11
PART B

The Cardiovascular System

ESSENTIALS OF HUMAN ANATOMY & PHYSIOLOGY
EIGHTH EDITION

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Blood Vessels: The Vascular System

- Taking blood to the tissues and back
  - Arteries
  - Arterioles
  - Capillaries
  - Venules
  - Veins
- **Arteries**: carry blood away from the heart
- **Capillaries**: sites of nutrient and gas exchange between blood and body cells
- **Veins**: carry blood toward the heart
Blood Vessels: Anatomy

- Three layers (tunics)
  - Tunic intima
    - Endothelium (epithelial tissue)
  - Tunic media
    - Smooth muscle
    - Controlled by sympathetic nervous system
  - Tunic externa
    - Mostly fibrous connective tissue
Differences Between Blood Vessel Types

- Walls of arteries are the thickest
- Lumens of veins are larger
- Skeletal muscle “milks” blood in veins toward the heart
- Walls of capillaries are only one cell layer thick to allow for exchanges between blood and tissue
Movement of Blood Through Vessels

- Most arterial blood is pumped by the heart.
- Veins use the milking action of muscles to help move blood.
- Veins contain one-way valves that prevent backflow of blood.

Figure 11.9
Capillary Beds

- Capillary beds consist of two types of vessels
  - **Vascular shunt** – directly connects an arteriole to a venule (blood bypasses capillary bed)
  - **True capillaries** – exchange vessels forming capillary beds
    - Oxygen and nutrients cross to cells
    - Carbon dioxide and metabolic waste products cross into blood

*Figure 11.10*
Capillary Exchange

- Substances exchanged due to concentration gradients
  - Oxygen and nutrients leave the blood
  - Carbon dioxide and other wastes leave the cells
Major Arteries of Systemic Circulation

- Internal carotid artery
- External carotid artery
- Vertebral artery
- Brachiocephalic trunk
- Axillary artery
- Ascending aorta
- Brachial artery
- Abdominal aorta
- Superior mesenteric artery
- Gonadal artery
- Inferior mesenteric artery
- Common iliac artery
- External iliac artery
- Internal iliac artery
- Digital arteries
- Femoral artery
- Popliteal artery
- Anterior tibial artery
- Posterior tibial artery
- Dorsalis pedis artery
- Arcuate artery

- Common carotid arteries
- Subclavian artery
- Aortic arch
- Coronary artery
- Thoracic aorta
- Branches of celiac trunk:
  - Left gastric artery
  - Splenic artery
  - Common hepatic artery
- Renal artery
- Radial artery
- Ulnar artery
- Deep palmar arch
- Superficial palmar arch
- Deep femoral artery
Arterial Supply of the Brain

Figure 11.13