CHAPTER 18

AN ANATOMY OF THE CARDIOVASCULAR SYSTEM

The heart is actually two pumps—one moves blood to the lungs, the other pushes it out into the body. These two functions seem rather elementary in comparison to the complex and numerous functions performed by most of the other body organs, and yet if this pump stops, within a few short minutes all life ceases.

The heart is divided into two upper compartments called atria, or receiving chambers, and two lower compartments, or discharging chambers, called ventricles. By age 45, approximately 300,000 tons of blood will have passed through these chambers to be circulated to the blood vessels. This closed system of circulation provides distribution of blood to the entire body (systemic circulation) and to specific regions, such as the pulmonary circulation or coronary circulation.

I    HEART

One hundred thousand miles of blood vessels make up the elaborate transportation system that circulates materials for energy, growth, and repair, and eliminates wastes from your body. These vessels, called arteries, veins, and capillaries, are exchange vessels, or connecting links, between the arteries and veins. The pumping action of the heart keeps blood moving through the closed system of vessels. This closed system of circulation provides distribution of blood to the entire body and to specific regions such as the pulmonary circulation or hepatic portal circulation. Your review of the anatomy of this system will provide you with an understanding of the complex transportation mechanism necessary to provide oxygen and nutrients to our tissues.

Multiple Choice — select the best answer.

1. The visceral pericardium is found:
   a. inside the fibrous pericardium.
   b. adhering to the surface of the heart.
   c. lining the inside of the chambers of the heart.
   d. comprising the bulk of the heart tissue.

2. The correct layers of the heart, from superficial to deep, are:
   a. myocardium, pericardium, endocardium.
   b. epicardium, myocardium, pericardium.
   c. epicardium, myocardium, endocardium.
   d. endocardium, myocardium, epicardium.

3. The atrioventricular valves are also called:
   a. cuspid valves.
   b. semilunar valves.
   c. aortic valves.
   d. pulmonary valves.

4. Respectively, the right and left atrioventricular valves are also referred to as:
   a. tricuspid, mitral.
   b. bicuspid, tricuspid.
   c. mitral, bicuspid.
   d. bicuspid, mitral.

5. Semilunar valves prevent backflow of blood into the:
   a. atria.
   b. lungs.
   c. vena cava.
   d. ventricles.
6. The most abundant blood supply goes to the:
   a. right atrium.  c. left atrium.
   b. right ventricle,  d. left ventricle.

7. Branching of an artery as it progresses from proximal to distal is called:
   a. ischemia.  c. anastomosis.
   b. infarction.  d. both a and c.

8. The cavity of the heart that normally has the thickest wall is the:
   a. right atrium.  c. left atrium.
   b. right ventricle,  d. left ventricle.

9. Which of the following is a semilunar valve?
   a. aortic  c. mitral
   b. pulmonary  d. both a and b

10. The pacemaker of the heart is/are the:
    a. AV bundle.  c. AV node.
    b. SA node.  d. Purkinje fibers.

Labeling
11. Trace the blood flow through the heart by numbering the following structures in the correct sequence.
    Start with number 1 for the vena cava and proceed until you have numbered all the structures.

    __________ tricuspid          __________ pulmonary veins
    __________ pulmonary arteries  __________ pulmonary semilunar valve
    __________ bicuspid valve      __________ left ventricle
    __________ vena cava           __________ right atrium
    __________ right ventricle     __________ left atrium
    __________ aorta              __________ aortic semilunar valve

***** If you had difficulty with this section, review pages 556-565
Fill in the blanks.

12. A noninvasive technique for evaluating the internal structures and motions of the heart and great vessels is known as ________________________________.

13. Increased serum levels in the blood are often indicative of a recent myocardial infarction. These levels are monitored by blood tests known as ________________________________

14. A safe, noninvasive method of evaluating blood flow in coronary arteries or to evaluate ventricular function is ________________________________

15. Rhythmic compressions of the heart combined with effective artificial respiration in cases of cardiac arrest is known as ________________________________

******If you had difficulty with this section, review pages 557-565

II BLOODVESSELS

Match the term on the left with the proper selection on the right.

16. ________ arteries

17. ________ capillaries

18. ________ tunica adventitia

19. ________ tunica intima

20. ________ sinuses

21. ________ veins

22. ________ precapillary sphincters

True or false

23. ________ Veins are the only blood vessels to contain semilunar valves.

24. ________ The walls of veins are much thicker than arteries.

25. ________ The flow of blood through the capillary bed is referred to as microcirculation.

26. ________ Arteries are often referred to as capacitance vessels.

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Labeling—label the structure of blood vessels depicted in the following diagrams.

III MAJOR BLOOD VESSELS

Multiple Choice — select the best answer.

27. The aorta carries blood out of the:
   a. right atrium. c. left atrium.
   b. right ventricle. d. left ventricle.

28. The superior vena cava returns blood to the:
   a. left atrium. c. right atrium.
   b. left ventricle. d. right ventricle.

29. Blood returns from the lungs during pulmonary circulation via the:
   a. pulmonary artery.
   b. pulmonary veins.
   c. aorta.
   d. inferior vena cava.

30. The hepatic portal circulation serves the body by:
   a. removing excess glucose and storing it in the liver as glycogen.
   b. detoxifying blood.
   c. assisting the body to maintain proper blood glucose.
   d. all of the above.

