Unit 28: Kidneys and Retroperitoneal Structures

Dissection Instructions:

The duodenum, pancreas and spleen must now be removed (Plates 319; 2.63, 2.72B). Transect the stomach between body and pyloric antrum. Near the duodenojejunal flexure, tie off the jejunum twice about an inch apart and transect the jejunum between the ties. Where the sigmoid colon enters the true pelvis, make two ties around it about an inch apart and transect the sigmoid colon between the ties. Now cut the common hepatic, right gastroepiploic, splenic, superior mesenteric and inferior mesenteric vessels. You should now be able to remove the lower part of the stomach, duodenum, pancreas, spleen and large and small intestines.

Carefully clean peritoneum and extraperitoneal tissue from the anterior lamella of renal fascia (Plates 319, 332; 2.71B). The anterior lamella covers the anterior surface of the kidney, suprarenal gland and upper ureter. It is fused to the posterior lamella of renal fascia superiorly and laterally, and is fused to the renal vessels medially. It is open inferiorly. The suprarenal gland is in a separate compartment of the renal fascia. In cleaning the renal fascia, do not destroy the blood supply to the suprarenal gland. Open the anterior lamella of renal fascia by a longitudinal incision and note the fat in which the kidney is embedded. This is called the perirenal fat. Try to remove the perirenal fat from around the kidney, keeping it in one piece so it can be replaced for demonstration. Examine the posterior lamella of renal fascia posterior to the kidney and perirenal fat. Between the posterior lamella of renal fascia and the posterior abdominal wall is another accumulation of fat. This is the pararenal fat.

Clean the blood supply to the suprarenal glands (Plates 319, 332; 2.71B). Arteries supply the suprarenal glands from three sources. The inferior phrenic arteries supply a series of superior suprarenal arteries. The aorta gives direct branches to the suprarenal glands called middle suprarenal arteries. The inferior suprarenal arteries are branches of the renal arteries. There is usually one major vein draining the suprarenal glands and they are different on the two sides. On the right side, the right suprarenal gland is pressed against the inferior vena cava and the suprarenal vein usually empties directly into the inferior vena cava. On the left side, the left suprarenal vein either empties directly into the left renal vein or joins the left inferior phrenic vein before entering the left renal vein. Because the inferior vena cava is on the right side of the aorta, the left renal vein is much longer than the right renal vein. That is why the left kidney is preferred for transplantation.

Observe the surface of the kidney (Plates 321, 322; 2.63, 2.65). For one kidney (Plates 317; 2.87, 2.88), dissect the anterior renal tissue away to expose the contents of the renal sinus (Plates 321; 2.79, 2.80). Clean the renal artery and vein, noting the autonomic nerves which follow them. Note also that the right renal artery passes behind the inferior vena cava and the left renal vein passes anterior to the aorta below the superior mesenteric artery (Plates 322, 327, 328; 2.62B 2.63A). Follow the ureter into the renal sinus, noting its expansion to form the renal pelvis. The minor and major calyces join to form the renal pelvis. If there are no extra renal arteries, the kidney should receive five segmental arteries from the main trunk (Plates 323; 2.66, 2.67). The apical and inferior branches supply the poles of the kidney. A posterior branch supplies the posterior part of the kidney between the polar segments. Anteriorly, there should be upper anterior and middle anterior branches. These five branches are end arteries. The five branches divide into arcuate branches at the junction of cortex and medulla of the kidney, where the interlobular arteries enter the cortex to give off afferent arterioles.

Section the other kidney from its lateral border to the hilus and study the cut surface (Plates 321, 323; 2.65, 2.66). Locate the division into cortex and medulla. In the cortex, look for medullary rays extending from the pyramids of the medulla. In the medulla, look for renal columns of cortical tissue.
extending between pyramids. Find the papilla of a pyramid which enters a **minor calyx**. The cortical tissue contains the uriniferous tubules which empty into collecting tubules in the medullary rays. The pyramids are composed primarily of collecting tubules. The **collecting tubules** carry the urine to the minor calyx. The urine then flows from the minor calyx through the major calyx and renal pelvis into the ureter. Look carefully for the blood supply to the **ureter**. Possible sources are renal arteries, gonadal arteries, aorta and common iliac branches in the abdominal cavity. Other branches supply it in the pelvis. Note the course and relationships of the ureters. They lie on the surface of the psoas muscles, usually in a sagittal plane near the tips of the transverse processes of lumbar vertebra. They then cross the common iliac artery near its division into internal and external iliac arteries. At this point, they are in a sagittal plane near the sacroiliac joints. These bony structures are helpful in locating where the ureters should be in radiographs.

