

Functions of the Blood Vessels

CHAPTER

19

Answer Key: Textbook page references are provided as a guide for answering these questions. A complete answer key was provided for your instructor.

OBJECTIVES

- List the five functions of the blood vessels.
- Discuss blood pressure, including:
 - Describe the measurement of blood pressure.
 - Explain the variance of blood pressure in different blood vessels.
 - Describe the factors that determine blood pressure.
 - Explain the mechanisms involved in regulation of blood pressure, including the baroreceptor reflex.
- Explain how blood vessels act as exchange vessels, including:
 - Describe the factors that determine capillary exchange.
 - Describe the mechanisms of edema formation.
- Explain how the blood vessels respond to changing body needs.
- Describe the role of the blood vessels in the regulation of body temperature.

Part I: Mastering the Basics

MATCHING

Directions: Use the following words to fill in the blanks. Some words are used more than once. See text, pp. 357-367.

- | | |
|-------------------|----------------------------------|
| A. capillaries | E. capillary filtration pressure |
| B. blood pressure | F. arterioles |
| C. albumin | G. ischemia |
| D. edema | |

- _____ Resistance vessels
- _____ Exchange vessels
- _____ Determines systemic vascular resistance (SVR)
- _____ It's cool: pulselessness, pallor, pain, paresthesia, paralysis

- _____ Determined by cardiac output \times SVR
- _____ Determines plasma oncotic pressure
- _____ Impaired blood flow to a tissue or organ
- _____ A deficiency of this plasma protein causes edema
- _____ Determined by stroke volume \times heart rate \times SVR
- _____ Abnormal collection of fluid
- _____ The force exerted by the blood against the walls of the blood vessels
- _____ The outward pushing pressure within the exchange vessels

MATCHING

Blood Pressure

Directions: Match the following terms to the most appropriate definition by writing the correct letter in the space provided. Some terms may be used more than once. See text, pp. 357-362.

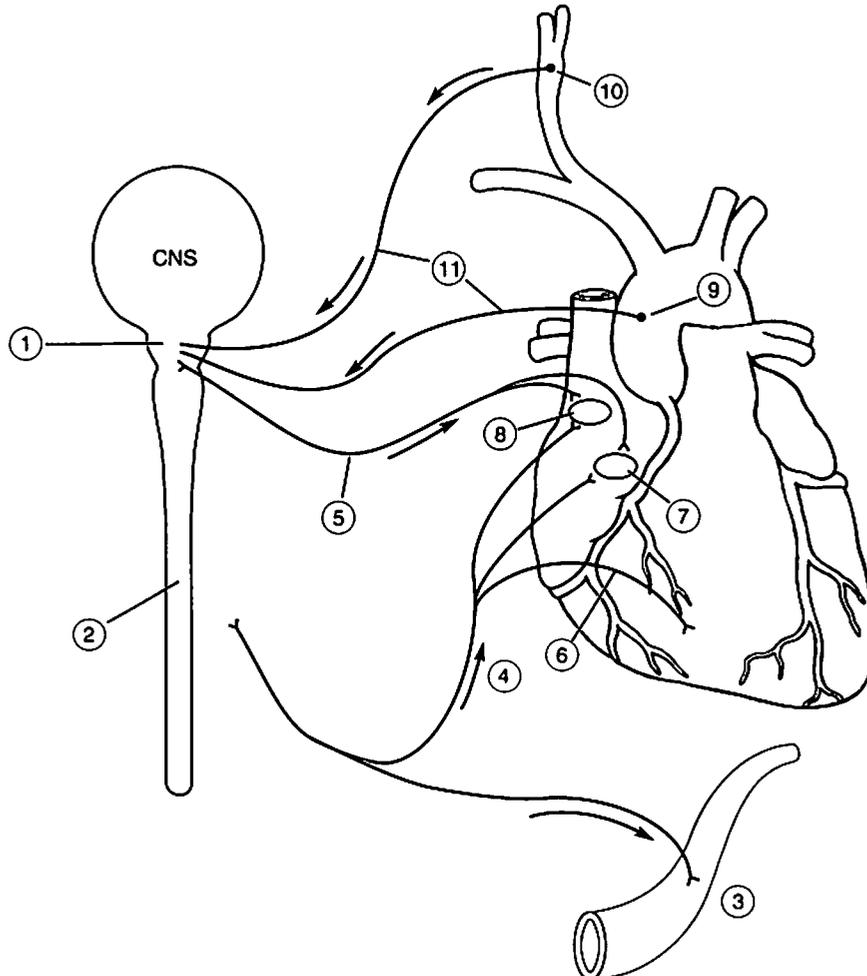
- | | |
|---------------------------------------|--|
| A. hypotension | H. pulse |
| B. normal blood pressure | I. systolic pressure |
| C. sphygmomanometer | J. vasopressors |
| D. pulse pressure | K. postural hypotension |
| E. hypertension | L. diastolic pressure |
| F. systemic vascular resistance (SVR) | M. Korotkoff sounds |
| G. brachial | N. mean arterial blood pressure (MABP) |