31. The structure used to bypass the liver in the fetal circulation is the:
   a. foramen ovale.
   b. ductus venosus.
   c. ductus arteriosus.
   d. umbilical vein.
32. The foramen ovale serves the fetal circulation by:
   a. connecting the aorta and the pulmonary artery.
   b. shunting blood from the right atrium directly into the left atrium.
   c. bypassing the liver.
   d. bypassing the lungs.

33. The structure used to connect the aorta and pulmonary artery in the fetal circulation is the:
   a. ductus arteriosus.
   b. ductus venosus.
   c. aorta.
   d. foramen ovale.

34. Which of the following is NOT an artery?
   a. femoral
c. coronary
   b. popliteal
d. inferior vena cava

Fill in the blanks.

35. Blood flow from the heart to all parts of the body and back again is known as __________________________
   ____________________________

36. Small vessels join the anterior and posterior arteries to form an arterial circle at the base of the brain known as the ____________________________
   ____________________________.

37. ____________________________ are the ultimate extensions of capillaries.

38. When blood is in the capillaries of abdominal digestive organs, it must flow through the
   ____________________________
   ____________________________
   ____________________________

39. If either hepatic portal circulation or venous return from the liver is interfered with, a condition known as
   ____________________________ may occur.

40. Two ____________________________ carry circulation to the placenta and one
   ____________________________ returns blood from the placenta.

41. Many arteries have corresponding ____________________________ with the same name.
Labeling — label the principal veins of the body on the following illustration.
Student Name _______________________________________________________________________________ 
Labeling—label the principal arteries of the body on the following illustration.
Labeling—label the following depiction of fetal circulation.

***** If you had difficulty with this section, review pages 569-584
Match the term on the left with the proper selection on the right.

42. ___________ heart attack
43. ___________ decreased blood supply to a tissue
44. ___________ tissue death
45. ___________ necrosis that has progressed to decay
46. ___________ a type of arteriosclerosis caused by lipids
47. ___________ a section of an artery that has become abnormally widened
48. ___________ varicose veins in the rectum
49. ___________ vein inflammation
50. ___________ clot formation
51. ___________ cerebral vascular accident
52. ___________ leaking of bicuspid valve
53. ___________ narrower-than-normal valve

*If you had difficulty with this section, review pages 584-588
Crossword Puzzle

Across
2. Visceral layer of the serous pericardium
7. "Pumping chamber" of the heart
9. Membrane that surrounds the heart
11. Carries blood away from the heart
12. Small vein
13. "Receiving chamber" of the heart
14. Muscle of the heart

Down
1. _______circulation (blood flow to lungs and back)
3. Delicate interior layer of the heart
4. Provides collateral circulation to a part
5. Small artery
6. Connects arterioles to venules
8. Cells that line the circulatory system
10. _______circulation (blood flow throughout the system)
11. Vessel that returns blood to the heart
APPLYING WHAT YOU KNOW

54. Mr. Shearer was admitted to the emergency room with severe swelling in his extremities, difficulty in breathing, and an elevated blood pressure. His doctor advised him that he had "left-sided heart failure." What is the other name for this condition and could you elaborate on the possible serious outcome of this diagnosis if Mr. Shearer does not respond to this treatment?

55. Else was experiencing angina pectoris. Her doctor suggested a surgical procedure that would require the removal of a vein from another region of her body. What is the name of this surgical procedure?

56. Mr. Wertz called his doctor and informed him that during the night he had experienced some "heartburn" and "night sweats." His wife had insisted that he call the doctor even though he felt better. Mr. Wertz's doctor ordered blood work to be done and was not surprised when the serum levels of CPK, AST, and LDH came back elevated. How would you explain this elevation in blood serum levels?

DID YOU KNOW

• Your heart pumps more than 5 quarts of blood every minute... that's 2,000 gallons a day!

ONE LAST QUICK CHECK

Multiple Choice—select the best answer.

57. The superior vena cava carries blood to the:
   a. left ventricle.
   b. coronary arteries.
   c. right atrium.
   d. pulmonary veins.

58. Which of the following statements is NOT true regarding pericarditis?
   a. It may be caused by infection or trauma.
   b. It often causes severe chest pain.
   c. It may result in impairment of the pumping action of the heart.
   d. All of the above statements are true.

59. The outside covering that surrounds and protects the heart is called the:
   a. endocardium.
   b. myocardium.
   c. pericardium.
   d. ectocardium.

60. A valve that permits blood to flow from the right ventricle into the pulmonary artery is called:
   a. tricuspid.
   b. mitral.
   c. aortic semilunar.
   d. pulmonary semilunar.

61. Hemorrhoids can best be described as:
   a. varicose veins.
   b. varicose veins in the rectum.
   c. thrombophlebitis of the rectum.
   d. clot formation in the rectum.

62. A common type of vascular disease that occludes arteries by lipids and other substances is:
   a. an aneurysm.
   b. atherosclerosis.
   c. varicose veins.
   d. thrombophlebitis.
Matching—select the most appropriate answer for each item on the left (there is only one correct answer for each item).

63. ____________ largest artery
64. ____________ decreased blood supply
65. ____________ leg vein
66. ____________ fetal circulation
67. ____________ arterial procedure
68. ____________ vein inflammation
69. ____________ lung circulation
70. ____________ weakened artery
71. ____________ largest vein
72. ____________ myocardial infarction

a. ischemia
b. phlebitis
c. foramen ovale
d. aneurysm
e. vena cava
f. angioplasty
g. aorta
h. pulmonary
i. great saphenous vein
j. heart attack