ANSWERS: CHAPTER 4

MATCHING

1. c  4. b  6. a  8. i
2. d  5. f  7. e  9. g
3. h

IMAGE LABELING

1A. Right hepatic vein
1B. Middle hepatic vein
1C. Left hepatic vein
1D. Portal vein
1E. Splenic vein
1F. Inferior mesenteric vein
1G. Left renal artery
1H. Superior mesenteric vein
1I. Left common iliac artery
1J. Right common iliac artery
1K. Right renal artery
2A. Abdominal aorta
2B. Celiac axis
2C. SMA
3A. IVC
3B. Portal vein
4A. IVC
4B. Hepatic vein
4C. Right renal artery
4D. Aorta
4E. Left renal artery

MULTIPLE CHOICE

1. a  8. a  15. c  22. c
2. b  9. d  16. b  23. b
3. d  10. d  17. c  24. c
4. a  11. b  18. c  25. b
5. c  12. b  19. c
6. b  13. d  20. d
7. b  14. b  21. b

FILL-IN-THE-BLANK

1. Tunica intima; tunica media; tunica adventitia; tunica media
2. Left ventricle; abdominal aorta; common iliac arteries
3. Hepatic artery; left gastric artery; splenic artery
4. Anterior; lateral
5. Common iliac veins; right atrium
6. Collapsing; expanding; expanding; collapses
7. Splenic vein; inferior mesenteric vein; portal confluence
8. Atherosclerosis
9. Saccular
10. Renal; iliac
11. Dissection
12. Abdominal aortic aneurysm; bilateral
13. Endovascular repair of an abdominal aortic aneurysm
14. Pseudoaneurysm
15. Endoleak; expansion; rupture
16. Atherosclerosis; origin; distal
17. Mesenteric insufficiency
18. Renal cell carcinoma; decreased; absent
19. Budd-Chiari syndrome; web or cord; tumor; thrombus
20. Cavernous transformation
21. 13 mm; increase; decrease
22. Portal hypertension; ascites; GI bleeding
23. Esophageal; coronary; umbilical; falciform ligament
24. Hepatopetal; hepatofugal
25. Transjugular intrahepatic portosystemic shunt; portal vein; hepatic veins

SHORT ANSWER

1. There are many risk factors for atherosclerosis, including family history, hyperlipidemia, hypertension, smoking, and diabetes mellitus. Many of these risk factors can be controlled. Unfortunately, patients with atherosclerosis do not experience symptoms until complications arise; therefore, screening for disease and management of the risk factors is important.

2. The protocol would include evaluating the entire length of the abdominal aorta and taking representative images in sagittal and transverse planes at the proximal, mid, and distal aorta. The AP diameter of the aorta should measure less than 3 cm. If an aneurysm was noted, its location and size would be documented. The renal arteries and common iliac arteries should be evaluated as well for involvement or extension of the aneurysm. Pitfalls during this examination could include large body habitus and bowel gas, particularly in the mid-distal aorta. The aorta may also be tortuous, making an accurate determination of the diameter more challenging.

3. An aortic endograft is used to repair an abdominal aortic aneurysm. Blood flow is diverted through the endograft, relieving pressure off of the wall of the aorta, lessening the likelihood of rupture. Complications include pseudoaneurysm, which appears sonographically as a pulsating mass, usually near the site of an anastomosis. Turbulent color Doppler signals and a swirling blood flow pattern are noted. Hematomas may occur and are a normal part of the healing process post-surgery. An abscess can occur and has a variable appearance. Graft occlusion can occur and is best documented by an absence of color or pulsed Doppler signal through the graft. Endoleaks occur when there is an incomplete seal between the graft and the wall of the aorta. This allows continued flow around the graft into the aneurysm. Color or pulsed Doppler signal can be noted outside the graft in the case of an endoleak.
4. Two methods are used to evaluate for renal artery stenosis sonographically. The first is the direct method, which evaluates the blood flow in the aorta and renal artery with the goal of locating and evaluating the blood flow changes at the level of stenosis. Velocity measurements are recorded in the aorta, at the origin of the renal artery, and along the renal artery at the proximal, mid, and distal segments. A renal artery to aortic ratio is calculated. The indirect method evaluates the blood flow within the kidney to evaluate changes that typically occur distal to a hemodynamically significant stenosis. The segmental or interlobar arteries within the upper, mid, and lower poles of the kidney are evaluated. The waveforms obtained in these arteries are evaluated for characteristics typically seen in cases of stenosis. The systolic acceleration time is also measured, as well as the resistive index in each kidney. A combination of these two methods will provide the best overall clinical picture.

5. Portal hypertension can be caused by a number of conditions, including portal vein thrombosis and Budd-Chiari syndrome. In the United States, the most common causes of portal hypertension are acute alcoholic hepatitis and alcoholic cirrhosis. Increased pressure in the portal system causes the portal vein to dilate; as pressure increases, collateral channels develop, diverting blood away from the high pressure portal vein. The most common collateral pathways are the coronary vein, gastroesophageal veins, umbilical vein, pancreatic duodenal veins, gastrorenal, and splenorenal veins. Esophageal varices and a dilated coronary vein are seen frequently in patients with portal hypertension. A portosystemic shunt can be used to decompress the portal venous pressure and alleviate some of the pressure on the varices, reducing the risk of variceal hemorrhage. A TIPS shunt is the most common.

**IMAGE EVALUATION/PATHOLOGY**

1. Thrombus or tumor in the IVC; Abdominal pain, ascites, and leg swelling; Right renal artery, which lies posterior to the IVC

**CASE STUDY**

1. An intimal flap is seen within the abdominal aorta and extending down into the right common iliac artery. In real time, an intimal flap will be seen pulsating within the vessel lumen. When a dissection is suspected, the flap should be imaged in both the transverse and sagittal planes. The flap should be visible in both planes. Color Doppler should be used to evaluate the area and in a dissection, color flow should be visualized along both sides of the flap.

2. Within the lumen of the aorta is an aortic endograft. The patient underwent an endovascular repair of the aneurysm (EVAR). The echogenic area within the aorta represents the graft. The second image demonstrates the bifurcated graft that will extend into the common iliac arteries. The transverse diameter of the aorta is 8.46 cm. The normal measurement of the aorta is less than 3 cm. An aneurysm of this size has a high likelihood of rupture.