- _____ A sudden drop in blood pressure when the person moves from a lying to a standing position; often causes dizziness and fainting
- _____ Vibrations of the blood vessel walls that reflect heart rate

3. _____ The noise heard through the stethoscope when blood pressure is measured
4. _____ In addition to cardiac output, this determines blood pressure.
5. _____ The pressure in the arteries at the peak of ventricular contraction
6. _____ The artery most commonly used to measure blood pressure
7. _____ The difference between the systolic reading and the diastolic reading
8. _____ This is most likely to be caused by a massive peripheral vasodilation.
9. _____ Diastolic blood pressure + one-third pulse pressure
10. _____ Blood pressure of 116/72 mm Hg
11. _____ Hormones or drugs that increase blood pressure
12. _____ This is most likely to be caused by intense peripheral vasoconstriction.
13. _____ A device used to measure blood pressure
14. _____ Blood pressure reading of 160/95 mm Hg
15. _____ Blood pressure reading of 75/40 mm Hg—a “shocky” blood pressure
16. _____ The pressure in the arteries during ventricular relaxation
17. _____ Silence . . . tap . . . tap . . . tap . . . muffle
18. _____ The top number of a blood pressure reading
19. _____ The bottom number of a blood pressure reading

READ THE DIAGRAM

Directions: Referring to the illustration, fill in the spaces on the next page with the correct numbers.



1. _____ Sympathetic nerve stimulation causes vasoconstriction.
2. _____ Sympathetic nerve stimulation increases heart rate.
3. _____ Autonomic stimulation is interpreted in the medulla oblongata.
4. _____ Carotid baroreceptors
5. _____ Sympathetic stimulation causes a (+) chronotropic and (+) inotropic effect.
6. _____ CNs IX and X carry baroreceptor information to the medulla oblongata.
7. _____ Determines SVR
8. _____ Vagal stimulation decreases heart rate.
9. _____ Sympathetic stimulation increases force of myocardial contraction.
10. _____ Aortic baroreceptors
11. _____ Vagal discharge affects the SA and AV nodal activity.
12. _____ These motor fibers are part of the craniosacral outflow.
13. _____ The fibers are part of the thoracolumbar outflow.
14. _____ SA node; pacemaker
15. _____ AV node
16. _____ Origin of the sympathetic nerves that transmit response to the heart and arterioles
3. _____ Normotension
4. _____ Blood pressure that may require an antihypertensive drug such as a calcium channel blocker
5. _____ Blood pressure that may require the use of an alpha₁-adrenergic antagonist
6. _____ Blood pressure caused by hemorrhage
7. _____ Blood pressure that may result from excess catecholamines such as epinephrine
8. _____ Blood pressure that may be caused by intense sympathetic discharge
9. _____ This person has a pulse pressure of 105 mm Hg.
10. _____ This person has a mean arterial blood pressure (MABP) of 56 mm Hg.
11. _____ This person has a pulse pressure of 40.
12. _____ This person has an MABP of 89 mm Hg.
13. _____ Blood pressure that is most likely to cause a stroke or brain attack
14. _____ Blood pressure that is most likely to underperfuse the heart muscle, causing chest pain and possibly a myocardial infarction (MI)
15. _____ This blood pressure is most likely to be treated with a drug that causes peripheral vasodilation.

