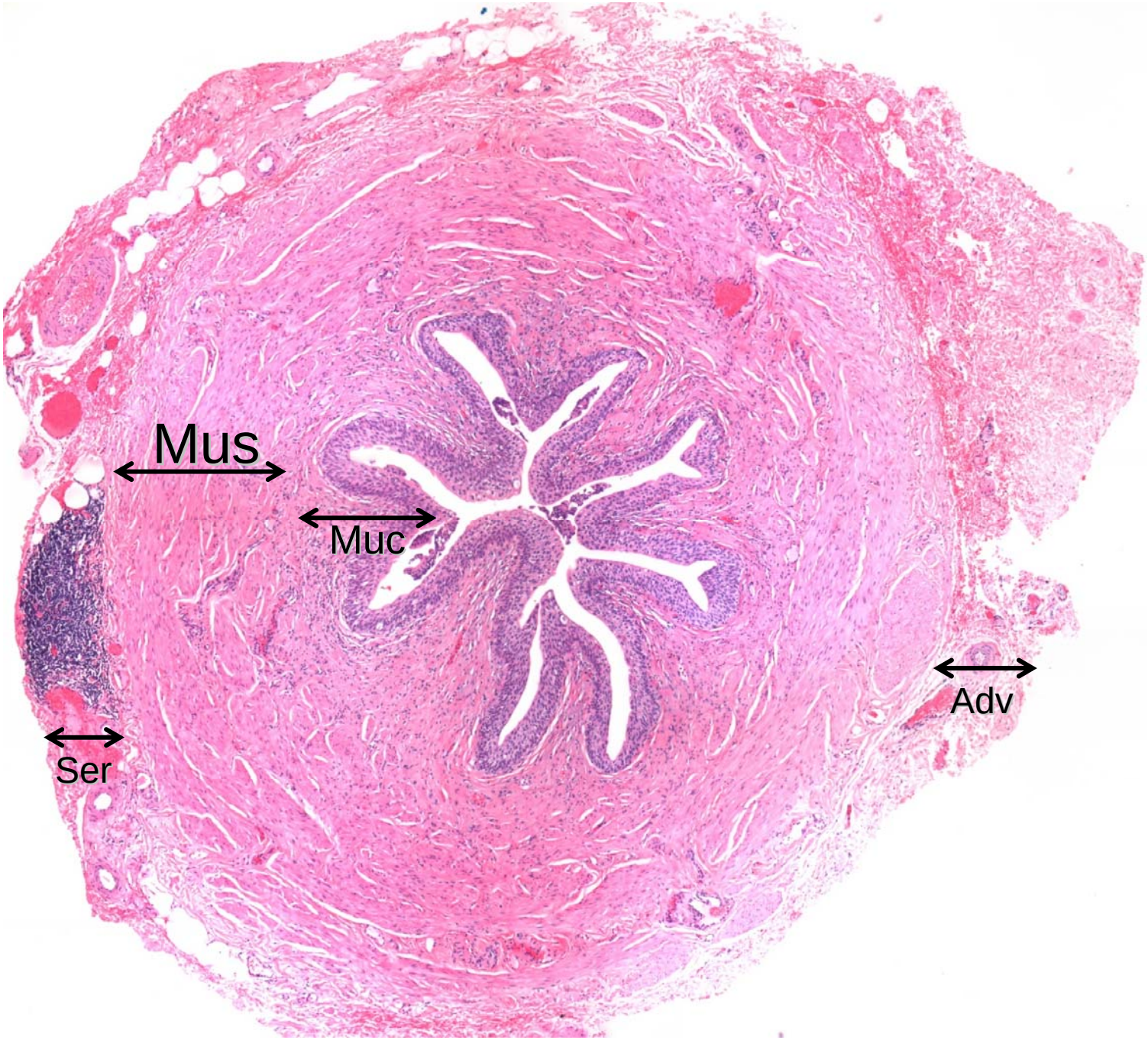