Carefully clean the **preaortic plexus of nerves** (Plates 308-310, 330 334; 2.76, 2.78). Locate the **celiac ganglion** near the **celiac arterial trunk**. As it is cleaned, elevate it to locate the **greater splanchnic nerves** piercing the crura of the diaphragm to reach the ganglion from the thoracic region. They are usually more inferior than one would expect. Note additional ganglionic masses in this area. Usually you can identify **aorticorenal and superior mesenteric ganglia**. Look for the **lesser splanchnic nerves** entering the aorticorenal ganglia. The plexus of nerves which surround the celiac trunk is the **celiac plexus**. The nerve plexus follows each of the branches and are named accordingly. Thus, the plexus surrounding the left gastric artery is the **left gastric plexus**. Look for branches to the celiac plexus from the vagus nerves near the esophagus. The **preaortic plexus** continues below the superior mesenteric artery where it is named the **intermesenteric plexus** until it reaches the inferior mesenteric artery. A small ganglion, the **inferior mesenteric ganglion**, should be located immediately superior to the inferior mesenteric artery. Note that the intermesenteric plexus receives **lumbar splanchnic nerves** from the **sympathetic trunk**, which lies just medial to the psoas muscles. The preaortic plexus and the plexuses surrounding the vessels which branch from the aorta contain pre- and postganglionic sympathetic fibers, but only preganglionic parasympathetic fibers. The cell bodies and their processes of the postganglionic parasympathetic neurons are located in the wall of the digestive tube and in or on the other organs supplied by the parasympathetic system. Below the inferior mesenteric artery to the pelvis, the preaortic plexus is called the **superior hypogastric plexus**.

Most of the branches of the **aorta** have been cleaned, but some have not (Plates 256, 290, 291, 292, 295,296, 322; 2,63A&B, 2.74, 2.75, 2.82C). Clean the inferior phrenic arteries and note their relationships to the esophagus and inferior vena cava. The **lumbar arteries** arise from the posterior surface of the aorta and lie on the bodies of the vertebra (Plates 247; 2.98). They pass into the body wall by passing under a fibrous arch which gives origin to the psoas muscle. Their further course will be seen in the next unit. The **middle or median sacral artery** branches from the posterior surface of the aorta, gives off the **fifth lumbar artery** and crosses over the sacral promontory to enter the pelvis. It is the remains of the embryonic dorsal aorta. The **celiac trunk**, inferior phrenic and middle suprarenal arteries are usually found superior to the first lumbar artery. The **superior mesenteric, renal and gonadal arteries** are usually found superior to the second lumbar artery. The **inferior mesenteric artery** is usually found above the third lumbar artery. Below the fourth lumbar arteries are the middle sacral and common iliac arteries. The aorta usually ends at the level of the fourth lumbar vertebra.

The **inferior vena cava** receives tributaries corresponding to the branches of the aorta except for the celiac, superior and inferior mesenteric arteries (Plates 235, 257; 2.101). It begins at the level of the LV5. The left **lumbar veins** pass posterior to the aorta. Note that the **left common iliac vein** passes posterior to the right common iliac artery and the **right common iliac vein** passes posterior to the right common iliac artery so that the **external iliac vein** is medial to the external iliac artery. Immediately below the diaphragm, the inferior vena cava receives the hepatic veins, which drain blood from the liver.
Retract the right crus of the diaphragm from the abdominal aorta and locate the thoracic duct (Plates 305: 1.69-1.71, 1.77). It should be in a sagittal plane with the right border of the aorta. Follow it inferiorly and attempt to identify the cisterna chyli. The cisterna chyli should receive left and right lumbar lymph trunks, intestinal lymph trunk and intercostal lymph trunks.

Be sure to identify all of the following in this unit:

renal fascia, anterior lamella, posterior lamella, suprarenal glands, perirenal fat, pararenal fat, superior suprarenal arteries, middle suprarenal arteries, inferior suprarenal arteries, suprarenal vein, renal veins, renal arteries, kidney, renal sinus, renal pelvis, minor calyx, major calyx, segmental arteries, apical & inferior branches, posterior, anterior & middle anterior branches, arcuate branches, cortex of the kidney, renal columns of cortical tissue, medulla of kidney, medullary rays, pyramids of the medulla, ureter, preaortic plexus of nerves, celiac ganglion, celiac artery, greater splanchnic nerve, aorticorenal ganglion, superior mesenteric ganglion, lesser splanchnic nerve, celiac plexus, left gastric plexus, inferior mesenteric ganglion, intermesenteric plexus, lumbar splanchnic nerves, sympathetic trunk, superior hypogastric plexus, aorta, inferior phrenic arteries, lumbar arteries, middle or median sacral artery, fifth lumbar artery, gonadal arteries & veins, inferior vena cava, lumbar veins, common iliac veins, external iliac vein, cisterna chyli.