MATCHING

Blood Pressure Readings

Directions: Refer to the following blood pressure readings and fill in the blanks below. See text, pp. 358-359.

- A. 115/75 mm Hg C. 72/48 mm Hg
 B. 210/105 mm Hg

1. _____ Blood pressure that causes a reflex tachycardia
2. _____ Blood pressure that may require a vasopressor drug

ORDERING

Directions: Referring to the two case studies, order the events that occur when a sudden change in blood pressure activates the baroreceptor response. Place the events listed below in the spaces provided.

Case 1. Mr. C has a 10-year history of hypertension, for which he was being treated with an antihypertensive drug. His physician recently prescribed an additional antihypertensive drug. On the first day that he took both drugs, Mr. C experienced the following. On arising from a sitting position, he became extremely dizzy and indicated that his heart was racing.

1. The medulla oblongata interprets the sensory information and fires the sympathetic nervous system.

2. Information is carried from the baroreceptors by the sensory nerves to the medulla oblongata.
3. Mr. C experienced the reflex tachycardia as a "racing" heart.
4. Sympathetic nerve stimulation increased heart rate, stroke volume, and SVR, thereby increasing blood pressure.
5. The blood pressure suddenly declined in response to the combined effects of the drugs.
6. The sudden decline in blood pressure activated the carotid and aortic baroreceptors.

1. _____
2. _____
3. _____
4. _____
5. _____
6. _____

Case 2. Ms. G was showering using a new pulsatile shower head. With no warning, she experienced an episode of syncope while showering. She was subsequently diagnosed with a carotid sinus syncope.

1. The medulla oblongata interprets the sensory information falsely as an increased blood pressure and fires the parasympathetic nervous system.
2. Information is carried from the baroreceptors by the sensory nerves to the medulla oblongata.
3. The low blood pressure decreased blood flow to the brain, and Ms. G fainted.
4. Parasympathetic nerve stimulation (and diminished sympathetic activity) decreased heart rate and SVR, thereby decreasing blood pressure.
5. The sudden "increase" in blood pressure activated the carotid and aortic baroreceptors.

1. _____
2. _____
3. _____
4. _____
5. _____

MATCHING

Nervous Stimulation of the Heart and Blood Vessels

Directions: Indicate whether the following are caused by the firing of sympathetic nerves (S) or parasympathetic nerves (P) by writing the correct letter in the space provided. See text, pp. 362-364.

1. _____ Decrease in heart rate
2. _____ Same as a vagal discharge
3. _____ Positive (+) inotropic effect
4. _____ Increased blood pressure
5. _____ Increased force of myocardial contraction
6. _____ Increased cardiac output
7. _____ Increased SVR
8. _____ (+) Chronotropic effect
9. _____ Negative (-) dromotropic effect
10. _____ Most likely to cause heart block
11. _____ Most likely to cause tachycardia
12. _____ Most likely to cause bradycardia
13. _____ Mimics the effects of the catecholamines

SIMILARS AND DISSIMILARS

Directions: Circle the word in each group that is least similar to the others. Indicate the similarity of the three words on the line below each question.