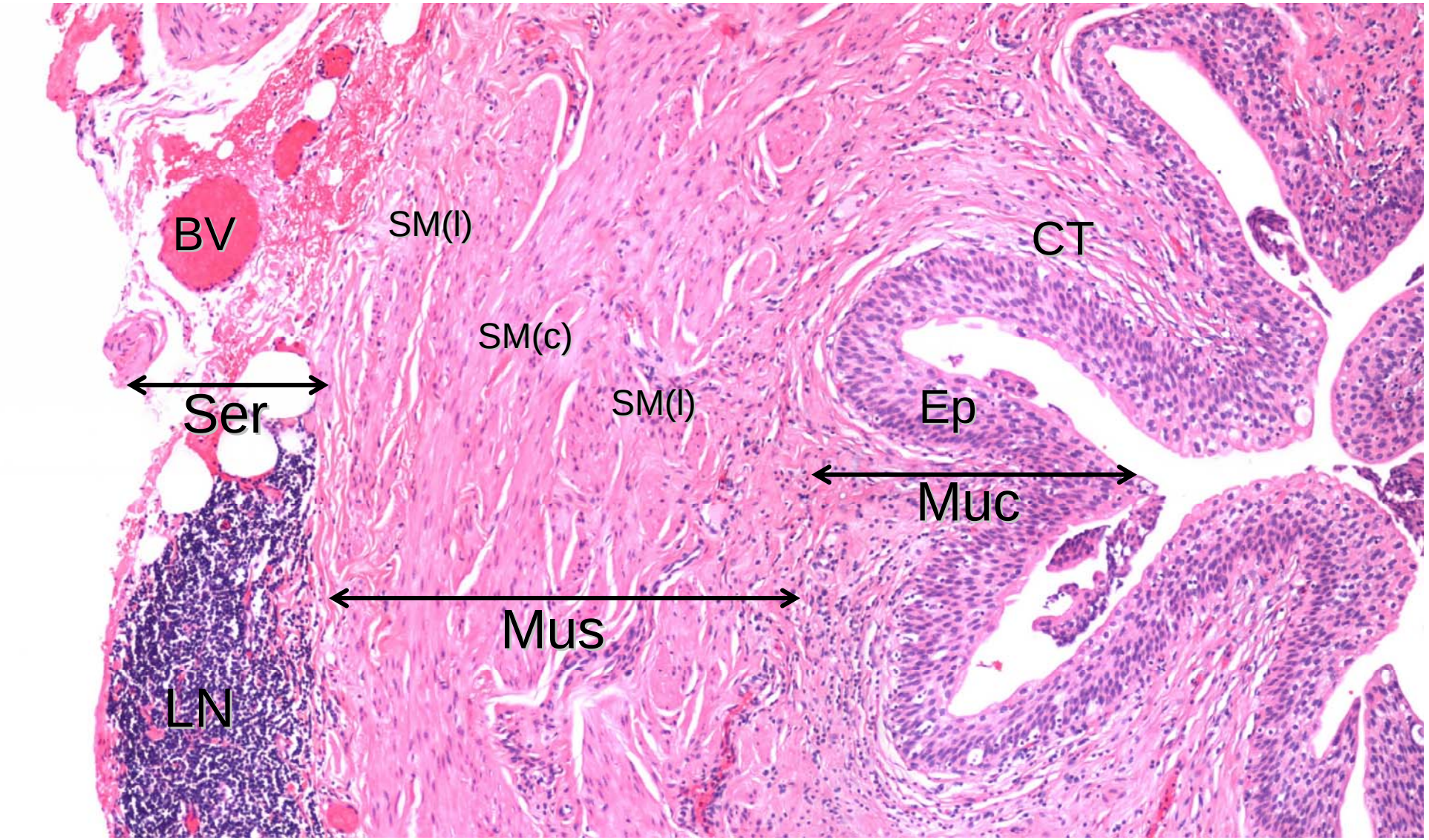


