THE CARDIOVASCULAR SYSTEM: BLOOD VESSELS

STUDY OBJECTIVES

Education is the most powerful weapon
that you can use to change the world.
Nelson Mandela

At the completion of this chapter the student should be able to:

1. Describe the function and anatomy of arteries.
2. Define vasoconstriction and vasodilation.
3. Distinguish structurally and functionally among elastic arteries, muscular arteries, and arterioles.
4. Describe the function and anatomy of capillaries.
5. Explain how blood is directed through capillaries by precapillary sphincters.
6. Describe the function and anatomy of venules.
7. Describe the function and anatomy of veins.
8. Explain the purpose of valves in veins.
9. [See Concept 20.3 in DVD.] Define varicose veins and hemorrhoids.
10. State what vessels serve as blood reservoirs.
11. Describe how and where substances enter and leave the blood stream.
12. Describe blood pressure, resistance, lumen diameter (blood vessel diameter), and blood viscosity and explain how each is related to blood flow.
13. Describe systolic and diastolic pressure.
14. [See Concept 20.3 in DVD.] Define hypotension.
15. Explain how blood pressure moves blood through the vessels of the systemic circulation.
16. Explain how valves in veins, skeletal muscle contractions, and breathing help return venous blood to the heart.
17. Explain how the cardiovascular center and baroreceptor reflexes regulate blood pressure.
18. Describe autoregulation of blood flow.
19. Define pulse and state where on the body the pulse may be felt.
20. [See Table 20.4 in DVD.] State which blood vessel is a common site for measuring the pulse.
21. State which blood vessel is commonly used for blood pressure measurements and describe the mechanism for measuring the systolic and diastolic blood pressures with a sphygmomanometer.
22. [See Concept 20.6 in DVD.] Define hypertension and explain the damaging effects of untreated hypertension.
23. [See Chapter 20 Additional Content in DVD.] Describe shock. The exam will not ask about the various types, responses, or signs and symptoms of shock.
24. [See Table 20.10 in text.] State which vein is commonly used for administration of medication or transfusions, or obtaining blood samples.
25. Explain how the azygos system provides collateral circulation.
26. State the function of the hepatic portal circulation.

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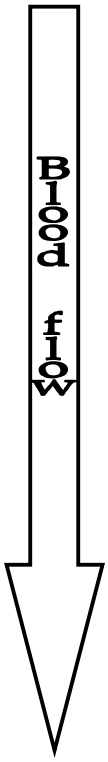
27. Identify following vessels and state the areas supplied or drained by each. Trace the path of blood through the body using these assigned blood vessels. We suggest you learn blood vessels in order of blood flow. Therefore, arteries are studied from major vessels to smaller tributaries, while veins are followed from smaller tributaries to major vessels.

Start by following arterial blood away from the heart:



- Ascending aorta
- Aortic arch
  - Brachiocephalic trunk (there is no left brachiocephalic trunk)
    - Right common carotid artery
      - External carotid artery
      - Internal carotid artery
  - Right subclavian artery (has same tributaries as those for left subclavian artery)
  - Left common carotid artery
    - External carotid artery
    - Internal carotid artery
  - Left subclavian artery
    - Vertebral artery
    - Axillary artery
      - Brachial artery
        - Radial artery
        - Ulnar artery
          - Palmar arches
            - Digital arteries of the hand
- Thoracic aorta
  - Posterior intercostal arteries
- Abdominal aorta
  - Celiac trunk
    - Gastric artery
    - Splenic artery
    - Common hepatic artery
  - Superior mesenteric artery
  - Suprarenal artery
  - Renal artery
  - Gonadal (ovarian or testicular) artery
  - Inferior mesenteric artery
  - Common iliac artery
    - Internal iliac artery
    - External iliac artery
      - Femoral artery
    - Popliteal artery
      - Anterior tibial artery
      - Posterior tibial artery
        - Plantar arch
          - Digital arteries of the foot

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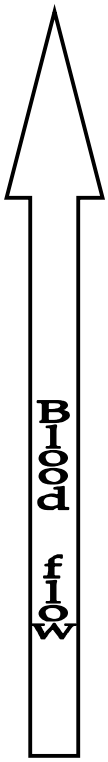
Now follow venous blood back to the heart:

Veins draining upper limbs:
- Superior vena cava
  - Brachiocephalic vein
    - Subclavian vein
      - Axillary vein
        - Cephalic vein
          - Median cubital vein (drains into both cephalic and basilic veins)
        - Brachial vein
          - Basilic vein
          - Radial vein
          - Ulnar vein
            - Palmar venous arches (drain into both ulnar and radial veins)
              - Digital veins of the hand



Veins draining head and neck:
- Superior vena cava
  - Brachipcephalic vein
    - Vertebral vein
    - Internal jugular
    - Subclavian vein
      - External jugular vein

Veins draining thorax:
- Superior vena cava
  - Azygos vein
    - Right posterior intercostal veins
    - Hemiazygos vein
    - Accessory hemiazygos vein
      - Left posterior intercostal veins (drain into hemiazygos and accessory hemiazygos veins)

Veins draining gonads, kidneys, and adrenal glands:
- Inferior vena cava
  - Right gonadal (ovarian or testicular) vein
  - Right suprarenal vein
  - Renal vein
    - Left gonadal (ovarian or testicular) vein
    - Left suprarenal vein

Veins draining gastrointestinal organs, spleen, and liver:
- Inferior vena cava
  - Hepatic veins
    - Hepatic portal vein
      - Superior mesenteric vein
      - Splenic vein
        - Inferior mesenteric vein

Veins draining lower limbs:
- Inferior vena cava
  - Common iliac veins
    - Internal iliac vein
    - External iliac vein
      - Great saphenous vein
      - Femoral vein
        - Popliteal vein
          - Small saphenous vein
          - Anterior tibial vein
          - Posterior tibial vein
            - Plantar venous arch
              - Digital veins of the foot