1. pale pallor oncotic pressure pulselessness

2. baroreceptor edema carotid sinus aortic arch

12. Which measurement do you need to calculate mean arterial pressure?
 - a. pulse pressure, 40 mm Hg
 - b. heart rate, 72 beats/min
 - c. pulse deficit, 5 beats
 - d. blood pressure, 120/80 mm Hg
13. Which of the following is least true of vasoconstriction?
 - a. caused by sympathetic discharge
 - b. decreases cardiac output and blood pressure
 - c. increases afterload
 - d. moves blood from the venous circulation to the arterial circulation
14. A person has a history of essential hypertension; he has been taking flu medication for the past 3 weeks. The flu medicine contains phenylephrine, an alpha₁-adrenergic agonist. Which adverse effect might the person experience?
 - a. stuffy nose from congested nasal mucous membrane
 - b. further elevation in blood pressure
 - c. drowsiness and fatigue
 - d. constipation and bloating
15. Which of the following cannot be determined from a blood pressure reading of 130/72 mm Hg?
 - a. systolic reading
 - b. diastolic reading
 - c. pulse
 - d. pulse pressure
16. Which of the following makes the capillaries ideal exchange vessels?
 - a. large area for diffusion
 - b. slow velocity of blood flow
 - c. thin capillary membrane
 - d. all of the above
17. A collar that exerts pressure over the baroreceptors may
 - a. cause hypotension and fainting.
 - b. cause a hypertensive crisis and stroke.
 - c. cause cerebral ischemia and loss of consciousness.
 - d. inhibit venous drainage, causing jugular vein distention.
18. What is most likely to "tent"?
 - a. the valves of the large veins of the legs
 - b. the capillaries that contain an expanded blood volume
 - c. the skin of a dehydrated person
 - d. the heart of an exercising person
19. Plasma oncotic pressure
 - a. pulls water into the capillary from the interstitium.
 - b. pushes water out of the capillary into the interstitium.
 - c. pushes water from the interstitium into the cells.
 - d. pumps K⁺ into the cells.
20. What is the effect of an age-related stiffening of the blood vessel walls?
 - a. anemia
 - b. increased blood pressure
 - c. increased cardiac output
 - d. decreased diastolic pressure

CASE STUDY

C.L. went to the physician for his annual physical. Although he had no symptoms, his blood pressure was elevated at 160/95 mm Hg. He was advised to lose weight, begin an exercise program, and take medication for his blood pressure.

1. What is the goal of therapy?
 - a. decrease the systolic reading to 90 mm Hg
 - b. decrease the pulse pressure to 10
 - c. decrease both the systolic and diastolic pressures
 - d. achieve a heart rate of 60 beats/min
2. Which type of drug acts as an antihypertensive agent? One that
 - a. stimulates the sympathetic nerves.
 - b. increases peripheral resistance.
 - c. causes a vasopressor effect.
 - d. causes vasodilation, thereby decreasing SVR.

Part III: Challenge Yourself!

GROUPS AND PUZZLE

1. Which of the following is incorrect?
 - a. hypertensive blood pressure readings: 172/95 mm Hg, 165/90 mm Hg, 147/88mm Hg
 - b. hypotensive blood pressure readings: 90/64 mm Hg, 80/65 mm Hg, 72/58 mm Hg
 - c. determinants of blood pressure: heart rate, stroke volume, SVR
 - d. types of blood vessels: conductance, resistance, exchange, capacitance

Student Name _____

2. Which of the following is incorrect?
 - a. hypertensive blood pressure readings: 172/95 mm Hg, 165/90 mm Hg, 147/88 mm Hg
 - b. hypotensive blood pressure readings: 82/48 mm Hg, 65/52 mm Hg, 72/58 mm Hg
 - c. determinants of blood pressure: heart rate, stroke volume, pulse
 - d. types of blood vessels: conductance, resistance, exchange, capacitance
4. Difference between the systolic and diastolic blood pressures
5. Three determinants of blood pressure
6. Effects of straining at stools
7. Location (two) of baroreceptors

PUZZLE

Hint: Why Is Al Bumin a Swell Fellow?

Directions: Perform the following functions on the Sequence of Words that follows. When all the functions have been performed, you are left with a word or words related to the hint. Record your answer in the space provided.

Functions: Remove the following:

1. Five Ps of ischemia
2. Top and bottom blood pressure numbers
3. Name of the resistance vessels and exchange vessels

Sequence of Words

CAPILLARIESCAROTIDSINUSPAIN
ONCOTIC(SWELLING)SYSTOLICPRE
SSUREDIASTOLICPRESSUREHEART
RATEVALSALVAMANEUVERONCOT
ICARTERIOLESSTROKEVOLUMEPR
ESSUREAORTICARCHPULSELESSN
ESSPALLORPARESTHESIASPULSEP
RESSURESYSTEMICVASCULARRESI
STANCEPARALYSIS

Answer: _____