Fig.11 93W7125 **Muc**: Mucosa; **Mus**: Muscularis; **Adv**: Adventitia; **Ser**: Serosa

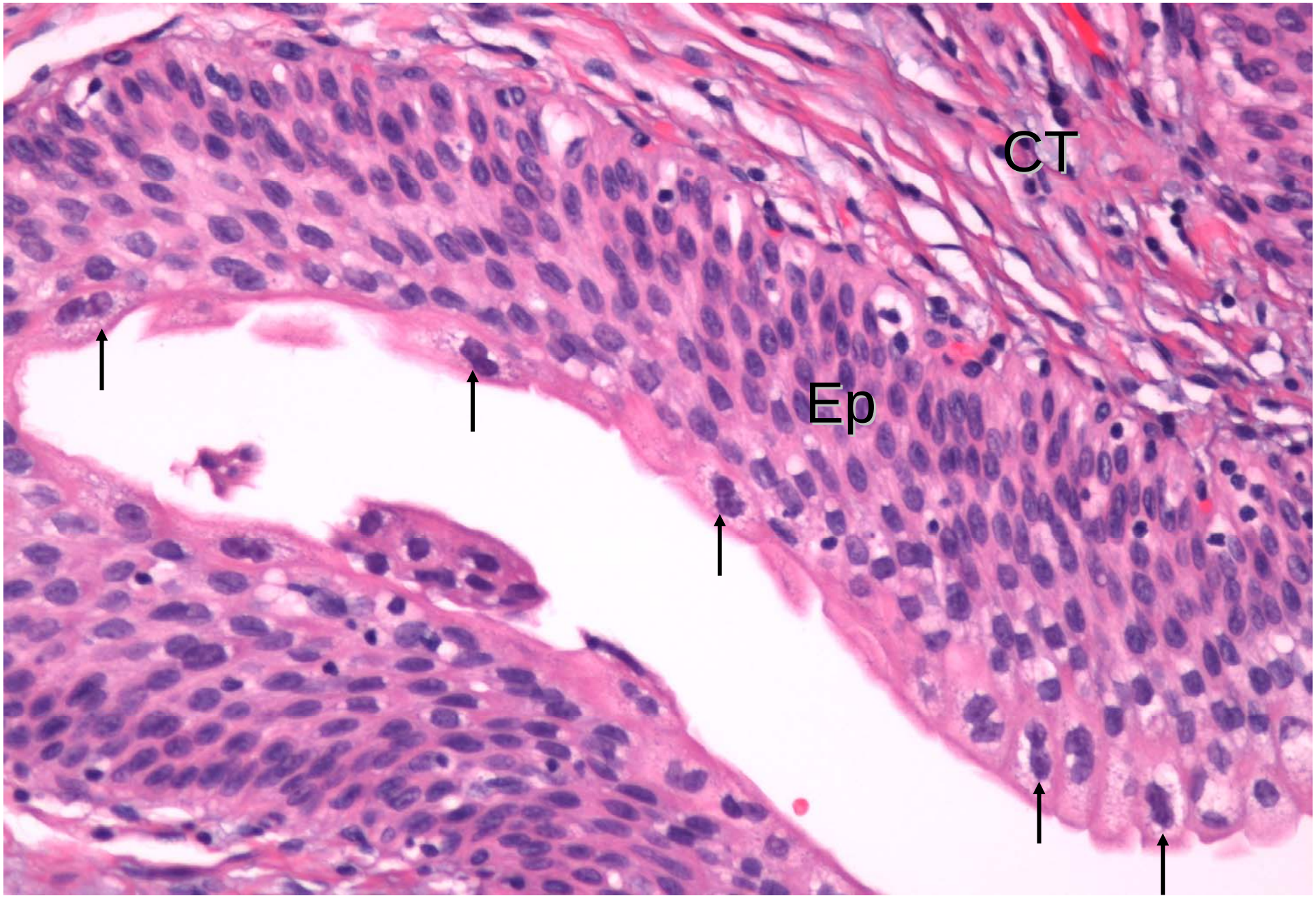
Fig.11 93W7125, Ureter (cs) , HE. As shown in this low-power orientation micrograph, the wall of the ureter consists of a mucosa (Muc), a muscularis (Mus), and an adventitia (Adv). Note that the ureters are located behind the peritoneum of the abdominal cavity in their course to the bladder. Thus, a serosa (Ser) may be found covering a portion of the circumference of the tube. Also, because of contraction of the smooth muscle of the muscularis, the luminal surface is characteristically folded, thus creating a star-shaped lumen.



Muc: Mucosa; **Mus**: Muscularis; **Ser**: Serosa; **LN**: Lymphatic nodule;
Ep: Transitional epithelium; **CT**: Connective tissue; **BV**: Blood vessels
SM(l): Longitudinal layer of smooth muscle;
SM(c): Circular layer of smooth muscle

Fig.12 93W7125

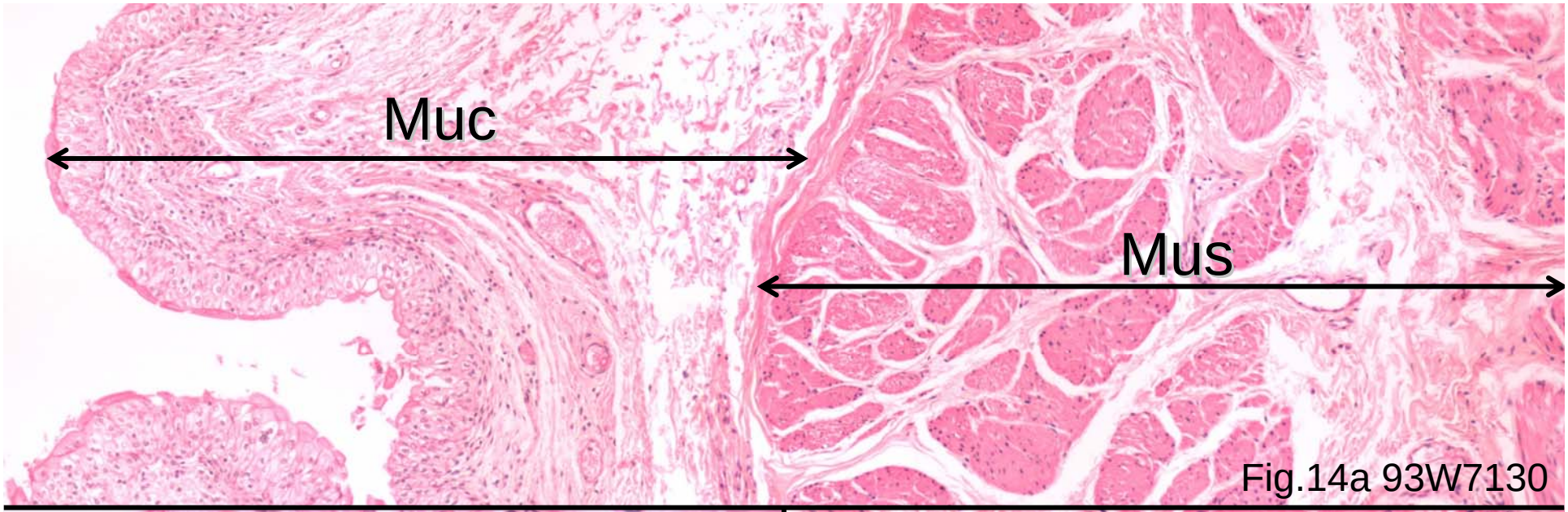
Fig.12 93W7125, Ureter (cs) , HE. The thick epitheliai lining is the transitional epithelium (Ep). The remainder of the wall is made up of connective tissue (CT) and smooth muscle. The transitional epithelium and its supporting connective tissue constitute the mucosa (Muc). A distinct submucosa is not present. The muscularis (Mus) is arranged as an inner longitudinal layer (SM(l)), a middle circular layer (SM(c)), and an outer longitudinal layer (SM(l)). However, the outer longitudinal layer is present only at the lower end of the ureter. By the way, there are blood vessels (BV) and lymphatic nodule (LN) in the serosa (Ser).

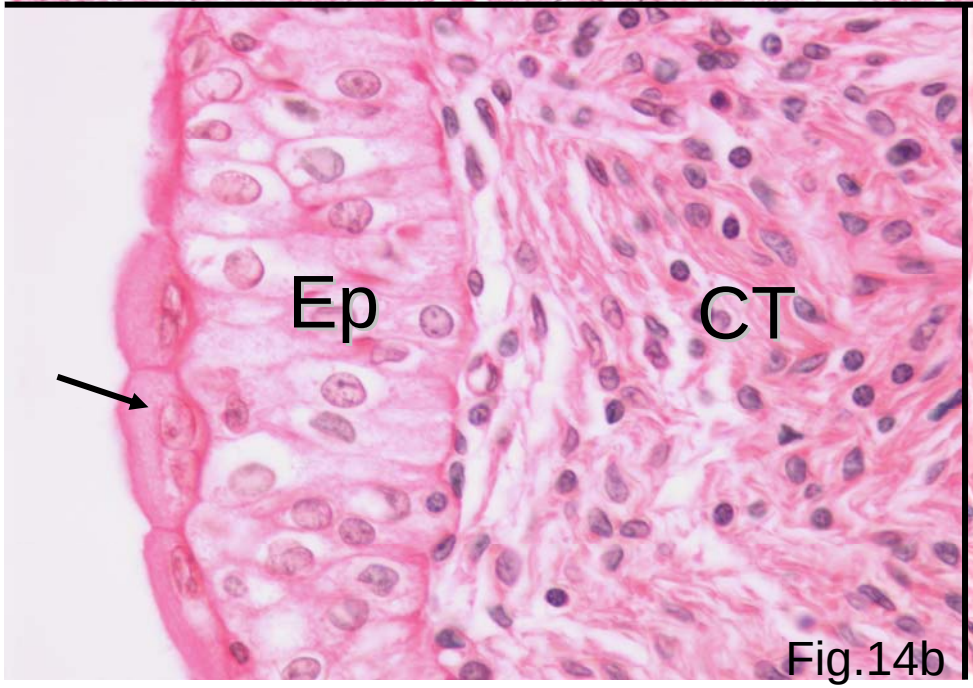


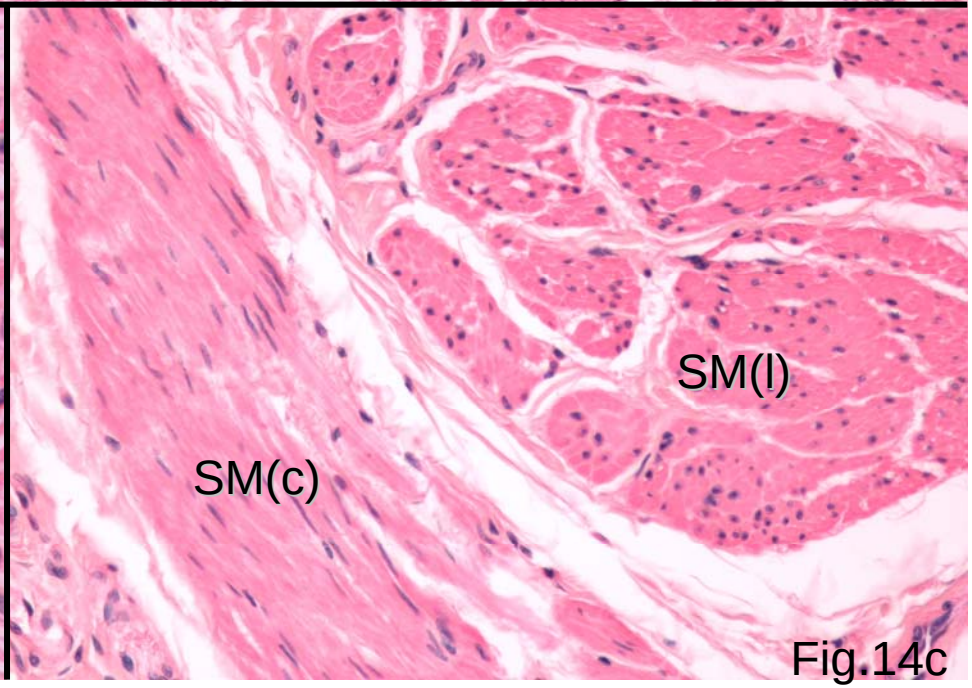
Ep: Transitional epithelium; **CT**: Connective tissue;
arrow: binucleate surface cell

Fig.13 93W7125

Fig.13 The photomicrograph of ureter mucosa. The transitional epithelium (Ep) and its supporting connective tissue (CT) constitute the mucosa. The surface cells of the transitional epithelium exhibit a rounded or dome-shaped profile, and some are binucleate (arrow). The basal cells are the smallest. The intermediate cells appear to consist of several layers and are composed of cells larger in size than the basal cells but smaller than the surface cells.

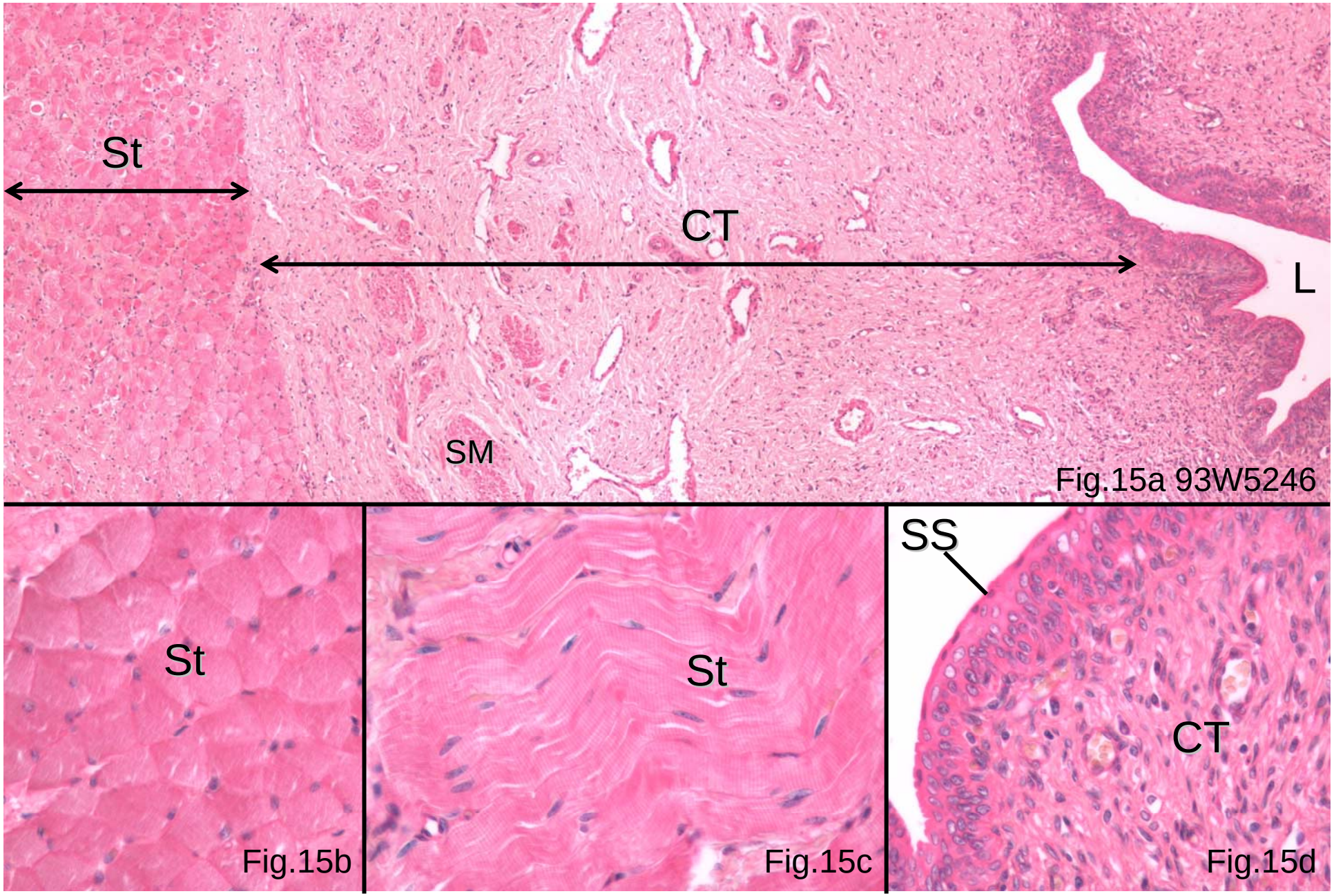






Muc: Mucosa; **Mus**: Muscularis; **SM(l), SM(c):** different orientations of smooth muscle
Ep: Transitional epithelium; **CT**: Connective tissue; **arrow**: binucleate surface cell

Fig.14 93W7130, Urinary bladder human (cs), HE. The transitional epithelium (Ep) lining the bladder is seen on the left. Beneath the epithelium is a relatively thick layer of connective tissue (CT) containing blood vessels of various sizes. The epithelium and connective tissue constitute the mucosa (Muc) of the bladder. The transitional epithelium is often characterized by the presence of surface cells that exhibit a "dome" shape. In addition, many of these surface cells are binucleate (arrows). The muscularis (Mus) consists of smooth muscle arranged as an inner longitudinal layer, a middle circular layer, and an outer longitudinal layer, but it is less regularly arranged than the description indicates.



St: Striated muscle; **SM**: Smooth muscle; **CT**: Connective tissue; **L**: Lumen of urethra
SS: Stratified squamous epithelium

Fig.15 93W5246, Urethra Female (cs) , HE. The lining is initially transitional epithelium, a continuation of the bladder epithelium, but changes to stratified squamous (SS) epithelium before its termination. Some investigators have reported the presence of stratified columnar and pseudostratified columnar epithelium in the midportion of the female urethra. The lamina propria is a highly vascularized layer of connective tissue (CT) that resembles the corpus spongiosum in the male. Some smooth muscle (SM) are present in the connective tissue. Where the urethra penetrates the urogenital diaphragm, the striated muscle (St) forms the external urethral sphincter.

Summary

NP-1-b, Kidney, human, PAS stain **93W7120,** Human ,Kidney,cortex , HE	Capsule, Cortex, Cortical labyrinth, Renal corpuscles, Distal convoluted tubule, Proximal convoluted tubule, parietal layer of Bowman's capsule, Urinary space, Glomerulus, Medullary rays, Arcuate vessels, Medulla, Collecting tubules

93W3039, Transitional epithelium (cs) , HE **93W7125,** Ureter (cs) , HE **93W7130,** Urinary bladder human (cs), HE	Mucosa, Transitional epithelium, Muscularis, longitudinal & circular layer of smooth muscle

Summary

93W5246, Urethra Female (cs) , HE	Stratified squamous epithelium, Striated muscle, Smooth muscle, highly vascularized connective tissue

- Understand the microscopic structure of urinary system
- Identify the transitional epithelium
- Compare the ureter and the urinary bladder
- Compare the urinary system and the other system